TRANSMOUNTAIN

CELEBRATING 60 YEARS OF SERVICE 1953 to 2013

Trans Mountain Pipeline ULC

Trans Mountain Expansion Project

An Application Pursuant to Section 52 of the National Energy Board Act

December 2013

Volume 5b ESA - Socio-Economic

KINDER MORGAN CANADA

NATIONAL ENERGY BOARD

IN THE MATTER OF

the *National Energy Board Act*,
R.S.C. 1985, c. N-7, as amended, ("*NEB Act*")
and the Regulations made thereunder;

AND IN THE MATTER OF

the *Canadian Environmental Assessment Act*, 2012,
S.C. 2012, c. 37, as amended,
and the Regulations made thereunder;

AND IN THE MATTER OF

an application by Trans Mountain Pipeline ULC
as General Partner of Trans Mountain Pipeline L.P.
(collectively "Trans Mountain")
for a Certificate of Public Convenience and Necessity and
other related approvals pursuant to Part III of the *NEB Act*

APPLICATION BY TRANS MOUNTAIN FOR APPROVAL OF THE TRANS MOUNTAIN EXPANSION PROJECT

December 2013

To: The Secretary
The National Energy Board
444 — 7th Avenue SW
Calgary, AB T2P 0X8

Trans Mountain Expansion Project
Application Pursuant to Section 52 of the *National Energy Board Act*

Guide to the Application

Application	
Transmittal - Letter to the National Energy Board	
Volume 1	Summary
Volume 2	Project Overview, Economics and General Information
Volume 3A	Public Consultation
Volume 3B	Aboriginal Engagement
Volume 3C	Landowner Relations
Volume 4A	Project Design and Execution – Engineering
Volume 4B	Project Design and Execution – Construction
Volume 4C	Project Design and Execution – Operations and Maintenance
Volume 5A	Environmental and Socio-Economic Assessment – Biophysical
Volume 5B	**Environmental and Socio-Economic Assessment – Socio-Economic**
Volume 5C	Environmental and Socio-Economic Assessment – Biophysical Technical Reports
Volume 5D	Environmental and Socio-Economic Assessment – Socio-Economic Technical Reports
Volume 6A	Environmental Compliance
Volume 6B	Pipeline Environmental Protection Plan
Volume 6C	Facilities Environmental Protection Plan
Volume 6D	Westridge Marine Terminal Environmental Protection Plan
Volume 6E	Environmental Alignment Sheets
Volume 7	Risk Assessment and Management of Pipeline and Facility Spills
Volume 8A	Marine Transportation
Volume 8B	Marine Environmental and Socio-Economic Technical Reports
Volume 8C	TERMPOL Reports

This volume contains:

Volume 5B			
Section 1.0	Introduction	Section 6.0	Socio-Economic Setting for Facilities
Section 2.0	Project Description	Section 7.0	Socio-Economic Effects Assessment
Section 3.0	Public Consultation, Aboriginal Engagement and Landowner Relations	Section 8.0	Cumulative Effects Assessment
		Section 9.0	Supplemental Studies
Section 4.0	Corridor and Facility Site Selection	Section 10.0	Follow-up
Section 5.0	Socio-Economic Setting for the Pipeline	Section 11.0	Conclusions

NEB FILING MANUAL CHECKLIST

CHAPTER 3 – COMMON INFORMATION REQUIREMENTS

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
3.1 Action Sought by Applicant			
1.	Requirements of s.15 of the Rules.	Volume 1 Section 1.1	---
3.2 Application or Project Purpose			
1.	Purpose of the proposed project.	Volume 2 Section 1.1	---
3.4 Consultation		Volumes 3A, 3B, 3C; Volumes 5A, 5B Section 3; Volume 8A Section 3	--
3.4.1 Principles and Goals of Consultation			
1.	The corporate policy or vision.	Volume 3A Section 1.2.1 Volume 3B Section 1.2.1	--
2.	The principles and goals of consultation for the project.	Volume 3A Section 1.2.2 Volume 3B Section 1.2.2 Volume 5A Section 3.2.1 Volume 5B Section 3.2.1	--
3.	A copy of the Aboriginal protocol and copies of policies and principles for collecting traditional use information, if available.	Volume 3B Section 1.3.5	--
3.4.2 Design of Consultation Program			
1.	The design of the consultation program and the factors that influenced the design.	Volume 3A Section 1.3 Volume 3B Section 1.3 Volume 5A Section 3.1.1, 3.2.2 Volume 5B Section 3.1.1, 3.2.2	--
3.4.3 Implementing a Consultation Program			
1.	The outcomes of the consultation program for the project.	Volume 3A Section 1.7 Volume 3B Section 1.5 Table 1.5.1 Volume 5A Section 3.1.5, 3.2.4 Volume 5B Section 3.1.5, 3.2.4	--
3.4.4 Justification for Not Undertaking a Consultation Program			
2.	The application provides justification for why the applicant has determined that a consultation program is not required for the project.	N/A	N/A
3.5 Notification of Commercial Third Parties			
1.	Confirm that third parties were notified.	Volume 2 Section 3.2.2	--
2.	Details regarding the concerns of third parties.	Volume 2 Section 3.2.2	--
3.	List the self-identified interested third parties and confirm they have been notified.	N/A	N/A
4.	If notification of third parties is considered unnecessary, an explanation to this effect.	N/A	N/A

CHAPTER 4 – SECTIONS 4.1 AND 4.2: COMMON REQUIREMENTS FOR PHYSICAL PROJECTS

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
4.1 Description of the Project			--
1.	The project components, activities and related undertakings.	Volume 2 Section 2.0; Volume 4A	--
2.	The project location and criteria used to determine the route or site.	Volume 2 Section 4.0; Volume 4A	--
3.	How and when the project will be carried out.	Volume 2 Section 2.3; Volume 4B Section 2.0	--
4.	Description of any facilities, to be constructed by others, required to accommodate the proposed facilities.	N/A	N/A
5.	An estimate of the total capital costs and incremental operating costs, and changes to abandonment cost estimates.	Volume 2 Section 2.9	--
6.	The expected in-service date.	Volume 2 Section 1.1; Volume 4B Section 2.1	--
4.2 Economic Feasibility, Alternatives and Justification			
4.2.1 Economic Feasibility			
1.	Describe the economic feasibility of the project.	Volume 2 Section 3.5	--
4.2.2 Alternatives			
1.	Describe the need for the project, other economically-feasible alternatives to the project examined, along with the rationale for selecting the applied for project over these other possible options.	Volume 2 Section 3.0; Volume 8A Section 2.2	--
2.	Describe and justify the selection of the proposed route and site including a comparison of the options evaluated using appropriate selection criteria.	Volume 2 Section 4.0; Volume 8A Section 2.2	--
3.	Describe the rationale for the chosen design and construction methods. Where appropriate, describe any alternative designs and methods evaluated and explain why these other options were eliminated.	Volume 2 Section 4.0; Volume 8A Section 2.2	--
4.2.3 Justification			
1.	Provide a justification for the proposed project	Volume 2 Section 3.4	--

GUIDE A – A.1 ENGINEERING

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.1.1 Engineering Design Details			
1.	Fluid type and chemical composition.	Volume 4A Section 3.1.1	--
2.	Line pipe specifications.	Volume 4A Section 3.2.8	--
3.	Pigging facilities specifications.	Volume 4A Section 3.3.1, 3.3.2	--
4.	Compressor or pump facilities specifications.	Volume 4A Section 3.4	--
5.	Pressure regulating or metering facilities specifications.	Volume 4A Section 3.5	--
6.	Liquid tank specifications, or other commodity storage facilities.	Volume 4A Section 3.4	--
7.	New control system facilities specifications.	Volume 4A Section 3.3	--
8.	Gas processing, sulphur or LNG plant facilities specifications.	N/A	N/A
9.	Technical description of other facilities not mentioned above.	N/A	N/A
10.	Building dimensions and uses.	Volume 4A Section 3.3, 3.4, 3.5	--
11.	If project is a new system that is a critical source of energy supply, a description of the impact to the new system capabilities following loss of critical component.	N/A	N/A
A.1.2 Engineering Design Principles			
1.	Confirmation project activities will follow the requirements of the latest version of CSA Z662.	Volume 4A Section 2.2	--
2.	Provide a statement indicating which Annex is being used and for what purpose	Volume 4A Section 2.3	--
3.	Statement confirming compliance with OPR or PPR.	Volume 4A Section 2.1	--
4.	Listing of all primary codes and standards, including version and date of issue.	Volume 4A Section 2, Table 5.1.1	--
5.	Confirmation that the project will comply with company manuals and confirm manuals comply with OPR/PPR and codes and standards.	Volume 4A Section 2.6, Table 5.1.2	--
6.	Any portion of the project a non-hydrocarbon commodity pipeline system? Provide a QA program to ensure the materials are appropriate for their intended service.	N/A – all hydrocarbons	N/A
7.	If facility subject to conditions not addressed in CSA Z662: • Written statement by qualified professional engineer • Description of the designs and measures required to safeguard the pipeline	Volume 4A Section 2.9	--
8.	If directional drilling involved: • Preliminary feasibility report • Description of the contingency plan	Volume 4A Section 2.12	--
9.	If the proposed project involves the reuse of materials, provide an engineering assessment in accordance with CSA Z662 that indicates its suitability for the intended service.	Volume 4A, Section 2.7	--
10.	If new materials are involved, provide material supply chain information, in tabular format.	Volume 4A Section 2.7	
11.	If reuse of material is involved, provide an engineering assessment in accordance with CSA Z662 that indicates its suitability for the intended service.	Volume 4A, Section 2.7	--
A.1.3 Onshore Pipeline Regulations			
1.	Designs, specifications programs, manuals, procedures, measures or plans for which no standard is set out in the OPR or PPR.	--	Existing standards will be followed
2.	A quality assurance program if project non-routine or incorporates unique challenges due to geographical location.	--	No unique challenges
3.	If welding performed on a liquid-filled pipeline that has a carbon equivalent of 0.50% or greater and is a permanent installation: • Welding specifications and procedures • Results of procedure qualification tests	--	Welding on liquid filled pipe will not be conducted

GUIDE A – A.2 ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

The following table identifies where information requested in the National Energy Board (NEB) Filing Manual Guide A – A.2 Environmental and Socio-economic Assessment checklist may be found in the various volumes of the Application for the Trans Mountain Expansion Project.

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
A.2.5 Description of the Environmental and Socio-Economic Setting				
1.	Identify and describe the current biophysical and socio-economic setting of each element (*i.e.*, baseline information) in the area where the project is to be carried out.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
2.	Describe which biophysical or socio-economic elements in the study area are of ecological, economic, or human importance and require more detailed analysis taking into account the results of consultation (see Table A-1 for examples). Where circumstances require more detailed information in an ESA see: i. Table A-2 – Filing Requirements for Biophysical Elements; or ii. Table A-3 – Filing Requirements for Socio-economic Elements.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
3.	Provide supporting evidence (*e.g.*, references to scientific literature, field studies, local and traditional knowledge, previous environmental assessment and monitoring reports) for: • information and data collected; • analysis completed; • conclusions reached; and • the extent of professional judgment or experience relied upon in meeting these information requirements, and the rationale for that extent of reliance.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
4.	Describe and substantiate the methods used for any surveys, such as those pertaining to wildlife, fisheries, plants, species at risk or species of special status, soils, heritage resources or traditional land use, and for establishing the baseline setting for the atmospheric and acoustic environment.	Volume 5A: ESA - Biophysical • Sections 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Section 4.2 Volume 8B: Technical Reports	---
5.	Applicants must consult with other expert federal, provincial or territorial departments and other relevant authorities on requirements for baseline information and methods.	Volume 5A: ESA - Biophysical • Sections 3.0, 5.0 and 6.0 Volume 5B: ESA - Socio-Economic • Sections 3.0, 5.0 and 6.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports	Volume 8A: Marine Transportation • Sections 3.0 and 4.2 Volume 8B: Technical Reports	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
A.2.6 Effects Assessment				
Identification and Analysis of Effects				
1.	Describe the methods used to predict the effects of the project on the biophysical and socio-economic elements, and the effects of the environment on the project (*i.e.*, changes to the Project caused by the environment).	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Technical Reports	Volume 8A: Marine Transportation • Sections 4.3, 5.5 and 5.6	---
2.	Predict the effects associated with the proposed project, including those that could be caused by construction, operations, decommissioning or abandonment, as well as accidents and malfunctions. Also include effects the environment could have on the project. For those biophysical and socio-economic elements or their valued components that require further analysis (see Table A-1), provide the detailed information outlined in Tables A-2 and A-3.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Technical Reports	Volume 8A: Marine Transportation • Sections 4.3, 5.6 and 5.7 Volume 8B: Technical Reports	---
Mitigation Measures for Effects				
1.	Describe the standard and project specific mitigation measures and their adequacy for addressing the project effects, or clearly reference specific sections of company manuals that provide mitigation measures. Ensure that referenced manuals are current and filed with the NEB.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 5C: ESA - Biophysical Technical Reports Volume 5D: ESA - Socio-Economic Technical Reports Volume 6B: Pipeline Environmental Protection Plan (EPP) Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP Volume 6E: Environmental Alignment Sheets Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 2.0, 3.0, 4.0, 6.0, 7.0, and 8.0 • Technical Reports	Volume 8A: Marine Transportation • Sections 4.3, 5.1, 5.3, 5.6 and 5.7 Volume 8B: Technical Reports	---
2.	Ensure that commitments about mitigative measures will be communicated to field staff for implementation through an Environmental Protection Plan.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP Volume 6E: Environmental Alignment Sheets Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 2.0, 3.0, 4.0, 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.3, 5.1, 5.3, 5.6 and 5.7	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
3.	Describe plans and measures to address potential effects of accidents and malfunctions during construction and operation of the project.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 2.0, 4.0, 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.3, 5.1, 5.3, 5.6 and 5.7	---
Evaluation of Significance				
1.	After taking into account any appropriate mitigation measures, identify any remaining residual effects from the project.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
2.	Describe the methods and criteria used to determine the significance of remaining adverse effects, including defining the point at which any particular effect on a valued component is considered “significant”.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
3.	Evaluate significance of residual adverse environmental and socio-economic effects against the defined criteria.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
4.	Evaluate the likelihood of significant, residual adverse environmental and socio-economic effects occurring and substantiate the conclusions made.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0	Volume 8A: Marine Transportation • Section 4.3	---
A.2.7 Cumulative Effects Assessment				
Scoping and Analysis of Cumulative Effects				
1.	Identify the valued components for which residual effects are predicted, and describe and justify the methods used to predict any residual results.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
2.	For each valued component where residual effects have been identified, describe and justify the spatial and temporal boundaries used to assess the potential cumulative effects.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
3.	Identify other physical works or activities that have been or will be carried out within the identified spatial and temporal boundaries for the cumulative effects assessment.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
4.	Identify whether the effects of those physical works or activities that have been or will be carried out would be likely to produce effects on the valued components within the identified spatial and temporal boundaries.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
5.	Where other physical works or activities may affect the valued components for which residual effects from the applicant's proposed project are predicted, continue the cumulative effects assessment, as follows: • consider the various components, phases and activities associated with the applicant's project that could interact with other physical work or activities; • provide a description of the extent of the cumulative effects on valued components; and • where professional knowledge or experience is cited, explain the extent to which professional knowledge or experience was relied upon and justify how the resulting conclusions or decisions were reached.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
Mitigation Measures for Cumulative Effects				
1.	Describe the general and specific mitigation measures, beyond project-specific mitigation already considered, that are technically and economically feasible to address any cumulative effects.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
Applicant's Evaluation of Significance of Cumulative Effects				
1.	After taking into account any appropriate mitigation measures for cumulative effects, identify any remaining residual cumulative effects.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
2.	Describe the methods and criteria used to determine the significance of remaining adverse cumulative effects, including defining the point at which each identified cumulative effect on a valued component is considered "significant".	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
3.	Evaluate the significance of adverse residual cumulative effects against the defined criteria.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
4.	Evaluate the likelihood of significant, residual adverse cumulative environmental and socio-economic effects occurring and substantiate the conclusions made.	Volume 5A: ESA - Biophysical • Section 8.0 Volume 5B: ESA - Socio-Economic • Section 8.0	Volume 8A: Marine Transportation • Section 4.4	---
A.2.8 Inspection, Monitoring and Follow-up				
1.	Describe inspection plans to ensure compliance with biophysical and socio-economic commitments, consistent with Sections 48, 53 and 54 of the *NEB Onshore Pipeline Regulations (OPR)*.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP	Volume 8A: Marine Transportation • Section 4.3	---
2.	Describe the surveillance and monitoring program for the protection of the pipeline, the public and the environment, as required by Section 39 of the *NEB OPR*.	Volume 5A: ESA - Biophysical • Section 7.0 Volume 5B: ESA - Socio-Economic • Section 7.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP Volume 6C: Facilities EPP Volume 6D: Westridge Marine Terminal EPP	Volume 8A: Marine Transportation • Section 4.3	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
3.	Consider any particular elements in the Application that are of greater concern and evaluate the need for a more in-depth monitoring program for those elements.	Volume 5A: ESA - Biophysical • Sections 9.0 and 10.0 Volume 5B: ESA - Socio-Economic • Sections 9.0 and 10.0 Volume 6A: Environmental Compliance Volume 6B: Pipeline EPP (Socio-Economic Management Plan of Appendix C)	Volume 8A: Marine Transportation • Section 4.5	---
4.	For *Canadian Environmental Assessment (CEA) Act, 2012* designated projects, identify which elements and monitoring procedures would constitute follow-up under the *CEA Act, 2012*.	Volume 5A: ESA - Biophysical • Section 10.0 Volume 5B: ESA - Socio-economic • Section 10.0	N/A	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
Table A-1 Circumstances and Interactions Requiring Detailed Biophysical and Socio-Economic Information				
Physical and meteorological environment		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0 and 7.0	N/A	---
Soil and soil productivity		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Soil Assessment Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 5.3, 6.0 and 7.0	N/A	---
Water quality and quantity (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Groundwater Technical Report • Fisheries (Alberta) Technical Report • Fisheries (British Columbia) Technical Report • Wetland Evaluation Technical Report • Marine Sediment and Water Quality – Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 7.0 • Quality Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Ecological Risk Assessment of Marine Transportation Spills Technical Report	---
Air emissions (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Marine Air Quality and Greenhouse Gas – Marine Transportation Technical Report • Air Quality and Greenhouse Gas Emissions Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 7.0	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Air Quality and Greenhouse Gas Emissions	---
Greenhouse gas emissions (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0 and 7.0 Volume 5C: ESA - Biophysical Technical Reports • Air Quality and Greenhouse Gas Emissions Technical Report	Volume 8A: Marine Transportation • Sections 4.2 and 4.3 Volume 8B: Technical Reports • Marine Air Quality and Greenhouse Gas Emissions	---
Acoustic environment (onshore and marine)		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0, and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Acoustic Environment Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3 and 4.4 Volume 8B: Technical Reports • Marine Noise (Atmospheric)	---
Fish and fish habitat (onshore and marine), including any fish habitat compensation required		Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Fisheries (Alberta) Technical Report • Fisheries (British Columbia) Technical Report • Marine Resources - Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Resources – Marine Transportation Technical Report • Ecological Risk Assessment of Westridge Marine Terminal Spills	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
	Wetlands	Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Wetland Evaluation Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	N/A	---
	Vegetation	Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Vegetation Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	N/A	---
	Wildlife and wildlife habitat (onshore and marine)	Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Wildlife and Wildlife Habitat Technical Report • Wildlife Modeling and Species Accounts Report • Marine Resources –Westridge Marine Terminal Technical Report • Marine Birds – Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2. 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Resources – Marine Transportation Technical Report • Marine Birds – Marine Transportation Technical Report • Ecological Risk Assessment of Westridge Marine Terminal Spills	---
	Species at Risk or Species of Special Status and related habitat (onshore and marine)	Volume 5A: ESA - Biophysical • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C: ESA - Biophysical Technical Reports • Fisheries (Alberta) Technical Report • Fisheries (British Columbia) Technical Report • Vegetation Technical Report • Wildlife and Wildlife Habitat Technical Report • Wildlife Modeling and Species Accounts Report • Marine Resources –Westridge Marine Terminal Technical Report • Marine Birds – Westridge Marine Terminal Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2. 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Resources – Marine Transportation Technical Report • Marine Birds – Marine Transportation Technical Report • Marine Transportation Spills Ecological Risk Assessment Technical Report	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
	Human occupancy and resource use (onshore and marine)	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Managed Forest Areas Technical Report • Agricultural Assessment Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report	---
	Heritage resources	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0 and 7.0 Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Section 6.3.3	N/A	---
	Navigation and navigation safety	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0 and 7.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report	Volume 8A: Marine Transportation • Section 5.2	---
	Traditional land and resource use	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Traditional Land and Resource Use Report • Pipeline and Facilities Human Health Risk Assessment Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Traditional Marine Use Report for Marine Transportation • Marine Transportation Human Health Risk Assessment Technical Report	---
	Social and cultural well-being	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0	N/A	---
	Human health and aesthetics	Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Community Health Technical Report • Viewshed Modelling Analysis Technical Report • Pipeline and Facilities Human Health Risk Assessment Technical Report Volume 7 Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0 • Qualitative Ecological Risk Assessment of Pipeline Spills Technical Report	Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Qualitative Human Health Risk Assessment of Westridge Marine Terminal Technical Report Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Transportation Human Health Risk Assessment Technical Report • Marine Transportation Spills Human Health Risk Assessment Technical Report	---

Filing #	Filing Requirement	In Application? References	Applicable Marine Transportation Elements	Not in Application? Explanation
Infrastructure and services		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Community Health Technical Report Volume 7: Risk Assessment and Management of Pipeline and Facility Spills • Sections 6.0, 7.0 and 8.0	Volume 8A: Marine Transportation • Sections 4.2, 4.3, 4.4, 5.6 and 5.7 Volume 8B: Technical Reports • Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report	---
Employment and economy		Volume 5B: ESA - Socio-Economic • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D: ESA - Socio-Economic Technical Reports • Socio-Economic Technical Report • Worker Expenditures Analysis Technical Report	N/A	---

GUIDE A – A.3 ECONOMICS

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.3.1 Supply			
1.	A description of each commodity.	Volume 2 Section 3.1.1	--
2.	A discussion of all potential supply sources.	Volume 2 Section 3.3.2	--
3.	Forecast of productive capacity over the economic life of the facility.	Volume 2 Sections 3.3.1, 3.4.1	
4.	For pipelines with contracted capacity, a discussion of the contractual arrangements underpinning supply.	Volume 2 Section 3.3.2	--
A.3.2 Transportation Matters			
Pipeline Capacity			
1.	In the case of expansion provide: • Pipeline capacity before and after and size of increment • Justification that size of expansion is appropriate	Volume 2 Sections 1.1, 2.1, 3.5	--
2.	In case of new pipeline, justification that size of expansion is appropriate given available supply.	N/A – expansion	N/A
Throughput			
1.	For pipelines with contracted capacity, information on contractual arrangements.	Volume 2 Section 3.2.1	--
2.	For non-contract carrier pipelines, forecast of annual throughput volumes by commodity type, receipt location and delivery destination over facility life.	N/A	N/A
3.	If project results in an increase in throughput: • theoretical and sustainable capabilities of the existing and proposed facilities versus the forecasted requirements • flow formulae and flow calculations used to determine the capabilities of the proposed facilities and the underlying assumptions and parameters	Volume 2 Section 3.1	--
4.	If more than one type of commodity transported, a discussion pertaining to segregation of commodities including potential contamination issues or cost impacts.	N/A	N/A
A.3.3 Markets			
1.	Provide an analysis of the market in which each commodity is expected to be used or consumed.	Volume 2 Section 3.4.2	--
2.	Provide a discussion of the physical capability of upstream and downstream facilities to accept the incremental volumes that would be received and delivered.	Volume 2 Section 3.4.2	--
A.3.4 Financing			
1.	Evidence that the applicant has the ability to finance the proposed facilities.	Volume 2 Section 3.2.2	--
2.	Estimated toll impact for the first full year that facilities are expected to be in service.	Volume 2 Section 3.2.1	--
3.	Confirmation that shippers have been apprised of the project and toll impact, their concerns and plans to address them.	Volume 2 Section 3.2.1	--
4.	Additional toll details for applications with significant toll impacts.	Volume 2 Section 3.2.1	
A.3.5 Non-NEB Regulatory Approvals			
1.	Confirm that all non-NEB regulatory approvals required to allow the applicant to meet its construction schedule, planned in-service date and to allow the facilities to be used and useful are or will be in place.	Volume 2 Section 1.5	--
2.	If any of the approvals referred to in #1 may be delayed, describe the status of those approval(s) and provide an estimation of when the approval is anticipated.	Volume 2 Section 1.5	--

GUIDE A – A.4 LANDS INFORMATION

Filing #	Filing Requirement	In Application? References	Not in Application? Explanation
A.4.1 Land Areas			
1.	• Width of right-of-way and locations of any changes to width • Locations and dimensions of known temporary work space and drawings of typical dimensions • Locations and dimensions of any new lands for facilities	Volume 2 Section 5.2	--
A.4.2 Land Rights			
1.	The type of lands rights proposed to be acquired for the project.	Volume 2 Section 5.3	--
2.	The relative proportions of land ownership along the route of the project.	Volume 2 Section 5.3.2	--
3.	Any existing land rights that will be required for the project.	Volume 2 Section 5.4	--
A.4.3 Lands Acquisition Process			
1.	The process for acquiring lands.	Volume 2 Section 5.4.1, 5.4.2	--
2.	The timing of acquisition and current status.	Volume 2 Section 5.4.3	--
3.	The status of service of section 87(1) notices.	Volume 2 Section 5.4.4	--
A.4.4 Land Acquisition Agreements			
1.	A sample copy of each form of agreement proposed to be used pursuant to section 86(2) of the NEB Act.	Volume 2 Section 5.4.2	--
2.	A sample copy of any proposed fee simple, work space, access or other land agreement.	Volume 2 Section 5.5.2	--
A.4.5 Section 87 Notices			
1.	A sample copy of the notice proposed to be served on all landowners pursuant to section 87(1) of the NEB Act.	Volume 2 Section 5.4.4, Appendix D	--
2.	Confirmation that all notices include a copy of Pipeline Regulation in Canada: A Guide for Landowners and the Public.	Volume 2 Section 5.4.4	--
A.4.6 Section 58 Application to Address a Complaint			
1.	The details of the complaint and describe how the proposed work will address the complaint.	N/A	N/A

CONCORDANCE TABLE WITH THE *CEA ACT, 2012*

CEA Act, 2012 Requirement	Section in *CEA Act, 2012*	Application Volume and Section
The environmental effects of the designated project, including:		
the environmental effects of malfunctions or accidents that may occur in connection with the designated project;	s.19.1(a)	Volume 5A ESA - Biophysical: • Section 7.0 Volume 5B ESA - Socio-economic: • Section 7.0 Volume 7 Risk Assessment and Management of Pipeline and Facility Spills Volume 8A Marine Transportation: • Sections 4.3 and 5.0
any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out;	s.19.1(a)	Volume 5A ESA - Biophysical: • Section 8.0 Volume 5B ESA - Socio-economic: • Section 8.0 Volume 8A Marine Transportation: • Section 4.4
the significance of the effects referred to in paragraph (a);	s.19.1(b)	Volume 5A ESA - Biophysical: • Sections 7.0 and 8.0 Volume 5B ESA - Socio-economic: • Sections 7.0 and 8.0 Volume 8A Marine Transportation: • Sections 4.3 and 4.4
comments from the public – or, with respect to a designated project that requires that a certificate be issued in accordance with an order made under section 54 of the *National Energy Board Act*, any interested party – that are received in accordance with this *act*;	s.19.1(c)	Volume 3A Public Consultation Volume 3B Aboriginal Engagement Volume 3C Landowner Relations Volume 5A ESA - Biophysical: • Section 3.0 Volume 5B ESA - Socio-economic: • Section 3.0 Volume 8A Marine Transportation: • Section 3.0
mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the designated project;	s.19.1(d)	Volume 5A ESA - Biophysical: • Sections 7.0 and 8.0 Volume 5B ESA - Socio-economic: • Sections 7.0 and 8.0 Volume 5C ESA – Biophysical Technical Reports Volume 5D ESA - Socio-economic Technical Reports Volume 6B Pipeline Environmental Protection Plan Volume 6C Facilities Environmental Protection Plan Volume 6D Westridge Marine Terminal Environmental Protection Plan Volume 6E Environmental Alignment Sheets Volume 8A Marine Transportation: • Sections 4.3, 4.4 and 5.0 Volume 8B Technical Reports
the requirements of the follow-up program in respect of the designated project;	s.19.1(e)	Volume 5A ESA - Biophysical: • Section 10.0 Volume 5B ESA - Socio-economic: • Section 10.0
the purpose of the designated project;	s.19.1(f)	Volume 5A ESA - Biophysical: • Section 2.0 Volume 5B ESA - Socio-economic: • Section 2.0 Volume 8A Marine Transportation: • Section 1.1

CONCORDANCE TABLE WITH THE *CEA ACT, 2012*

CEA Act, 2012 Requirement	Section in *CEA Act, 2012*	Application Volume and Section
alternative means of carrying out the designated project that are technically and economically feasible and the environmental effects of any such alterative means;	s.19.1(g)	Volume 5A ESA - Biophysical: • Sections 2.0 and 4.0 Volume 5B ESA - Socio-economic: • Sections 2.0 and 4.0 Volume 8A Marine Transportation: • Section 2.2
any change to the designated project that may be caused by the environment;	s.19.1(h)	Volume 5A ESA - Biophysical: • Section 7.10 Volume 8A Marine Transportation: • Section 4.3
the results of any relevant study conducted by a committee established under section 73 or 74; and	s.19.1(i)	N/A
any other matter relevant to the environmental assessment that the responsible authority, or, – if the environmental assessment is referred to a review panel – the Minister, requires to be taken into account.	s.19.1(j)	Volume 8A Marine Transportation Volume 8B Technical Reports Volume 8C TERMPOL Reports These volumes take into consideration the *Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project* (September 10, 2013) (NEB 2013)
The environmental assessment of a designated project may take into account community knowledge and Aboriginal traditional knowledge.	s 19.3	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 5D ESA - Socio-economic Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3 and 4.4 Volume 8B Technical Reports
Subsection 5(1) of *CEA Act, 2012* defines environmental effects as a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:		
fish as defined in section 2 of the *Fisheries Act* and fish habitat as defined in subsection 34(1) of that *Act*;	s.5(1)(a)(i)	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3, 4.4 and 5.0 Volume 8B Technical Reports
aquatic species as defined in subsection 2(1) of the *Species at Risk Act;*	s.5(1)(a)(ii)	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3, 4.4 and 5.0 Volume 8B Technical Reports
migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*, and	s.5(1)(a)(iii)	Volume 5A ESA - Biophysical: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5C ESA - Biophysical Technical Reports Volume 8A Marine Transportation: • Sections 4.2, 4.3, 4.4 and 5.0 Volume 8B Technical Reports
any other component of the environment that is set out in Schedule 2.	s.5(1)(a)(iv)	N/A
Subsection 5(1) of the *CEA Act, 2012* defines environmental effects as (b) a change that may be caused to the environment that would occur		
on federal lands,	s.5(1)(b)(i)	Volume 5A ESA - Biophysical: • Section 7.0 Volume 5B ESA - Socio-economic: • Section 7.0
in a province other than the one in which the *act* or thing is done or where the physical activity, the designated project or the project is being carried out, or	s.5(1)(b)(ii)	N/A No changes are anticipated in provinces other than Alberta and BC in relation to the ESA.
outside Canada.	s.5(1)(b)(iii)	Volume 8A Marine Transportation: • Sections 4.3, 4.4 and 5.0
Subsection 5(1) of the *CEA Act, 2012* defines environmental effects as (c) with respect to aboriginal peoples, an effect occurring in Canada of any change that may be caused to the environment on:		

CONCORDANCE TABLE WITH THE *CEA ACT, 2012*

CEA Act, 2012 Requirement	Section in *CEA Act, 2012*	Application Volume and Section
health and socio-economic conditions;	s.5(1)(c)(i)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D ESA - Socio-economic Technical Reports Volume 8A Marine Transportation: • Sections 4.3 and 4.4 Volume 8B Technical Reports
physical and cultural heritage;	s.5(1)(c)(ii)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0 and 7.0
the current use of lands and resources for traditional purposes; or	s.5(1)(c)(iii)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0, 7.0 and 8.0 Volume 5D ESA - Socio-economic Technical Reports Volume 8A Marine Transportation: • Sections 4.3 and 4.4 Volume 8B Technical Reports
any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	s.5(1)(c)(iv)	Volume 5B ESA - Socio-economic: • Sections 5.0, 6.0 and 7.0

ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT FOR THE TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT

VOLUME 5B: ESA - SOCIO-ECONOMIC

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EXECUTIVE SUMMARY

This socio-economic component of the Environmental and Socio-Economic Assessment (ESA) was completed in support of the proposed Trans Mountain Expansion Project (referred to as "TMEP" or "the Project"). (The biophysical component of the ESA is found in the companion Volume 5A.)

Application is being made by Trans Mountain Pipeline ULC (Trans Mountain), a Canadian corporation with its head office located in Calgary, Alberta, pursuant to Section 52 of the *National Energy Board Act* (*NEB Act*) for the TMEP.

The proposed expansion will, in essence, comprise the following.

- Pipeline segments that complete a twinning (or "looping") of the pipeline in Alberta and British Columbia with about 987 km of new buried pipeline.
- New and modified facilities, including pump stations and tanks.
- Three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The Project will require a NEB Certificate of Public Convenience and Necessity (CPCN) pursuant to Section 52 of the *NEB Act*. In addition, according to the Regulations Designating Physical Activities, the Project is a designated project under the *Canadian Environmental Assessment Act, 2012* (*CEA Act, 2012*). The ESA considers the mandatory factors listed in Section 19(1) of the *CEA Act, 2012*, the factors listed in the NEB *Filing Manual* (NEB 2013a), and pertinent issues and concerns identified through consultation and engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public.

In addition, the ESA addresses the NEB's List of Issues (July 29, 2013) for the Project (NEB 2013b) provided below. Issues 4 and 5 of this list specifically informed the ESA.

1. *The need for the proposed project.*
2. *The economic feasibility of the proposed project.*
3. *The potential commercial impacts of the proposed project.*
4. *The potential environmental and socio-economic effects of the proposed project, including any cumulative environmental effects that are likely to result from the project, including those required to be considered by the NEB's Filing Manual.*
5. *The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed project, including the potential effects of accidents or malfunctions that may occur (addressed in Volume 8A).*
6. *The appropriateness of the general route and land requirements for the proposed project.*
7. *The suitability of the design of the proposed project.*
8. *The terms and conditions to be included in any approval the Board may issue.*
9. *Potential impacts of the project on Aboriginal interests.*
10. *Potential impacts of the project on landowners and land use.*
11. *Contingency planning for spills, accidents or malfunctions, during construction and operation of the project.*
12. *Safety and security during construction of the proposed project and operation of the project, including emergency response planning and third-party damage prevention.*

The Board does not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands, or the downstream use of the oil transported by the pipeline.

Project Overview

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta. Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and is fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system).

The TMPL system commenced operations 60 years ago and now transports a range of crude oil and petroleum products from Western Canada to locations in central and southwestern British Columbia, Washington State and offshore. The TMPL system currently supplies much of the crude oil and refined products used in BC. The TMPL system is operated and maintained by staff located at Trans Mountain's regional and local offices in Alberta (Edmonton, Edson, and Jasper) and BC (Clearwater, Kamloops, Hope, Abbotsford, and Burnaby).

The TMPL system has an operating capacity of approximately 47,690 m^3/d (300,000 bbl/d) using 23 active pump stations and 40 petroleum storage tanks. The expansion will increase the capacity to 141,500 m^3/d (890,000 bbl/d).

The proposed expansion will comprise the following:

- pipeline segments that complete a twinning (or "looping") of the pipeline in Alberta and BC with about 987 km of new buried pipeline;
- new and modified facilities, including pump stations and tanks; and
- three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The expansion has been developed in response to requests for service from Western Canadian oil producers and West Coast refiners for increased pipeline capacity in support of growing oil production and access to growing West Coast and offshore markets. NEB decision RH-001-2012 reinforces market support for the expansion and provides Trans Mountain the necessary economic conditions to proceed with design, consultation, and regulatory applications.

Application is being made pursuant to Section 52 of the *NEB Act* for the proposed Trans Mountain Expansion Project (referred to as "TMEP" or "the Project"). The NEB will undertake a detailed review and hold a Public Hearing to determine if it is in the public interest to recommend a Certificate of Public Convenience and Necessity (CPCN) for construction and operation of the Project. Subject to the outcome of the NEB Hearing process, Trans Mountain plans to begin construction in 2016 and go into service in 2017.

Trans Mountain has embarked on an extensive program to engage Aboriginal communities and to consult with landowners, government agencies (*e.g.*, regulators and municipalities), stakeholders, and the general public. Information on the Project is also available at www.transmountain.com.

The scope of the Project will involve:

- using existing active 610 mm (NPS 24) and 762 mm (NPS 30) OD buried pipeline segments;
- constructing three new 914 mm (NPS 36) OD buried pipeline segments totalling approximately 987 km:
  - Edmonton to Hinton – 339.4 km
  - Hargreaves to Darfield – 279.4 km
  - Black Pines to Burnaby – 367.9 km;

- reactivating two 610 mm (NPS 24) OD buried pipeline segments that have been maintained in a deactivated state:
  - Hinton to Hargreaves – 150 km
  - Darfield to Black Pines – 43 km;
- constructing two, 3.6 km long 762 mm (NPS 30) OD buried delivery lines from Burnaby Terminal to Westridge Marine Terminal (the Westridge delivery lines);
- installing 23 new sending or receiving traps (16 on the Edmonton-Burnaby mainlines), for in-line inspection tools, at nine existing sites and one new site;
- adding 35 new pumping units at 12 locations (*i.e.*, 11 existing and one new pump station site);
- reactivating the existing Niton Pump Station that has been maintained in a deactivated state;
- constructing 20 new tanks located at the Edmonton (5), Sumas (1) and Burnaby (14) Terminals, preceded by demolition of 2 existing tanks at Edmonton (1) and Burnaby (1), for a net total of 18 tanks to be added to the system; and
- constructing one new dock complex, with a total of three Aframax-capable berths, as well as a utility dock (for tugs, boom deployment vessels, and emergency response vessels and equipment) at Westridge Marine Terminal, followed by the deactivation and demolition of the existing berth.

Volume 5B includes the socio-economic component of the Environmental and Socio-economic Assessment (ESA) for the Project (*i.e.*, the proposed pipeline corridor and associated facilities, including the expansion of the Westridge Marine Terminal). The biophysical component of the ESA for the Project is provided in Volume 5A. Volume 8A provides a discussion related to potential environmental and socio-economic effects of increased marine shipping activities as a result of the Project.

Public Consultation, Aboriginal Engagement and Landowner Relations

The Aboriginal engagement, stakeholder consultation, and landowner programs are designed to foster participation from the public who have an interest in the scope, activities and routing of the Project. Engagement and consultation touched on all aspects of the Project along the proposed pipeline corridor and associated facilities. Trans Mountain has reached out to community leaders, elected officials, environmental groups and the public to receive their input. Feedback was received from public open houses, workshops, one-on-one meetings, public presentations, online discussion and comment forums that have helped shape aspects of the Project. Key topics and issues were considered and incorporated into this volume where applicable.

Since April 2012, Trans Mountain has engaged with Aboriginal communities that may be affected by the Project or that may have an interest in the Project based on the proximity of their community, and their assertion of Aboriginal rights and title governing the traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. A number of methods have been used to inform Aboriginal communities, obtain feedback and identify issues about the Project including: community gatherings; face-to face meetings; targeted interviews; formal and informal discussions; and distribution of Project letters, newsletters, GIS data, maps and fact sheets as well as through the collection of Traditional Ecological Knowledge (TEK) with participating Aboriginal communities during biophysical field studies for the Project, Traditional Land Use (TLU) and socio-economic studies. The results of these engagement efforts have contributed to the development of the environmental assessment, including mitigation measures. Trans Mountain is committed to the continuation of an effective engagement program that satisfies all parties.

Trans Mountain has met with essentially all landowners along the proposed pipeline corridor. Meetings comprised discussions about the Project in general as well as requests for consent for Project-specific

surveys. The meetings also provided an opportunity for landowners to ask questions and identify concerns regarding the Project.

The questions, issues, or concerns raised by landowners were categorized most frequently related to compensation issues, land impacts, land values, site-specific pipeline location and issues related to the existing TMPL line (see Volume 3B).

Landowners of approximately 85% of all tracts of land raised no comments or concerns at this phase of the program. Of those that did comment within Alberta, concerns are about environmental and land-related issues. In BC, the primary concerns relate to environmental and compensation/financial issues. Trans Mountain will continue to respond to concerns and issues of each landowner or occupant.

Corridor and Facility Site Selection

More than two thirds of the length of the proposed pipeline corridor parallels the existing TMPL right-of-way in order to reduce the socio-economic effects and facilitate efficient pipeline operations. However, paralleling the existing TMPL right-of-way was not possible in all cases because of engineering, constructability, geotechnical, environmental, socio economic, Aboriginal concerns or other reasons. In these locations, potential alternative corridors were examined. While the proposed pipeline will generally require a construction right-of-way of 45 m, it was decided to study and apply for a wider corridor (generally 150 m) to accommodate locations where field information was unavailable due lack of access to public lands or where input from environmental, socio-economic, geotechnical or other disciplines would be beneficial to guide final placement of the proposed pipeline centreline and associated right-of-way. It is recognized that corridor and route refinement is an iterative process that will continue throughout the application process of the Project as more information becomes available.

Site selection criteria primarily were used to choose the sites where facility sites will be located, including the pump stations and associated power lines, storage tanks, and mainline block valves. Site selection is primarily focused on reducing disturbance by using existing facility locations to the extent possible. Similar site selection criteria will be applied to select temporary facility sites and construction workspace.

Socio-Economic Setting

Lands traversed by the proposed pipeline corridor include: agricultural lands (disturbed by plowing for cultivation); hay and tame pasture; areas of aspen woodlands and mixed aspen forest; treed pasture; native vegetation; urban; industrial; and parks. Numerous waterbodies are crossed by and in proximity to the proposed pipeline corridor.

Socio-economic setting information along the proposed pipeline corridor and at facilities is provided in this volume for the following elements identified in the NEB *Filing Manual*:

- heritage resources;
- traditional land and resource use;
- social and cultural well-being;
- human occupancy and resource use;
- infrastructure and services;
- navigation and navigation safety;
- employment and economy;
- community health; and
- human health.

Setting information is also provided for traditional marine resource use and marine commercial, recreation and tourism use.

The socio-economic setting was compiled based on the following sources:

- heritage resources, traditional land and resource use, socio-economic, community health, economic studies, and human health risk assessment conducted for the Project;
- existing published literature including topographic maps, aerial photography, scientific papers and reference books, as well as municipal, provincial and federal government maps, reports, interactive websites, guides, information letters, fact sheets, and databases; and
- engagement with Aboriginal communities (including TLU studies, socio-economic studies and biophysical field study participation) as well as consultation with landowners, regulatory authorities, stakeholders and the general public.

The settings for each element are discussed by the six socio-economic regions that have been designated for the purposes of this assessment. The socio-economic regions are defined by political and administrative boundaries that are relevant to service delivery and governance for the communities and residents who might have direct or indirect interactions with the Project. The use of the socio-economic regions allows more precision in the estimates of potential socio-economic effects since they follow jurisdictional boundaries for service delivery and governance and, therefore, align with available data. These regions also align with a local “sense of place” and assist stakeholders in understanding how the socio-economic components of the assessment reflect local and regional interests. The six socio-economic regions for this assessment are the:

- Edmonton Region;
- Rural Alberta Region;
- Jasper National Park Region;
- Fraser-Fort George/Thompson-Nicola Region;
- Fraser Valley Region; and
- Metro Vancouver Region.

The settings for each element are also discussed in the context of the Footprint of the Project, a Local Study Area and a Regional Study Area. The Socio-economic Regional Study Area, for which most of the elements in this volume are described, considers communities close enough to the Project to potentially be a: source of labour; source of procured goods or services; location of community infrastructure/services influenced by the Project; accommodation or camp location for Project workers; or Project construction office location. This includes the counties and regional districts crossed by the proposed pipeline corridor (or certain regional subareas), and communities approximately 50 km from the proposed pipeline corridor that could participate in or be affected by the Project. It also includes Aboriginal communities whose reserves or traditional territory is crossed by the proposed pipeline corridor.

Information in the socio-economic setting is supported by several supporting studies provided in Volume 5D, including:

- Traditional Land and Resource Use Technical Report;
- Socio-Economic Technical Report;
- Worker Expenditures Along the Proposed Pipeline Corridor Technical Report;
- Managed Forest Areas and Forest Health Technical Report;
- Viewshed Modelling Analysis Technical Report;

- Agricultural Assessment Technical Report;
- Community Health Technical Report; and
- Screening Level Human Health Risk Assessment of Pipeline and Facilities Technical Report.

Socio-Economic Effects Assessment

Socio-economic elements potentially interacting with the Project include heritage resources, traditional land and resource use, traditional marine resource use, social and cultural well-being, human occupancy and resource use, infrastructure and services, navigation and navigation safety, employment and economy, community health, and human health risk assessment. The description of the socio-economic setting (current state of the socio-economic environment) within the Project area was compared against the Project description to assess potential socio-economic effects that might be caused by the Project. For this assessment, one or more indicators (*i.e.*, a biophysical, social or economic property or variable that society considers to be important, and is assessed to predict Project-related changes and focus the impact assessment on key issues, often referred to as Valued Ecosystem or Valued Socio-economic Components) were selected to describe the present and predicted future condition of an element. One or more measurement endpoints (measurable parameters) were identified for each indicator to allow quantitative or qualitative measurement of potential Project effects.

The assessment evaluates the socio-economic effects of the construction (including reactivation/modification), operation, decommissioning and abandonment phases of each component of the Project. The assessment method includes the following steps.

1. Describe the socio-economic setting.
2. Identify key socio-economic elements that could be affected.
3. Define the indicators and measurement endpoints to be used to assess each element.
4. Determine spatial and temporal boundaries for each element.
5. Identify potential socio-economic effects for each indicator.
6. Develop appropriate technically and economically feasible site-specific mitigation and, where warranted, enhancement/restitution measures that are technically and economically feasible.
7. Predict anticipated residual effects.
8. Determine the significance of residual effects.

Socio-economic effects arising from potential accidents and malfunctions are also considered. However, large onshore spill scenarios (including Westridge Marine Terminal) and marine spills are discussed in Volumes 7 and 8A, respectively. Changes to the Project caused by the environment were not considered to interact with the socio-economic environment and, therefore, are not discussed in this volume. Changes to the Project caused by the environment are, however, discussed in Volume 5A.

To ensure that the potential adverse socio-economic effects are eliminated or reduced and potential positive socio-economic effects are enhanced during Project activities, general and site-specific mitigation and enhancement measures have been recommended based upon current industry-accepted standards, consultation with regulatory authorities, interested groups and individuals, engagement with Aboriginal communities, and the professional judgment of the assessment team.

Mitigation and enhancement measures are presented in the Project-specific Environmental Protection Plans (EPPs) (Volumes 6B through 6D). Mitigation and enhancement measures that will be implemented by Trans Mountain to address certain socio-economic issues and opportunities not addressed by the EPPs are summarized in the Socio-economic Management Plan (Appendix C of Volume 6B). Mitigation measures developed from element-specific technical reports are incorporated into the assessment. In addition, various federal and provincial regulatory authorities, and industry-accepted standards and guidelines are considered in this assessment and are referenced for each element.

Most of the potential effects on socio-economic indicators arising from construction of the Project can be readily mitigated by standard socio-economic mitigation measures common to pipeline projects in similar settings. There are no situations that meet the criteria of a significant adverse residual socio-economic effect as defined in Section 7.1 of this volume. Consequently, the identified adverse residual effects of construction and operation of the Project on socio-economic indicators will be not significant for the pipeline and facilities component of the Project. There are, however, several positive residual socio-economic effects associated with the Project, of which two were identified as being significant: provincial and national economic benefits; and increased municipal taxes in Footprint communities.

The Project was evaluated with respect to the objectives and goals of relevant land and resource use management plans, municipal development plans, and government policies of the communities, counties and regional districts traversed by the proposed pipeline corridor and facilities. The planning, design, construction and operation of the Project will be consistent with key actions or objectives of these plans. In addition, for each element, it was determined that the Project does not hinder the ability of the respective agency to fulfill the relevant goals or objectives of these plans.

Cumulative Effects Assessment

The Project may act cumulatively with existing activities and reasonably foreseeable developments in the vicinity of the Project including agriculture (*e.g.*, crop production and livestock grazing), forestry, recreational activities, transportation activities (*e.g.*, vehicle and rail traffic, road infrastructure and highway maintenance), utilities activities (*e.g.*, transmission lines and gas distribution lines), rural and urban residential and commercial development, and industrial, oil and gas, and mineral resources developments. Cumulative effects associated with the Project were evaluated on a conservative basis for the element under consideration. Most of the Project's contribution to cumulative effects within the element-specific LSAs and RSAs that are likely to occur, are anticipated to be reversible in the short to long-term and are generally of low to medium magnitude. There are no situations that would result in a significant adverse cumulative socio-economic effect from the pipeline and facilities component of the Project, as defined in Section 7.1.

Supplemental Studies

Supplemental (ongoing) studies may be warranted as the route is refined and optimized. At some locations, access for environmental and resource survey was also not available at the time of field study. In those situations, information on adjacent lands, desktop studies and professional judgment based on the team's familiarity with pipeline issues and mitigation were used to predict potential effects. Ongoing studies will support effects assessment predictions and refine and augment site-specific environmental protection planning. Land access was available at intervals in all segments of the entire proposed pipeline corridor. Studies are proposed for heritage resources, traditional land and resource use and traditional marine resource use. If findings change or significantly different conditions are observed that information will be provided to the NEB. The respective scope and timing (field and reporting schedule) for the planned supplemental filings are described in Section 9.0.

Current mitigation, management and contingency plans have been conservatively developed to address the expected findings from the ongoing studies and have been based on professional judgment relying on continuity of adjoining land parcels for which comprehensive field studies have been completed. The additional study requirements are not anticipated to change the significance conclusions in Sections 7.0 and 8.0 of Volume 5B.

Follow-up

Under the *CEA Act, 2012* and as described in the NEB *Filing Manual*, a follow-up program is defined as a program to verify the accuracy of the environmental assessment of a designated project, and to determine the effectiveness of any mitigation measures. Based on Project knowledge and comprehensive field studies to date, the need for follow-up programs under the *CEA Act, 2012* have been identified for select wildlife species at risk and various indicators within the Socio-economic Management Plan. Trans Mountain plans to collect additional information in 2014 to inform and refine the mitigation strategies recommended in the Environmental Protection Plans.

Conclusion

The socio-economic assessment indicates that the proposed pipeline and associated facilities (*e.g.*, pump stations, terminals, Westridge Marine Terminal) does not result in significant adverse residual socio-economic effects as defined in Section 7.1. Consequently, the identified residual effects of construction and operation of the pipeline and facilities component of the Project on socio-economic indicators will be not significant. There are, however, two significant positive residual socio-economic effects identified, namely provincial and national economic benefits as well as increased municipal taxes in Footprint communities.

The socio-economic issues identified through engagement with Aboriginal communities, and consultation with landowners, regulatory authorities, stakeholders and the general public, as well as through literature reviews, field studies and the professional experience of the assessment team, are consistent with other projects of this nature. Most of the associated potential effects on socio-economic indicators arising from construction of the Project can be readily mitigated by standard environmental mitigation measures common to pipeline projects in similar settings.

Project design and industry and regulatory standards anticipate and address many of the Project's potential residual effects on the socio-economic environment. Routing of the proposed pipeline corridor to parallel existing linear disturbances for most of its length (89%) has reduced the potential effects associated with construction and operation of the Project. Mitigation measures have been developed to further reduce the severity of potential adverse residual environmental effects. Implementation of the proposed mitigation measures will further reduce the adverse residual environmental effects associated with the construction and operation of the Project. Enhancement measures have been developed to promote the likelihood of potential socio-economic residual effects where a positive impact balance was identified. Applicable proposed construction mitigation measures will form the basis of operation and maintenance procedures during the life of the Project.

GLOSSARY

Aboriginal Traditional Knowledge (ATK)	Knowledge that is held by, and unique to, Aboriginal peoples.
adverse effect	The impairment of or damage to the environment or the health of humans, or damage to property or loss of reasonable enjoyment of life or property.
Agricultural Land Reserve	Administered by the Agricultural Land Commission, the Agricultural Land Reserve is a provincial zone in which agriculture is recognized as the priority use and non-agricultural uses are controlled.
anthropogenic	Materials modified by human activities so that the original properties of the material have been altered.
appropriate regulatory authority	The regulator(s) that will be consulted prior to and during construction regarding approvals, notifications, constraints and the direction of activities.
archaeological site	A site composed of artefacts associated with a prehistoric period that precedes written record.
automated mainline block valves	Enable remotely operated automatic emergency shut-down and isolation of the pipeline along a given segment.
avoidance	A means to prevent a potential adverse effect through routing/siting of the project, changes to project design or construction timing.
compensation	A means intended to compensate unavoidable and potentially significant or unacceptable effects and may consist of offsets (no net loss), research, education programs, and financial compensation (considered only when all other options have been exhausted).
construction hub/ hub community	A community where staging of construction activity and accommodation of workers is anticipated to be focused.
construction right-of-way	Right-of-way area comprised of temporary workspace and the permanent easement that is disturbed during construction. Consists of four newly constructed 914 mm OD (NPS 36) pipeline segments from: Edmonton to Hinton, Alberta; Hargreaves to Darfield, BC; Black Pines to Hope, BC; Hope to Burnaby, BC; and one newly constructed pipeline segment containing two 762 mm OD (NPS 30) pipelines from Burnaby to the Westridge Marine Terminal.
cultivated land	Agricultural land use where the ground is usually tilled or disturbed regularly.
cumulative effects	Changes to the environment that are caused by an action in combination with other past, present and future human actions (“action’ includes projects and activities).
element	A technical discipline or discrete component of the biophysical or human environment identified in the NEB *Filing Manual.*
enhancement measure	A recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.
Environmental Alignment Sheets	A series of maps noting the locations of select environmental features that are encountered by the proposed pipeline corridor, associated potential issues and recommended mitigation measures.
feasible	Capable of being reasonably accomplished or brought about, given environmental and economic consideration.
Footprint	The area directly disturbed by surveying, construction and clean-up and operation of the pipeline and associated physical works and activities (including, where appropriate, the permanent rights-of-way, pump stations, tanks, Westridge Marine Terminal, temporary construction workspace, temporary stockpile sites, temporary staging sites, construction camps, access roads and power lines).
historic site	An area of human activity that was created after the appearance of writing and before the last 50 years.
historic structure	An above ground structure dating prior to 50 years before present.
Indian Reserve	A tract of land, the legal title to which is vested in Her Majesty, that has been set apart by Her Majesty for the use and benefit of a band.

GLOSSARY Cont'd

indicator	A biophysical, social or economic property or variable that society considers to be important and is assessed to predict Project-related changes and focus the effects assessment on key issues. One or more indicators (often referred to as Valued Ecosystem or Valued Socio-economic Components) are selected to describe the present and predicted future condition of an element. Societal views are understood by the assessment team through published information such as management plans and engagement with regulatory authorities, the public, Aboriginal communities, and other interested groups.
International Area	The area extending beyond Canada.
Kinder Morgan Canada Inc.	Kinder Morgan Canada Inc. (KMC) is a corporation owned by Kinder Morgan Energy Partners. KMC operates Trans Mountain Pipeline L.P., a general partner of Trans Mountain Pipeline ULC (Trans Mountain).
Local Study Area	The zone of influence or area where the element and associated indicators are most likely to be affected by Project construction and operation. This generally represents a buffer from the centre of the proposed pipeline corridor.
Lower Mainland Developed Area	Urban and agricultural area in the Fraser Valley including the City of Chilliwack, City of Abbotsford, Township of Langley, City of Surrey, City of Coquitlam and City of Burnaby.
measurement endpoint	One or more measurement endpoints are identified for each indicator to allow quantitative or qualitative measurement of potential Project effects. The degree of change in these measurable parameters is used to characterize and evaluate the magnitude of Project-related environmental and socio-economic effects. A selection of the measurement endpoints may also be the focus of monitoring and follow-up programs, where applicable.
merchantable timber	Timber that will be sold to a timber processor.
mitigation measure	Mean measures for the elimination, reduction or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means, or a means of reducing or managing a project's adverse socio-economic effects.
National Area	The area extending beyond Alberta and BC but confined to Canada.
National Energy Board	An independent federal agency established in 1959 by the Parliament of Canada to regulate international and interprovincial pipelines and associated facilities.
native grassland	Lands dominated by native grasses and forbs, generally exhibiting a high species diversity, abundant grass thatch and little evidence of regular ground disturbance.
navigable water	Considered to be any body of water that does not meet the criteria of a Class 1 or Class 2 non-navigable water, as defined under the Minor Navigable Waters of the *Minor Works and Waters* (*NWPA*) *Ministerial Order*, or a potentially non-navigable water (Class 3) as defined in the Fisheries (Alberta) and Fisheries (British Columbia) Technical Reports (Volume 5C).
non-salvageable timber	Timber and woody debris that will not be used during and after pipeline construction that is deposed of.
nuisance	For the purposes of this assessment, an effect considered to be of nuisance value is considered to be one that is perceptible and may result in annoyance (*e.g.,* nuisance air emissions may include dust during construction while nuisance noise emissions may include noise from construction equipment).
palaeontological resource	There are two types of palaeontological resources, body fossils and trace fossils. Body fossils are the remnants of an organism, such as a skeleton or leaf imprint, that is embedded and preserved within the earth's crust. Trace fossils consist of tracks, burrows, coprolites and marks left by feeding which reflect the organisms' behaviours.
Port Metro Vancouver	A non-shareholder, financially self-sufficient corporation established by the Government of Canada and accountable to the federal Minister of Transport, responsible for the operation and development of the assets and jurisdictions of over 600 km of shoreline, extending from Point Roberts at the Canada/US border through Burrard Inlet to Port Moody and Indian Arm, and from the mouth of the Fraser River eastward to the Fraser Valley.
practical	Capable of or suitable to being put into effect, given environmental and economic consideration.
proposed pipeline corridor	Generally a 150 m wide corridor encompassing the pipeline construction right-of-way and temporary workspace.

GLOSSARY Cont'd

Provincial Area	The area extending beyond regional or administrative boundaries, but confined to Alberta and BC.
reclamation	The process of establishing a recovery trajectory to allow the land to re-establish its former or other productive use. The land will have the ability to support the land use that existed prior to the disturbance, but may support a different land use depending on the land management goals following the disturbance. Soils will be managed at contaminated sites to facilitate vegetation cover re-establishment suited to the post-disturbance land use. Reclamation will be considered complete once landscape, soils and vegetation goals for reclamation have been achieved.
Reference Kilometres	Distances measured along the general centre of the proposed pipeline corridor, referred to as Reference Kilometres (RKs), measured approximately 1 km apart.
Regional Study Area	The area extending beyond the Local Study Area boundary where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on the environmental or socio-economic indicator. This varies for each element.
residual effects	Effects that are present after mitigation and enhancement measures are applied.
right-of-way	A legally defined strip of land with defined boundaries in which the pipeline runs through properties owned by others.
root zone material	Organic matter rich surface soil found within shrub, treed or forested land uses.
salvageable timber	Merchantable timber without a market or non-merchantable timber salvaged for use during and after pipeline construction.
salvageable timber	Merchantable timber without a market or non-merchantable timber salvaged for use during and after pipeline construction.
shoo-flies	Vehicle and equipment access to the construction right-of-way from each side of a watercourse crossing where vehicle and equipment crossing of the watercourse on the right-of-way is not practical.
significant contribution to a cumulative socio-economic effect	The Project's contribution to a cumulative socio-economic effect is considered significant if the Project's contribution to the effect is predicted to be: • high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or • high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.
significant residual socio-economic effect	A residual socio-economic effect is considered significant if the effect is predicted to be: • high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or • high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.
supplemental (ongoing) studies	Studies to be conducted post submission of the application to confirm the effects assessment conclusions and gather site-specific information for the implementation of mitigation from the Project-specific Environmental Protection Plans.
tame pasture	Agricultural land use which is dominated by perennial, non-native grasses and forbs, which is used primarily for livestock grazing.
topsoil	Organic matter rich surface soil developed within a grassland land use.
Traditional Ecological Knowledge (TEK)	A subset of ATK that is primarily concerned with the environment.
traditional land use (TLU)/ traditional land and resource use (TLRU)/ traditional marine resource use (TMRU)	Current and former use of the land/water and its resources by Aboriginal peoples.
warranted	Justify or necessitate a course of action.

GLOSSARY Cont'd

Westridge Marine Terminal	Trans Mountain-owned marine loading facility located within Port Metro Vancouver that can accommodate ships up to 120,000 deadweight tonnes and barges. This facility also receives jet fuel, which is delivered to Vancouver International Airport through Trans Mountain's affiliate, Trans Mountain (Jet Fuel) Inc. The Westridge Marine Terminal has been in operation since 1957.

ABBREVIATIONS AND ACRONYMS

AAC	Annual Allowable Cut
AADT	average annual daily traffic
AADTM	average annual daily traffic by month
AB	Alberta
ACCESS	ACCESS Pipeline Inc.
ACIMS	Alberta Conservation Information Management System
AEAE	Alberta Enterprise and Advanced Education
AENV	Alberta Environment
AER	Alberta Energy Regulator
AESO	Alberta Electric System Operator
AESRD	Alberta Environment and Sustainable Resource Development
AHS	Alberta Health Services
AIA	Archaeological Impact Assessment
Ajax	KGHM Ajax Mining Inc.
Ajax Project	Ajax Copper/Gold Project
ALR	Agricultural Land Reserve
AltaLink	AltaLink Management Ltd.
AMEC	AMEC Earth & Environmental
ATCO Electric	ATCO Electric Ltd.
ATCO Gas	ATCO Gas and Pipelines Ltd.
ATK	Aboriginal Traditional Knowledge
ATPR	Alberta Tourism, Parks and Recreation
ATV	all-terrain vehicle
AUC	Alberta Utilities Commission
bbl	barrels
bbl/d	barrels per day
BC	British Columbia
BC EAO	BC Environmental Assessment Office
BC Hydro	BC Hydro and Power Authority
BC ILMB	Integrated Land Management Bureau
BC MFLNRO	BC Ministry of Forests, Lands and Natural Resources Operations
BC MJTST	BC Ministry of Jobs, Tourism and Skills Training
BC MOE	BC Ministry of Environment
BC MOH	BC Ministry of Health
BC MOT	BC Ministry of Transportation
BC MTI	BC Ministry of Transportation and Infrastructure
BC OGC	BC Oil and Gas Commission
BCAS	BC Ambulance Service
BCCP	BC Coast Pilots
BCIT	BC Institute of Technology
BCMF	BC Métis Federation
BCUC	BC Utilities Commission
BGC Zone	Biogeoclimatic Zone
BIEAP	Burrard Inlet Environmental Action Program
BNSF	Burlington Northern Santa Fe Corp.
Brookfield	Brookfield Renewable Power Inc.
CAPP	Canadian Association of Petroleum Producers
CCG	Canadian Coast Guard
CD	census division
CEA Act, 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency

ABBREVIATIONS AND ACRONYMS Cont'd

CFN	Cheam First Nation
CHRS	Canadian Heritage Rivers System
CMA	census metropolitan area
CMHC	Canadian Mortgage and Housing Corporation
CMT	culturally modified tree
CN	Canadian National Railway Company
Coalspur	Coalspur Mines Ltd.
COPD	chronic obstructive pulmonary disorder
CPCN	Certificate of Public Convenience and Necessity
CPR	Canadian Pacific Railway
CSA	Canadian Standards Association
CSC	Construction Sector Council
DFO	Fisheries and Oceans Canada
EMR	emergency medical responders
EMS	emergency medical services
EMT	Emergency Medical Technologist
EMT-P	Emergency Medical Technologist – Paramedic
Enbridge	Enbridge Pipelines Inc.
ENGO	environmental non-government organizations
Enhance	Enhance Energy Inc.
EPCOR	EPCOR Distribution and Transmission Inc.
EPP	Environmental Protection Plan
ERA	Ecological Risk Assessment
ERCB	Alberta Energy Resources Conservation Board
ESA	Environmental and Socio-economic Assessment
EWMC	Edmonton Waste Management Centre
FEARO	Federal Environmental Assessment Review Office
FHA	Fraser Health Authority
FMA	Forest Management Agreement
FNFNES	First Nations Food, Nutrition and Environment Study
Footprint	Footprint Study Area
FortisBC	FortisBC Energy Inc.
FOTS	fibre-optic transmission system
FREMP	Fraser River Estuary Management Program
FVRD	Fraser Valley Regional District
FVREB	Fraser Valley Real Estate Board
GDP	gross domestic product
GHG	greenhouse gas
GI	gastrointestinal
GIS	geographic information system
Grand Rapids	Grand Rapids Pipeline GP Ltd.
GVRD	Greater Vancouver Regional District
GVSDD	Greater Vancouver Sewerage and Drainage District
GVWD	Greater Vancouver Water District
ha	hectare
HDD	horizontal directional drill
HHRA	Human Health Risk Assessment
HORU	human occupancy and resource use
HP	horsepower
HRA	*Historical Resources Act*
HRIA	Historical Resources Impact Assessment

ABBREVIATIONS AND ACRONYMS Cont'd

HRO	Historical Resources Overview
HRV	Historical Resources Value
HSDA	health service delivery area
ICA	Integrated Cultural Assessment
ICS	Incident Command System
IHS Inc.	Information Handling Services Inc.
Inter Pipeline	Inter Pipeline Ltd.
IR	Indian Reserve
JAMES	Joint Abbotsford Mission Environmental Systems
KDCC	KDC Consulting
KEEP Canada	Knowledge and Experience Enhancement Program Canada
km	kilometre
KMC	Kinder Morgan Canada Inc.
KP	kilometre post
kV	kilovolt
Lifeways	Lifeways Canada Ltd.
LMDA	Lower Mainland Developed Area
LOU	Letter of Understanding
LRMP	land and resource management plan
LRT	light rail transit
LSA	Local Study Area
m	metre
MADT	monthly average daily traffic
MAXIM	MAXIM Power Corp.
MBA	Mutual Benefit Agreement
MCRTU	marine commercial, recreational and tourism use
MCTS	Marine Communication and Traffic Services
MDP	municipal development plan
MLBV	mainline block valve
mm	millimetre
MNBC	Métis Nation of BC
MPMO	Major Projects Management Office
MPOI	maximum point of impingement
MRA	movement restriction area
MU	management unit
MVA	megavolt ampere
MW	megawatt
NAIT	Northern Alberta Institute of Technology
NDIT	Northern Development Initiatives Trust
NEB	National Energy Board
NEB Act	*National Energy Board Act*
NEB OPR	*National Energy Board Onshore Pipeline Regulations*
New Gold	New Gold Inc.
NGPLP	Northern Gateway Pipelines Ltd. Partnership
NHS	National Household Survey
NM	nautical mile
NPS	nominal pipe size
NWPA	*Navigable Waters Protection Act*
OCP	official community plan
OD	outside diameter
OPAC	Online Permitting and Clearances

ABBREVIATIONS AND ACRONYMS Cont'd

PCEM	Post-Construction Environmental Monitoring
PHRCC	Petroleum Human Resources Council of Canada
PMV	Port Metro Vancouver
PTP	Pacific Trails Pipeline Limited Partnership
RAP	Restricted Activity Period
RCMP	Royal Canadian Mounted Police
RDFFG	Regional District of Fraser-Fort George
REBGV	Real Estate Board of Greater Vancouver
RGS	regional growth strategy
RHS	regional health survey
RK	reference kilometer
RMZ	riparian management zone
RSA	Regional Study Area
RV	recreational vehicle
Sasol	Sasol Canada Holdings Ltd.
Seaspan	Seaspan ULC
SEMP	Socio-economic Management Plan
SFPR	South Fraser Perimeter Road
Shell	Shell Canada Ltd.
Sherrit	Sherrit International Corporation
SRMP	sustainable resource management plan
SRY	Southern Railway of British Columbia
SSN	Stk'emlupsemc te Secwepemc Nation
STARS	Shock Trauma Air Rescue Society
STI	sexually transmitted infection
TB	tuberculosis
Teck	Teck Resources Ltd.
TEK	Traditional Ecological Knowledge
Telus	Telus Communications Corp.
TERA	TERA Environmental Consultants
TERMPOL	Technical Review Process of Marine Terminal Systems and Transshipment Sites
TEU	twenty-foot equivalent unit
the Project	Trans Mountain Expansion Project
TIABC	Tourism Industry Association of British Columbia
TLU/TLRU/TMRU	traditional land use / traditional land and resource use / traditional marine resource use
TMEP	Trans Mountain Expansion Project
TMPL	Trans Mountain pipeline
TNRD	Thompson-Nicola Regional District
Trans Mountain	Trans Mountain Pipeline ULC
TransAlta	TransAlta Corp.
TransCanada	TransCanada PipeLines Limited
TSA	Timber Supply Area
TTML	Ts'elxwéyeqw Tribe Management Limited
TUC	Transportation/Utility Corridor
TUS	Traditional Use Study
UBC	University of British Columbia
UBCM	Union of British Columbia Municipalities
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
VARDA	Valemount Area Recreation Development Association
VCHA	Vancouver Coastal Health Authority

ABBREVIATIONS AND ACRONYMS Cont'd

VEC and VSC	valued environmental and social component
Vista Project	Vista Coal Mine Project
VMA	viewshed modeling analysis
VQO	visual quality objective
WCMRC	Western Canada Marine Response Corporation
West Fraser	West Fraser Mills Ltd.
Weyerhaeuser	Weyerhaeuser Company Ltd.
WMU	Wildlife Management Unit
YVR	Vancouver International Airport
YXX	Abbotsford International Airport
ZOI	zone of influence

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF PLATES

LIST OF TABLES

1.0 INTRODUCTION

1.1 Overview of the Project

Trans Mountain Pipeline ULC (Trans Mountain) is a Canadian corporation with its head office located in Calgary, Alberta. Trans Mountain is a general partner of Trans Mountain Pipeline L.P., which is operated by Kinder Morgan Canada Inc. (KMC), and is fully owned by Kinder Morgan Energy Partners, L.P. Trans Mountain is the holder of the National Energy Board (NEB) certificates for the Trans Mountain pipeline system (TMPL system).

The TMPL system commenced operations 60 years ago and now transports a range of crude oil and petroleum products from Western Canada to locations in central and southwestern British Columbia (BC), Washington State and offshore. The TMPL system currently supplies much of the crude oil and refined products used in BC. The TMPL system is operated and maintained by staff located at Trans Mountain's regional and local offices in Alberta (Edmonton, Edson, and Jasper) and BC (Clearwater, Kamloops, Hope, Abbotsford, and Burnaby).

The TMPL system has an operating capacity of approximately 47,690 m^3/d (300,000 bbl/d) using 23 active pump stations and 40 petroleum storage tanks. The expansion will increase the capacity to 141,500 m^3/d (890,000 bbl/d).

The proposed expansion will comprise the following:

- pipeline segments that complete a twinning (or "looping") of the pipeline in Alberta and BC with about 987 km of new buried pipeline;
- new and modified facilities, including pump stations and tanks;
- three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The expansion has been developed in response to requests for service from Western Canadian oil producers and West Coast refiners for increased pipeline capacity in support of growing oil production and access to growing West Coast and offshore markets. NEB decision RH-001-2012 reinforces market support for the expansion and provides Trans Mountain the necessary economic conditions to proceed with design, consultation, and regulatory applications.

Application is being made pursuant to Section 52 of the *National Energy Board Act* (*NEB Act*) for the proposed Trans Mountain Expansion Project (referred to as "TMEP" or "the Project"). The NEB will undertake a detailed review and hold a Public Hearing to determine if it is in the public interest to recommend a Certificate of Public Convenience and Necessity (CPCN) for construction and operation of the Project. Subject to the outcome of the NEB Hearing process, Trans Mountain plans to begin construction in 2016 and go into service in 2017.

Trans Mountain has embarked on an extensive program to engage Aboriginal communities and to consult with landowners, government agencies (*e.g.*, regulators and municipalities), stakeholders, and the general public. Information on the Project is also available at www.transmountain.com.

The scope of the Project will involve:

- using existing active 610 mm (NPS 24) and 762 mm (NPS 30) OD buried pipeline segments;
- constructing three new 914 mm (NPS 36) OD buried pipeline segments totalling approximately 987 km:
  - Edmonton to Hinton – 339.4 km
  - Hargreaves to Darfield – 279.4 km

  - Black Pines to Burnaby – 367.9 km;

- reactivating two 610 mm (NPS 24) OD buried pipeline segments that have been maintained in a deactivated state:

  - Hinton to Hargreaves – 150 km

  - Darfield to Black Pines – 43 km;

- constructing two, 3.6 km long 762 mm (NPS 30) OD buried delivery lines from Burnaby Terminal to Westridge Marine Terminal (the Westridge delivery lines);

- installing 23 new sending or receiving traps (16 on the Edmonton-Burnaby mainlines), for in-line inspection tools, at nine existing sites and one new site;

- adding 35 new pumping units at 12 locations (*i.e.*, 11 existing and one new pump station site);

- reactivating the existing Niton Pump Station that has been maintained in a deactivated state;

- constructing 20 new tanks located at the Edmonton (5), Sumas (1) and Burnaby (14) Terminals, preceded by demolition of 2 existing tanks at Edmonton (1) and Burnaby (1), for a net total of 18 tanks to be added to the system; and

- constructing one new dock complex, with a total of three Aframax-capable berths, as well as a utility dock (for tugs, boom deployment vessels, and emergency response vessels and equipment) at Westridge Marine Terminal, followed by the deactivation and demolition of the existing berth.

Figure 1.1 provides an overview of the location of the Project.

TRANS MOUNTAIN

FIGURE 1.1

PROJECT OVERVIEW
ALBERTA AND BRITISH COLUMBIA

TRANS MOUNTAIN
EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: LCC Modified. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrastructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2009 ESRI.

tera ENVIRONMENTAL CONSULTANTS

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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0 25 50 75 100

ALL LOCATIONS APPROXIMATE

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1.2 Purpose of the Socio-Economic Assessment

As described in Section 3.0 of Volume 2, the Project will require a NEB CPCN pursuant to Section 52 of the *NEB Act* because the proposed pipeline crosses a provincial border and is greater than 40 km in length. In addition, according to the *Regulations Designating Physical Activities,* the Project is a designated project under the *Canadian Environmental Assessment Act, 2012* (*CEA Act, 2012*) because the new pipeline is greater than 40 km. The Environmental and Socio-economic Assessment (ESA) prepared for the Project considers the mandatory factors listed in Section 19(1) of the *CEA Act, 2012*, the factors listed in the NEB *Filing Manual* (NEB 2013a), and pertinent issues and concerns identified through consultation and engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public.

Trans Mountain understands that the NEB will conduct the review of the TMEP under the *NEB Act* as well as the *CEA Act, 2012.*

The Project is federally regulated and subject to obtaining a CPCN from the NEB and complying with the terms and conditions imposed by the NEB. Trans Mountain intends to work with Provincial regulatory authorities, municipal authorities and other agencies to provide them the information they need to fulfill their permitting requirements if the NEB approves the Project. Examples of these authorizations are listed in Section 1.5 of Volume 2.

1.2.1 Scope of the Project

According to the NEB *Filing Manual*, the scope of the Project includes the activities and components required to carry out the Project and allow it to proceed. This combination of activities for pipelines and facilities is provided in Section 1.1.

There will be additional marine traffic to move the product from the Project. Although regulation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in accordance with the NEB's direction from their *List of Issues* for the Project, released on July 29, 2013 (NEB 2013b). The predicted increase in marine traffic related to the Project is discussed in Volume 8A, Marine Transportation. Volume 8A addresses the requirements of the NEB's *List of Issues* (July 29, 2013) (NEB 2013b) as they relate to increased marine shipping resulting from the Project, the *CEA Act, 2012*, and the NEB's *Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project* (September 10, 2013) (NEB 2013c).

The potential effects of an operational pipeline or marine spill are evaluated in Volumes 7 and 8A, respectively, including the risk of a spill, spill response plans, and the potential effects of hypothetical spill scenarios. The evaluation of the hypothetical spill scenarios also includes a Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA).

1.2.2 Scope of the Assessment

Scoping is the process of identifying the physical works and activities to include within the ESA, and the biophysical and socio-economic elements are likely to be affected by the Project. Proper scoping reduces the risk of including unimportant or irrelevant information in the assessment or excluding factors that should be assessed (NEB 2013a).

The NEB's *List of Issues* (July 29, 2013) for the Project (NEB 2013b) is provided below. Issues 4 and 5 of this list specifically informed the ESA.

1. *The need for the proposed project.*
2. *The economic feasibility of the proposed project.*
3. *The potential commercial impacts of the proposed project.*

4. *The potential environmental and socio-economic effects of the proposed project, including any cumulative environmental effects that are likely to result from the project, including those required to be considered by the NEB's Filing Manual.*
5. *The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed project, including the potential effects of accidents or malfunctions that may occur (addressed in Volume 8A).*
6. *The appropriateness of the general route and land requirements for the proposed project.*
7. *The suitability of the design of the proposed project.*
8. *The terms and conditions to be included in any approval the Board may issue.*
9. *Potential impacts of the project on Aboriginal interests.*
10. *Potential impacts of the project on landowners and land use.*
11. *Contingency planning for spills, accidents or malfunctions, during construction and operation of the project.*
12. *Safety and security during construction of the proposed project and operation of the project, including emergency response planning and third-party damage prevention.*

> *The Board does not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands or the downstream use of the oil transported by the pipeline.*

Recognizing the scope of the assessment described above, Trans Mountain must submit an ESA for the proposed pipeline and facilities. Trans Mountain's ESA includes a description of the following:

- the environmental and socio-economic setting;
- the predicted beneficial and adverse effects of the proposed Project on the socio-economic and biophysical environment over the life of the Project;
- the methods used for effects analysis, and the rationale for selecting the methods chosen;
- the proposed inspection, monitoring and mitigation measures; and
- the predicted significance of residual Project effects and residual cumulative effects.

The socio-economic assessment considers the mandatory factors listed in Section 19(1) of the *CEA Act, 2012,* the factors listed in the NEB *Filing Manual* (NEB 2013a), and pertinent issues and concerns identified through Aboriginal engagement and consultation with landowners, regulatory authorities, stakeholders, and the general public. It should be noted that Aboriginal engagement and stakeholder consultation does not end with the filing of the application to the NEB. Engagement, consultation as well as refinement of the environmental and socio-economic mitigation measures, continue through the next phases of the regulatory process and project execution.

The socio-economic assessment considers the potential effects of the Project on the socio-economic conditions within defined spatial and temporal boundaries. These boundaries will vary with the issues and socio-economic elements or interactions to be considered and will reflect:

- the socio-economic setting within the spatial boundaries of the Project;
- the construction, operation, maintenance and decommissioning and abandonment phases of the proposed physical works and physical activities;
- the time required for an effect to become evident;
- the time required for a population to recover from an effect and return to a pre-effect condition;

- the area directly affected by proposed physical works and physical activities; and
- the area in which a population functions and within which a Project effect may be felt.

The spatial boundaries consider one or more of the following areas, as summarized below and described in detail in Section 7.2. Figures showing the spatial boundaries used for each element are provided in Sections 5.0, 6.0 and 7.0 depending on the element in question.

- A **Footprint Study Area (Footprint)** consisting of the area directly disturbed by surveying, construction and clean-up of the pipeline and associated physical works and activities (including, where appropriate, the permanent right-of-way, pump stations, tanks, Westridge Marine Terminal, temporary construction workspace, temporary stockpile sites, temporary staging facilities, construction camps, access roads, power lines, etc).
- A **Local Study Area (LSA)** consisting of the zone of influence (ZOI) or area where the element and associated indicators are most likely to be affected by Project construction and operation. This generally represents a buffer from the centre of the proposed pipeline corridor. Detailed discussions regarding the element-specific LSAs and associated rationale are provided in Section 7.2.
- A **Regional Study Area (RSA)** consisting of the area extending beyond the LSA boundary where the direct and indirect influence of other activities could overlap with project-specific effects and cause cumulative effects on the indicator. For each element considered, a separate spatial RSA boundary was established in consideration of the regional effects of the Project on the individual element. Further rationale for the establishment of the RSAs is provided in Section 7.2.
- A **Provincial Area** that extends beyond regional or administrative boundaries, but is confined to Alberta and BC.
- A **National Area** that extends beyond Alberta and BC but is confined to Canada.
- An **International Area** that extends beyond Canada.

Reconnaissance, detailed field studies and desktop studies considered a proposed pipeline corridor approximately 150 m wide, encompassing the pipeline construction right-of-way, temporary workspace, pump stations, and related facilities. In the event that an area of interest was identified, field crews expanded their survey as appropriate (the survey was not expanded to an area greater than the LSA) to identify the extent and distribution of the area of interest, and to ensure that a comprehensive assessment of the feature(s) were being surveyed.

The time frames of the socio-economic assessment of the Project include the planning, construction (including reactivation/modification), operation, and decommissioning and abandonment phases. Pending regulatory approval, construction activities are expected to commence in Q1 2016 and extend to Q4 2017. The operation phase commences following completion of construction in Q4 2017 and extends for the useful life of the pipeline (approximately 50-70 years).

The socio-economic assessment also considers residual and cumulative effects that are likely to result from the Project in combination with existing activities and reasonably foreseeable developments that have been or will be carried out. In areas where environmental field crews were not able to get access for resource surveys, desktop studies, literature reviews, information derived from study of adjacent lands and professional judgment were relied on to make predictions. Possible effects and available mitigation measures are well known and can be relied on to make assessment predictions. Where necessary to confirm impact predictions and gather site-specific information, Trans Mountain will be conducting additional studies on those areas where access was not available. Where warranted, follow-up studies may be recommended.

1.3 Overview of Volume 5B

The socio-economic component of the ESA for the Project has been prepared under the guidance provided by the NEB *Filing Manual* and the requirements of the *CEA Act, 2012*. In addition, the mitigation measures, contingency and management plans provided in the project-specific Environmental Protection

Plans (EPPs) for the pipeline, facilities and Westridge Marine Terminal (Volumes 6B, 6C and 6D), the Socio-economic Management Plan (SEMP) (Volume 6B) and information on the Environmental Alignment Sheets (Volume 6E) will form the foundation for future socio-economic management activities by Trans Mountain, particularly during the construction phase of the Project. The biophysical component of the ESA for the Project is provided in Volume 5A. The environmental and socio-economic effects of increased Project-related marine vessel traffic are discussed in Volume 8A. Volume 5B is divided into the following sections.

1.0 **Introduction:** Provides the purpose of the socio-economic assessment, a description of the scope of the Project and the scope of the assessment, an outline of Volume 5B and a summary of the Project team.

2.0 **Project Description:** Provides a description of the Project components and Project phases related to the pipeline and facilities component of the Project.

3.0 **Public Consultation, Aboriginal Engagement and Landowner Relations:** Provides a summary of public involvement and Aboriginal engagement activities conducted in preparation of the ESA for the pipeline and facilities component of the Project. This section discusses the engagement with Aboriginal communities and consultation with landowners, federal, provincial and municipal regulatory authorities, and other interested parties such as environmental non-government organizations (ENGOs), where applicable. The section also identifies key socio-economic issues raised during the consultation and engagement program. The consultation conducted in preparation of this volume was designed to complement the Trans Mountain public consultation and engagement program, which is discussed in Volumes 3A, 3B and 3C.

4.0 **Corridor and Facility Site Selection:** Provides a detailed description of the proposed pipeline corridor selection processes and site selection process for pipeline facilities, pump stations and storage tanks.

5.0 **Socio-Economic Setting for the Pipeline:** Provides a description of the current socio-economic conditions present along the proposed pipeline corridor and reactivated pipeline segments.

6.0 **Socio-Economic Setting for Facilities:** Provides a description of the current socio-economic conditions present at pump stations, storage tank sites, the Westridge Marine Terminal and temporary facilities.

7.0 **Socio-Economic Effects Assessment:** Describes the effects assessment and identifies the potential socio-economic effects, mitigation and enhancement measures and potential residual effects, including an assessment of their significance for the following Project components: pipeline; temporary facilities; pump stations (including power lines); storage tanks; Westridge Marine Terminal; and reactivated pipeline segments.

8.0 **Cumulative Effects Assessment:** Provides a description of the Project's contribution to potential adverse cumulative effects as well as an assessment of their significance.

9.0 **Supplemental Studies:** Provides a description of the plans to carry out ongoing studies.

10.0 **Follow-Up:** Provides a description of any proposed follow-up programs.

11.0 **Conclusion:** Provides conclusions related to the significance of potential adverse residual socio-economic effects and cumulative effects associated with the pipeline and facilities components of the Project.

1.4 Project Team

The companies that assisted with the preparation of Volume 5B are listed in Table 1.4-1.

TABLE 1.4-1

PROJECT TEAM

Project Description Public Consultation, Aboriginal Engagement and Landowner Relations Corridor and Facility Site Selection	Trans Mountain
Managed forest areas and forest health and assessment	B.A. Blackwell & Associates Ltd.
Palaeontological overview	Steppe Consulting Inc. L.V. Hills
Socio-economic assessment (Social and Cultural Well-Being, Human Occupancy and Resource Use, Infrastructure and Services, Navigation and Navigation Safety, and Employment and Economy)	Vista Strategy Corp. TERA Environmental Consultants (TERA) Conference Board of Canada
Agricultural assessment	McTavish Resource & Management Consultants
Worker expenditure analysis	Decision Economics Consulting Group
Community health assessment	Habitat Health Impact Consulting Corp.
Human health risk assessment	Intrinsik Environmental Sciences Inc.
Historical Resources Impact Assessment (HRIA) (Alberta) Archaeological Impact Assessment (AIA) (BC) Traditional land and resource use (TLRU) evaluation and assessment Viewshed modelling analysis (VMA)	TERA

Supporting socio-economic technical reports are provided in Volume 5D. The technical reports provide discipline-specific background information, the methodology and results of field surveys and research conducted in support of the socio-economic assessment. These technical reports and previous surveys and studies provide an information base for the pipeline and facilities component of the Project. The authors of the supporting technical reports also participated in the identification of potential effects, the evaluation of significance of residual effects and the development of mitigation measures within their respective disciplines.

1.5 References

1.5.1 Literature Cited

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2.0 PROJECT DESCRIPTION

This section provides a description of the Project's components and summarizes activities associated with the construction, operation, and decommissioning and abandonment phases of the pipeline and associated facilities.

2.1 Project Components

The following subsections describe the components of the Project and locations of the proposed and reactivated pipeline segments, proposed activities at pump stations, temporary facilities, proposed storage tank facilities, and the expansion of the Westridge Marine Terminal. More detailed descriptions are provided in Volume 2. The existing TMPL system and proposed and reactivated segments, as well as pump stations and terminals, are shown in Figure 1.1-1 of Section 1.0.

To delineate features along the proposed pipeline corridor, Reference Kilometre (RK) posts approximately 1 km apart have been established based on the general centre of the proposed pipeline corridor. RK 0.0 is located at the Edmonton Terminal where the existing TMPL system starts. The end of the existing TMPL system is located at the Burnaby Terminal (RK 1179.8), where two approximately 3.6 km long (RK 0 to RK 3.6) delivery lines extend from the Burnaby Terminal to the Westridge Marine Terminal.

The ESA is based on preliminary engineering and designs. In general, conservative assumptions have been used. However, further technical development during the upcoming phases of engineering and detailed design in 2014 and 2015 will confirm the current assessment of socio-economic effects. If there are substantive changes from the preliminary designs, additional assessment and regulatory consultation may be required.

For the purposes of the socio-economic assessment, the proposed pipeline corridor is divided into six distinct socio-economic regions (Figures 5.0-1 to 5.0-7 of Section 5.0). Table 2.1-1 describes the six regions and the type of facilities to be constructed and operated in each.

TABLE 2.1-1

SOCIO-ECONOMIC REGIONS

Socio-Economic Region	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/ hompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Region Boundaries	Strathcona County to western boundary of Parkland County	Eastern boundary of Yellowhead County to eastern boundary of Jasper National Park	Eastern and western boundaries of Jasper National Park	Western boundary of Jasper National Park (Alberta/BC border) to halfway between Merritt and Hope	Halfway between Merritt and Hope to the western boundary of the Fraser Valley Regional District (FVRD)	Boundaries of Metro Vancouver or the Greater Vancouver Regional District
Pipeline RK Range	RK 0.0 to RK 135.0	RK 135.0 to RK 339.4	No new pipeline (RK 339.4 to RK 489.6)	RK 489.6 to RK 991.1	RK 991.1 to RK 1137.4	RK 1137.4 to RK 1179.8 RK 0 to RK 3.6 (Burnaby Terminal to Westridge Marine Terminal)
New Pipeline Segment(s) in the Region	Edmonton to Hinton	Edmonton to Hinton	None	Hargreaves to Darfield; Black Pines to Hope	Black Pines to Hope; Hope to Burnaby	Hope to Burnaby; Burnaby to Westridge
Pipeline Reactivation Segments	None	Hinton to Hargreaves	Hinton to Hargreaves	Hinton to Hargreaves; Darfield to Black Pines	None	None
Pump Stations (bolded indicates Project activity)	Stony Plain **Gainford**	Chip **Niton** **Wolf**	**Jasper**	**Rearguard** Albreda Chappel	Hope Waleach **Sumas**	Port Kells

TABLE 2.1-1 Cont'd

Socio-Economic Region	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/ Thompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Pump Stations (cont'd) (bolded indicates Project activity)	See above	Edson Hinton	See above	**Blue River** Finn McMurphy **Blackpool** **Darfield** **Black Pines (new site)** **Kamloops** Stump **Kingsvale**	See above	See above
Terminals (bolded indicates Project activity)	**Edmonton Terminal**	None	None	**Kamloops Terminal**	**Sumas Terminal**	**Burnaby Terminal** **Westridge Marine Terminal**

2.1.1 Pipeline

2.1.1.1 New Pipeline

The Edmonton Region extends from the existing Edmonton Terminal at SW 5-53-23 W4M (RK 0.0) in Strathcona County to the western boundary of Parkland County at NW 17/SW 20-53-7 W5M (RK 135.0). The total length of new pipeline in the Edmonton Region is 135 km.

The Rural Alberta Region extends from the western boundary of Parkland County at NW 17/SW 20-53-7 W5M (RK 135.0) to the boundary of Jasper National Park at NE 15-49-27 W5M. The total length of proposed pipeline in the Rural Alberta Region is 204.4 km, extending from the boundary of Parkland County at NW 17/SW 20-53-7 W5M (RK 135.0) to the existing TMPL at the Hinton Pump Station at NW 33-49-26 W5M (RK 339.4). The existing deactivated pipeline segment from Hinton Pump Station to Jasper National Park will be reactivated (refer to Section 2.1.1.2).

The Fraser-Fort George/Thompson-Nicola Region extends from Mount Robson Provincial Park at the Alberta/BC border at SE 23-45-4 W6M to the boundary of the FVRD at 71-H/92-H-11 (RK 991.1). The total length of new pipeline in the Fraser-Fort George/Thompson-Nicola Region is 458.7 km, extending from a tie-in at Hargreaves at 20-B/083-E-3 (RK 489.6) to Darfield at 75-B/092-P-8 (RK 769) and from Black Pines at 41-K/092-I-16 (RK 811.8) to the boundary of the FVRD at 71-H/92-H-11 (RK 991.1). Existing deactivated pipeline segments will be reactivated where no new pipeline is proposed as part of the Project (refer to Section 2.1.1.2).

The Fraser Valley Region extends from the boundary of the FVRD at 71-H/92-H-11 (RK 991.1) to the boundary of the City of Abbotsford and Township of Langley at 57-E/92-G-1 (RK 1137.4). The total length of new pipeline in the Fraser Valley Region is 146.3 km.

The Metro Vancouver Region extends from the boundary of the City of Abbotsford and Township of Langley at 57-E/92-G-1 (RK 1137.4) to the Burnaby Terminal at 25-D/092-G-7 (RK 1179.8), also encompassing the Westridge delivery lines extending from the Burnaby Terminal at 25-D/092-G-7 (RK 0) to the Westridge Marine Terminal at 46-D/092-G-7 (RK 3.6). The total length of new pipeline in the Metro Vancouver Region is 46 km.

The proposed route of the new pipeline in the five socio-economic regions is identified along an approximately 150 m wide corridor. Although the proposed pipeline will generally require a construction right-of-way of 45 m, the corridor width varies along the route depending on the types of land use and potential engineering and environmental constraints.

The proposed pipeline corridor will parallel the existing TMPL system right-of-way to the greatest extent feasible considering, among other factors, present land uses and terrain adjacent to the existing TMPL system right-of-way. To reduce the area of new disturbance, the proposed pipeline corridor will parallel

other existing linear disturbances where feasible. For the purposes of this ESA, existing linear disturbance include electrical transmission lines, oil and gas pipelines, fibre optic lines, railways, highways and permanent roads.

A summary of technical details for the proposed pipeline corridor is provided in Table 2.1-2. Technical details specific to reactivated segments are provided in the following subsection. An overview map of the existing TMPL system and the proposed pipeline corridor is provided in Section 1.0. Additional information pertaining to the alignment of the proposed pipeline corridor and the location and rationale of route deviations is provided in Section 4.0 and Volume 2.

TABLE 2.1-2

TECHNICAL DETAILS – PROPOSED PIPELINE CORRIDOR

Total Length (including Westridge delivery lines):	Approximately 990.5 km
Length Parallel to Existing TMPL:	661.6 km (66.8%)
Length Deviating from Existing TMPL:	328.9 km (33.2%)
Total Length Parallel to Other Existing Linear Features:	221.2 km (22.3%)
Total Length Deviating from Other Existing Linear Features:	107.8 km (10.9%)
Product:	Heavy synthetic crude oil and diluted bitumen (also capable of transporting light crude oil and light synthetic oil, if necessary)
Source Point:	Existing Edmonton Terminal at SW 5-53-23 W4M (RK 0.0)
Delivery Point:	Existing Sumas Terminal at a-097-B/092-G-01 (RK 1117.5), existing Burnaby Terminal at a-025-D/092-G-07 (RK 1179.8) and existing Westridge Marine Terminal at 46-D/092-G-7 (RK 0.0 [Burnaby Terminal] to RK 3.6)
Pipe Size:	One 914.4 mm OD (NPS 36) pipeline from Edmonton Terminal to Burnaby Terminal and two 762 mm OD (NPS 30) Westridge delivery lines from Burnaby Terminal to Westridge Marine Terminal
Construction Footprint (typical) (construction right-of-way):	The construction right-of-way will typically be 45 m wide, including an approximately 18 m wide permanent easement. The remainder of the construction right-of-way width will be used as temporary workspace.
Construction Footprint (atypical) (construction right-of-way):	The construction right-of-way will be narrowed to 10 m or less where specific constraints or limitations are identified, such as parks and sensitive areas, confined valleys, urban areas, adjacent infrastructure or land features and when in proximity to the existing TMPL right-of-way.
Temporary Workspace:	Additional temporary workspace will be necessary at select locations to accommodate construction activities (*e.g.*, road, rail, buried utility line and water crossings, sharp sidebends, tie-ins, and locations where extra depth of cover, deep topsoil, three-lift handling or heavy grading is necessary). Trans Mountain will also acquire temporary workspace for Project construction needs such as stockpile sites, equipment storage sites, shoo-flies, contractor staging areas, borrow pits and construction work camps (refer to Section 2.1.2 for additional information).
Trench Depth	1.8-2.1 m, deeper at watercourses
Minimum Depth of Cover:	0.9 m (0.6 m in bedrock)
Typical Trench Width:	Approximately 2 m
Test Medium:	Water
New Above Ground Line Facilities:	Includes approximately 86 automated mainline block valves (MLBVs), scraper traps and a pressure control station (pending results of detailed hydraulic studies). Refer to Section 2.1.1.3 for a description of automated MLBVs and the pressure control station, and Sections 2.1.3 to 2.1.5 for information on scraper trap facilities at pump stations, storage terminals and the Westridge Marine Terminal, respectively.

2.1.1.2 Reactivated Pipeline Segments

The reactivated pipeline segments from Hinton to Hargreaves and Darfield to Black Pines generally parallel the existing TMPL right-of-way. The existing TMPL easement through Jasper National Park and Mount Robson Provincial Park is 6.1 m wide and 18 m wide, respectively. Outside the parks, the existing easement along the two segments is generally 18 m wide. Permanent surface disturbance along the reactivated segments will be limited to locations where automated MLBVs will be installed or where existing valves will be automated. Temporary surface disturbance will be limited to preparation for in-line inspection, defect repair and hydrostatic testing.

2.1.1.3 Pipeline Associated Permanent Facilities

Approximately 86 automated MLBVs will be installed along the pipeline for emergency shutdown and isolation of pipeline segments. Automated MLBVs will be constructed within the operating pipeline right-of-way and most will be sited adjacent to existing TMPL valves. Many automated MLBVs will be accessed by existing access roads, however, permanent access roads may be required at yet unspecified locations. Automated MLBVs will require a permanent power source. Typically, new power lines will only be used when there is a source nearby, thereby reducing any additional disturbance. Otherwise, alternative power sources such as solar panels, battery banks and/or nitrogen bottles will be used. Each automated MLBV installation will require a fenced and gravelled operating area of approximately 5 m x 12 m (60 m^2). The exact location of automated MLBVs and power sources utilized will be determined during the detailed engineering and design phase.

Pending results of detailed hydraulic studies, a pressure control station may be required for TMEP at the Hope Pump Station. The purpose of the station, if required, will be to control pressure in the pipeline to ensure product flows at a relatively steady rate as it leaves Kingsvale Pump Station (high elevation) and flows down slope toward the Lower Mainland (low elevation). The station will utilize the existing electrical distribution line and access road to the Hope Pump Station. No new lands will be required.

2.1.2 Pipeline Associated Temporary Facilities

Temporary Access Roads and Shoo-flies

Existing infrastructure will be used where practical for access during construction. Access to the new pipeline construction right-of-way, where it is not contiguous with the existing pipeline alignment, will be from existing public and private access points and roads (respecting traffic safety and concern for other users), controlled existing access, rights-of-way of others (*e.g.*, Canadian National Railway Company [CN], Telus, Spectra), and existing shoo-flies and trails. Only approved access will be used.

Where existing access is not sufficient or available, access might be improved along existing trails as necessary during construction by widening, re-grading or other means. Former access trails may also be reactivated and existing rights-of-way of others may be used to reduce disturbance.

Where new temporary access is required, all applicable authorizations and approvals will be sought on private and public lands, including parks and protected areas. Temporary access roads and shoo-flies will typically be 5 m wide to accommodate equipment and machinery.

Temporary Facility Sites

In addition to the pipeline easement and associated temporary workspace, land will be required for temporary sites, including:

- staging and stockpile sites;
- equipment storage sites;
- construction office sites;
- construction work camps (likely one in Alberta and two in BC);
- trenchless crossing work areas;
- borrow pits; and
- log decks.

Wherever practical, these temporary facilities will be located within previously disturbed areas to minimize overall Project disturbance. All temporary facility sites will be reviewed from an environmental perspective before their use.

Sewage and grey water will be treated in a temporary treatment facility on-site at each facility and hauled to regional facilities for disposal. Power will be supplied by generators and by the local electrical grid, where available.

If permitted, potable water at the facilities will be drawn from adjacent sources such as the Athabasca, Fraser, North Thompson, Coldwater and Coquihalla rivers, at rates acceptable to the appropriate regulatory authorities and filtered before use. Otherwise, potable water will be trucked in to each work camp site.

2.1.3 Pump Station Facilities

Pump stations are positioned along the existing TMPL system at 23 locations to maintain pressure and move the product along the line and monitor flow. To accommodate the expansion, the Project will include construction and operation of new pump stations serving the new pipeline at 10 of the existing pump station sites at Edmonton, Gainford, Wolf, Edson and Hinton in Alberta, and at Rearguard, Blue River, Blackpool, Kamloops and Kingsvale in BC. Two new pump stations will also be constructed and operated at a new greenfield site at Black Pines, BC to serve both the existing pipeline and new pipeline.

Pump stations are generally located within a fenced area on approximately 4 ha of land and contain the following: pumps and motors housed in a building; an electrical service building; an operator building; an electrical substation; and station piping and valves. Pump stations will be connected to the provincial power grid via new or existing power lines. Trans Mountain or a third party (*e.g.*, AltaLink Management Ltd., BC Hydro and Power Authority [BC Hydro]) will apply to the appropriate provincial regulatory authorities for electrical facilities necessary to connect with the provincial power lines. Existing access will be utilized for all pump stations with the exception of Black Pines, which will require construction of a permanent 5 m wide gravelled access road approximately 25 m in length, subject to final site selection and detailed engineering and design.

There will be one new 2,500 HP pumping unit installed on the NPS 24 pipeline heading south along the Puget Sound line from the Sumas Pump Station into Washington State. The existing Jasper Pump Station in Alberta will be relocated from the TMX Anchor Loop pipeline to serve TMPL system (currently deactivated). Valves, controls and other instruments will also be installed as part of the pump station modifications.

As an outcome of the TMEP, the Niton Pump Station will be reactivated (currently deactivated) to serve the existing pipeline and the existing pump stations at Wolf and Blue River will be deactivated since they will no longer be required for the existing TMPL system. The infrastructure that is currently in place at the deactivated pump stations will remain on-site should there be the need to reactivate either of the stations at some point in the future. The existing electrical service building and variable frequency drive building will, however, serve the new pump stations at Wolf and Blue River. The deactivated stations will be disconnected from the existing TMPL system and purged with nitrogen. All associated reactivation and deactivation activities will be conducted within the current fenced areas and no new disturbance will be required.

Although no changes to pumping capacity are anticipated at the Darfield Pump Station, valve modifications and installation of a new scraper trap (sending and receiving) are planned.

No work is planned at the following pump stations: Stony Plain and Chip, Alberta; and Albreda, Chappel, Finn, McMurphy, Stump, Hope, Wahleach and Port Kells, BC.

A summary of the location, components, present land use, land requirements and ancillary facilities (including scraper traps) at each pump station is provided in Table 2.1-3. Pump station schematics are provided in Volume 4A.

TABLE 2.1-3

TECHNICAL DETAILS – PUMP STATION ACTIVITIES

Pump Station and Location	Activities	Land Use and Land Requirements	Nearest Residence/ Receptor from Facility Fence Line
Edmonton • RK 0.0 • SW 5-53-23 W4M	• new pump station[1] consisting of four electrically driven 5,000 HP pumps plus one spare[2] added to serve TMEP • new scraper facilities (sending) on TMEP • a new substation • a new power line (to be determined by provincial regulatory authority)[3] • fencing	industrial/within existing Trans Mountain-owned lands	• 1.9 km northwest and southeast
Gainford • RK 117.5 • NE 13-53-6 W5M	• new pump station[1] consisting of three electrically driven 5,000 HP pumps to serve TMEP • upgrades to existing substation • fencing	industrial and forested (clearing required)/within existing Trans Mountain-owned lands	• 140 m east
Niton • RK 191.4 • SW 34-53-13 W5M	• reactivate two existing 2,000 HP pumps to serve TMPL	industrial/within existing Trans Mountain-owned lands	• 1 km southwest
Wolf • RK 206.2 • NW 19-53-14 W5M	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • existing pump building will be deactivated • fencing	industrial/within existing Trans Mountain-owned lands	• 600 m west-southwest
Edson • RK 247.1 • SW 18-53-18 W5M	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • new scraper facilities (sending and receiving) on TMEP • replace existing substation • a new power line (to be determined by provincial regulatory authority)[3] • fencing and on-site gravel road	industrial/within existing Trans Mountain-owned lands	• 360 m west
Hinton • RK 339.4 • NW 33-49-26 W5M	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • new scraper facilities (sending) on TMPL • fencing	industrial/will require acquisition of approximately 0.32 ha (35 m x 90 m) new land outside existing Trans Mountain-owned lands to the west	• 820 m southwest
Jasper • NW 2-46-1 W6M	• relocate two existing 2,500 HP pumps from the TMX Anchor Loop pipeline to TMPL (currently deactivated) • drag resistant agent injection facility requiring small storage tank (with secondary containment) and a high pressure injection pump	industrial/within Crown lands currently leased by Trans Mountain	• 1.3 km southeast
Rearguard • RK 498.3 • d-068-K/083-D-14	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • remove scraper facilities (sending and receiving) from Hargreaves • new scraper facilities (sending and receiving) on TMPL and TMEP • fencing and on-site gravel road	industrial and disturbed forested (clearing required)/will require acquisition of approximately 0.7 ha (70 m x 100 m) new land outside existing Trans Mountain-owned lands to the east	• none within 2 km

TABLE 2.1-3 Cont'd

Pump Station and Location	Activities	Land Use and Land Requirements	Nearest Residence/ Receptor from Facility Fence Line
Blue River • RK 614.7 • a-035-F/083-D-03	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • existing pump building will be deactivated	industrial/within existing Trans Mountain-owned lands	• 30 m east and south
Blackpool • RK 736.8 • c-073-B/092-P-09	• new pump station[1] consisting of three electrically driven 5,000 HP pumps serving TMEP • upgrade existing transformer • fencing and on-site gravel road	industrial/within existing Trans Mountain-owned lands	• 150 m north-northwest
Darfield • RK 769 • d-075-B/092-P-08	• new scraper facilities (receiving) on TMEP • fencing	industrial and agricultural/will require acquisition of approximately 0.07 ha (23 m x 30 m) new land outside existing Trans Mountain-owned lands extending from the northwest corner of the property line	• 150 m south
Black Pines • RK 811.8 • d-041-K/092-I-16	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • new pump station[1] consisting of two electrically driven 2,500 HP pumps serving TMPL • new substation to serve both lines • new scraper facilities (sending and receiving) on TMPL and TMEP • new access road approximately 5 m x 25 m[3] • new 138 kV power line approximately 50 m x 2.2 km[3] • fencing and on-site gravel road	forested (clearing required)/requires acquisition of approximately 150 m x 150 m (2.3 ha) of privately-owned land	• 600 m south
Kamloops • RK 850.8 • d-094-E/092-I-09	• new pump station[1] consisting of three electrically driven 5,000 HP pumps plus one spare[2] added to TMEP • new substation to serve TMEP • new scraper facilities (sending and receiving) on TMEP	industrial with grading required/within existing Trans Mountain-owned lands	• 520 m southeast
Kingsvale • RK 955.6 • b-023-L/092-H-15	• new pump station[1] consisting of two electrically driven 5,000 HP pumps serving TMEP • replace existing substation • new 138 kV power line approximately 50 m by 23.5 km[3] • fencing	forested (clearing and grading required)/within existing Trans Mountain-owned lands	• 300 m southwest
Sumas • RK 1113.8 • c-073-B/092-G-01	• one electrically driven 2,500 HP pump serving the Puget Sound line • upgrade existing substation	industrial/within existing Trans Mountain-owned lands	• 110 m southwest

Notes: 1 New pump stations require the installation of an electrical service building, pump building and operator building, as well as motors, instrumentation, station piping and valves. Existing electrical service buildings and operator buildings will be used where possible.

2 Spare pumps will remain inactive during normal operations.

3 Power line routing and the new access road will be confirmed during the detailed engineering and design phase.

2.1.4 Tank Facilities

To serve the expanded pipeline, a total of 20 new storage tanks will be constructed: 5 at the Edmonton Terminal; 1 at the Sumas Terminal; and 14 at the Burnaby Terminal. The new welded steel tanks will be similar in structure to the existing tanks at the terminals and installed on stable, engineered foundations within a bermed containment area.

After the site has been rough graded, foundations for each tank will be constructed. Foundation design parameters may vary across terminals based on the results of detailed geotechnical surveys. Leak-detection systems consisting of a passive-weeping channel between the liner and tank floor will be installed. An internal tank liner, covering the bottom and about 1 m up the shell, will be provided for corrosion prevention. Cathodic protection will be installed on all new tanks as an added measure to protect against corrosion. Tank control systems will include a radar gauging system for high and low level monitoring and overfill protection. Redundant instrumentation for overfill protection will be provided.

All tanks will have secondary containment consisting of compacted clay or a geosynthetic liner. Secondary containment will be capable of containing 100% of the working volume of the largest tank plus 10% of the working volume of other tanks that share a common impoundment. The bermed area will be graded to direct all surface water to a runoff containment area, where it can be inspected before release. Surface runoff within these containment areas will be released through manually controlled valves following water quality monitoring. Drainage features will be designed and installed to ensure that no runoff originating off-site will be allowed to enter the proposed development area.

Additional components include valves, metering and provers, pumps and inter-connecting pipes. The existing fire-protection system and stormwater management system will be expanded to accommodate the additional tanks at each site. Final details will be determined during the detailed engineering and design phase.

A summary of technical details associated with the proposed storage tanks at the Edmonton, Sumas and Burnaby terminals is provided in Table 2.1-4. Terminal schematics are provided in Volume 4A.

TABLE 2.1-4

TECHNICAL DETAILS – STORAGE TANKS AND ASSOCIATED FACILITIES AT THE EDMONTON, SUMAS AND BURNABY TERMINALS

Technical Details	Edmonton Terminal	Sumas Terminal	Burnaby Terminal
Location	• RK 0 • SW 5-53-23 W4M	• RK 1117.5 • a-097-B/092-G-01	• RK 1179.8 • a-025-D/092-G-07
Nearest Residence/Receptor from Facility Fence Line	• 1.9 km northwest and southeast	• 60 m south	• approximately 50 m south
Product	Diluted bitumen, synthetic bitumen, diluted synthetic bitumen, light crude and synthetic crude		
Existing Storage Tank Capacity	• 19 tanks with an approximate capacity of 429,270 m^3 (2.7 million bbl)[1]	• 6 storage tanks with an approximate capacity of 113,680 m^3 (715,000 bbl)	• 13 tanks with an approximate capacity of 270, 280 m^3 (1.7 million bbl)
New Storage Tank Capacity	• 2 x 34,980 m^3 (220,000 bbl) • 2 x 63,600 m^3 (400,000 bbl) • 1 x 11,920 m^3 (75,000 bbl)	• 1 x 27,820 m^3 (175,000 bbl)	• 2 x 39,750 m^3 (250,000 bbl) • 10 x 45,310 m^3 (285,000 bbl) • 2 x 53,260 m^3 (335,000 bbl)
Maximum Tank Height	21.3 m	17.1 m	18.3 m
Roof Type	external floating roof	fixed steel roof with internal floating roof	
Overall Site Area	47.2 ha	43.3 ha (only 11.6 ha currently disturbed)	76.7 ha
Total Containment Capacity	will allow for containment of 100% of the working volume of the largest tank plus 10% of the working volume of other tanks that share a common impoundment and stormwater		
Runoff Containment Area Size/Capacity	1-in-100-year storm event with a 24 hour duration period		
Pump Sizes	Seven 800 HP booster pumps (electric drive)	None	Eight 500 HP booster pumps (electric drive)
Test Water Source	from existing storage ponds filled with water diverted from nearby creeks (subject to existing or future permit approval conditions) and/or purchased from the municipal water supply		
Land Requirements	within existing Trans Mountain fence line on previously disturbed industrial lands	within the existing Trans Mountain property boundary, however, existing fence line will be moved approximately 20 m north (20 m x 350 m [0.7 ha] of new disturbance) to accommodate a new access road and earthworks for modifications to the tank secondary containment berm	within existing Trans Mountain fence line on previously disturbed industrial lands, however, disturbance to natural watercourses within the existing site boundaries will result in the loss of riparian vegetation as well as a change in natural surface flow patterns

TABLE 2.1-4 Cont'd

Technical Details	Edmonton Terminal	Sumas Terminal	Burnaby Terminal
Associated Infrastructure	on-site access roads to each new tank, power requirements/upgrades	on-site access road to the new tank, power requirements/upgrades are not required due to small increase in load at this facility	on-site access roads to each new tank and other associated facilities, power requirements/upgrades will be determined by BC Hydro (anticipated that approximately 5 MW of additional power will be required)
Other Activities	an existing 12,720 m^3 (80,000 bbl) tank will be dismantled and replaced by the new 11,920 m^3 (75,000 bbl) tank	to make space available for the new tank, a power line will be relocated approximately 20 m to the north and an existing containment berm will be dismantled and the area graded to support the foundation for the new tank. A new containment berm will be constructed before the new tank is put into operation	new scraper facilities for new pipeline (receiving) and Westridge delivery lines (sending), and an existing 12,720 m^3 (80,000 bbl) tank will be dismantled and replaced by one of the 45,310 m^3 (285,000 bbl) tanks

Note: 1 Trans Mountain is currently in the process of constructing the Edmonton Terminal Expansion Project, which involves constructing 10 new tanks and associated facilities at the Edmonton Terminal. This project was approved by the National Energy Board (NEB) in March 2008 and is now being constructed under Amending Order AO-005-XO-T246-04-2008. In February 2013, Trans Mountain applied to the NEB to vary Amending Order AO-005-XO-T246-04-2008 to permit construction of four additional tanks at the Edmonton Terminal for a total of 14 tanks. The NEB issued an Amending Order AO-006-XO-T246-04-2008 on June 20, 2013 and the four additional tanks are expected to come into service by late 2014. Furthermore, in July 2013 Trans Mountain applied to the NEB (File OF-Fac-Oil-T260-2013-04 01) to construct an additional two tanks at the Edmonton Terminal. Pending regulatory approval, the two tanks are expected to come into service by late 2014 or early 2015.

2.1.5 Westridge Marine Terminal

The Westridge Marine Terminal is located on the south shore of Burrard Inlet east of the Second Narrows at RK 3.6 (d-047-D/092-G-07) of the Westridge delivery lines. Preliminary design of the additional facilities at the Westridge Marine Terminal is currently underway. These plans include constructing the following dock facilities:

- one dock with three operational berths for Aframax tankers, with one of the three new berths equipped to accommodate oil and jet fuel barges; and
- one small utility dock with multiple berths for pilot launches, tugs, spill response vessels and equipment.

The proposed configuration of the new docks is provided in Volume 4A. Some near shore dredging might be necessary to accommodate construction of the new docks.

Each of the three tanker berths consists of a number of individual elements or structures arranged in accordance with accepted industry practice. Typical elements include:

- fender and mooring structures;
- vessel access towers;
- delivery and receipt pipeline systems, including loading arms;
- pedestrian catwalks connecting the dolphin structures to the central platform; and
- vapour recovery systems and fire-suppression systems.

The existing water lease will need to be expanded to accommodate the new docks. Foreshore lands will also be expanded along the lateral footprint to provide the necessary space for shore equipment and structures. The outer face of the fill will be protected with rip rap (stone armour) to prevent erosion.

New scraper receiving facilities will be installed for the two new Westridge delivery lines between the Burnaby Terminal and the Westridge Marine Terminal. The new scraper receiving facilities will be

installed within the existing fence line of the Westridge Marine Terminal on previously disturbed lands owned by Trans Mountain.

The existing electrical substation and electricity supply line within the Westridge Marine Terminal will be upgraded as required. Electrical upgrades will be determined through a study to be conducted by BC Hydro. At this time, it is anticipated that an additional 3 MW of power will be required at this facility. No new roads will be required to access the terminal. However, an improved site access road and an expanded parking area for staff and contractors will be required. No new access will be constructed across the existing Canadian Pacific Rail line that bisects the facility.

The nearest residence is located approximately 75 m south of the Westridge Marine Terminal property boundaries.

2.2 Project Execution

This subsection describes the activities to be conducted as part of construction of the Project, including: construction of the new pipeline segments and associated permanent and temporary facilities; pipeline reactivation; pump station construction, expansion, reconfiguration, reactivation and deactivation; storage tank construction; and expansion of the Westridge Marine Terminal. It also describes the construction schedule and estimated workforce.

2.2.1 Construction Activities

Standard activities and equipment requirements for construction and other activities associated with the Project are described in Table 2.2-1. These activities are presented in their general order of occurrence. All of these activities are considered in the socio-economic effects assessment (see Section 7.0). For detailed descriptions of Project activities refer to Volume 4B.

TABLE 2.2-1

PROJECT ACTIVITIES

Construction Phase	Associated Activities
Engineering	All Project components will be designed and constructed in accordance with all applicable Canadian Standards Association (CSA) standards, the *National Energy Board Onshore Pipeline Regulations* (*NEB OPR*) and additional requirements described in Volume 4A.
New Pipeline Segments	
Construction Survey	Activities include line-of-sight clearing with chain saws (where needed), flagging and staking of the boundaries of the construction right-of-way and temporary workspace, as well as marking the trench line and existing utilities. Avoidance areas, such as protected habitats or rare plants, will also be appropriately fenced or flagged.
Clearing	Vegetation (trees, stumps, brush, grasses, crops and other vegetation) and snow will be cleared or mowed from the construction right-of-way and temporary workspace. Equipment used during clearing activities may include chainsaws, rotary grinders, feller-bunchers, hydro-axes or other tree-clearing and brushing equipment, as well as skidders, bulldozers and excavators. A stump mulcher will be utilized rather than grubbing on areas where topsoil or root zone material salvage and grading is not necessary.
Disposal	Timber and brush disposal options will be subject to agreements with occupants and the Crown. Merchantable timber will be salvaged as determined in the Timber Salvage Plan (Pipeline EPP [Volume 6B]). Residual woody materials will be disposed of by burning or chipping, unless otherwise directed by the Lead Environmental Inspector, Inspector(s) or the appropriate regulatory authority (*e.g.*, Alberta Environment and Sustainable Resource Development [AESRD], BC Ministry of Forests, Lands and Natural Resource Operations and/or British Columbia Ministry of Environment [BC MOE]). In the Lower Mainland where air quality is an issue and along highways where smoke may be a hazard, residual woody materials will be mulched in place or hauled to an approved disposal location.
Topsoil or Root Zone Material Salvage	In general, topsoil will be salvaged to ensure that the soil productivity is maintained in agricultural and grassland areas and root zone material will be salvaged where grading is necessary on treed lands. The width and depth of topsoil or root zone material salvage depends on a number of factors including the land use, soil conditions, microtopography, landowner and regulatory authority requests, and grading requirements. Equipment used during topsoil or root zone material handling activities may include bulldozers, graders and excavators.
Grading	Following topsoil or root zone material salvage, grading will be conducted on irregular ground surfaces (including temporary workspace) to provide a safe work surface. Graders, excavators and bulldozers will be used for this activity. Ripping or blasting might be required where hard bedrock is encountered.

TABLE 2.2-1 Cont'd

Construction Phase	Associated Activities
Stringing and Welding	The pipe will be transported by truck from stockpile sites to the construction right-of-way. The pipe will be bent, lined-up, welded, joint-coated and inspected, before being lowered into the trench. Is it anticipated that a mix of manual and mechanized welding will be used depending on terrain and anticipated productivity. Other equipment used during stringing and welding activities includes pipe trucks, booms, pick-up trucks, excavators and x-ray or ultrasonic inspection equipment mounted on pick-up trucks or skids.
Trenching	The trench will be excavated using tracked excavators to a depth sufficient to ensure the depth of cover is in accordance or in excess of applicable codes. The minimum depth of cover for the pipeline will generally be 0.9 m (the pipeline trench will be deeper at watercourse crossings, highway crossings etc.). Railway crossings and paved road crossings will generally be bored.
Lowering-In	The pipe will be lowered into the trench using sideboom tractors and excavators. Trench dewatering might be necessary at certain locations during lowering-in (*e.g.*, to ensure acceptable bedding for pipe, to prevent the pipe from floating or for performing tie-in welds).
Backfilling	Before backfilling, subsurface erosion-control structures such as trench breakers will be installed on steep slopes or long continuous slopes, along with subdrains, where warranted, to control subsurface drainage along the trench. The trench will be backfilled using excavators, graders, bulldozers or specialized backfilling equipment. Backfill material will generally consist of native-trench spoil material. Displaced subsoil will be crowned over the trench to compensate for settlement and any excess trench spoil will be feathered-out over adjacent portions of the construction right-of-way where topsoil or root zone material salvage has occurred. Padding may be necessary where the trench is created in areas of bedrock.
Testing	The pipeline segments will be hydrostatically pressure-tested in accordance with the *NEB OPR*, provincial legislation, codes of practice and guidelines as well as the latest version of CSA Z662. The pipeline will be pressure-tested in sequential segments, using water. Source water is likely to be drawn from the North Saskatchewan, Pembina and McLeod rivers for new pipeline in Alberta, and from the Fraser, Canoe, North Thompson, Thompson, Coldwater, Coquihalla and Sumas rivers for new pipeline in BC. Test water will be withdrawn and released in accordance with Alberta Codes of Practice (*i.e.*, Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines and Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines)and BC *Water Act* approval conditions. Upon completion, test water will be returned to its source basin. A detailed hydrostatic test plan will be developed and reviewed before the start of the hydrostatic pressure testing program.
Clean-Up and Reclamation	Initial clean-up and reclamation activities along disturbed portions of the construction right-of-way and temporary access trails (shoo-flies) will be initiated following backfilling, once weather and soil conditions permit. Debris remaining following construction will be removed and disposed of in compliance with local regulations. The construction right-of-way will be graded to restore pre-construction contours, where practical, and returned to a stable condition. The topsoil or root zone material will be replaced, with cross ditches and diversion berms installed on moderate and steep slopes to reduce the risk of erosion. On treed lands where erosion is not expected, natural revegetation will be the preferred method of reclamation. Non-cultivated agricultural and native grassland areas will be seeded with an appropriate seed mix unless otherwise directed by landowners or provincial or local authorities.
Watercourse Crossings	Options available for crossing watercourses include trenched (*e.g.*, isolation [dam and pump, flume] and open cut) and trenchless (horizontal directional drill [HDD] and bore) methods. The crossing method chosen will be based on the width, streamflow, channel morphology, subsurface geology, sensitivity and approach slopes. Additional information is provided in the Pipeline EPP (Volume 6B) and the fisheries technical reports (Volume 5C).
Permanent Pipeline Facilities	
Site Preparation	Sites located within the proposed easement will be prepared as part of the pipeline construction activities above. Sites located along the existing active or reactivated easements will involve clearing of snow and/or vegetation where present, salvaging of topsoil or root zone material and grading of the site, where warranted, using equipment similar to that described for construction of the pipeline.
Facility Construction	Once the infrastructure has been installed along the new pipeline or existing pipeline rights-of-way, the area inside the new fence line will be gravelled. The Pressure Control Station, if required, will be constructed entirely within the existing pump station boundary at Hope. Permanent pipeline-related facilities will be constructed as an integrated part of the pipeline construction. Permanent facilities work along the existing active and proposed reactivated segments will require surface disturbance confined to the existing right-of-way easement.
Potential Ancillary Infrastructure	Permanent Access Roads Activities associated with construction of new permanent access roads to the MLBVs (in the event any are required) and the Black Pines Pump Station include: surveying; clearing; salvaging and storing of topsoil or root zone material; grading; installing culverts at the road bar ditches; and clean-up and reclamation. Equipment used during access road construction includes bulldozers and graders. Distribution Power Lines Activities associated with the installation of distribution power lines to the MLBVs (in the event any are required) and the Pressure Control Station, if required, as well as the power lines at Black Pines and Kingsvale pump stations, include: surveying; clearing or mowing of brush; salvaging of topsoil or root zone material; drilling of holes; erecting poles; stringing of new cable; replacing topsoil or root zone material; and clean-up and reclamation. Equipment used to install distribution lines includes backhoes, bulldozers and drill equipment for the poles.
Reactivated Segments	
Pipeline Inspection, Repairs and Cleaning	Before testing, reactivated pipeline segments will be assessed using in-line inspection tools. Specific locations along the pipeline will be physically inspected and repaired, if required, as determined necessary to ensure integrity. Following inspection, in-line cleaning tools will be used to scrub the pipe walls and remove residual hydrocarbon products and debris.

TABLE 2.2-1 Cont'd

Construction Phase	Associated Activities
Testing	Following inspection and cleaning, the pipeline segments will be hydrostatically tested using similar procedures for new pipeline above. Source water is likely to be drawn from the Athabasca, Snaring, Miette and Fraser rivers as well as Moose Lake for the reactivated pipeline segment from Hinton to Hargreaves and from the North Thompson River for the reactivated pipeline segment from Darfield to Black Pines. Discharge water from hydrostatic testing of the previously in-service pipeline segments will require more extensive treatment than new pipeline segments due to the presence of residual hydrocarbons. Holding ponds or tanks will be used to provide storage for the discharge water, which will be treated on-site before release into the environment.
Temporary Facilities	
Site Preparation	Initial site preparation will involve clearing of vegetation where present, salvaging of topsoil or root zone material and grading, where warranted, using equipment similar to that described for construction of the pipeline.
Facility Construction	Sites may be gravelled and/or fenced, depending on site use.
Access	Access to the various types of temporary facilities will be controlled during site use, if warranted, for public safety and to prevent vandalism of equipment and/or facilities.
Facility Dismantle	Any above ground structures (*e.g.*, fencing, buildings) will subsequently be dismantled and removed from the site. Access roads and associated gravel will also be removed.
Reclamation	Reclamation procedures will be initiated following the dismantling of above ground structures using bulldozers, excavators and graders. Debris remaining at temporary facility sites will be removed and disposed of in compliance with local regulations. Site contours will be replaced and the site will be returned to a stable and maintenance-free condition. Depending on the intended land use of the site, topsoil or root zone material will be replaced where salvaged and disturbed areas will be seeded with an appropriate seed mix.
New, Expanded and Reconfigured Pump Stations	
Construction Survey	Activities include staking of the boundaries of the pump station site and temporary workspace as well as marking hot lines and existing utilities. Avoidance areas, such as protected habitats, will be appropriately fenced or flagged.
Clearing and Disposal	Activities associated with vegetation clearing and disposal at pump stations are described above under new pipeline segments.
Topsoil or Root Zone Material Salvage	Topsoil or root zone material, where present, will be salvaged from pump station sites where clearing and grubbing are required. The topsoil or root zone material will be stockpiled in low profile berms or piles adjacent to the site perimeter. The topsoil or root zone material location will be documented for future reference. Equipment used during topsoil or root zone material handling activities may include bulldozers, graders and excavators.
Grading	Following topsoil or root zone material salvage, grading will be conducted on irregular ground surfaces to provide a safe work surface. Graders, excavators, and bulldozers will be used for this activity. Ripping might be required where hard bedrock is encountered.
Piles and Foundations	Once the site is graded, piles will be driven into the ground using pile drivers, where required. In some instances, concrete foundations will be poured using concrete trucks, smoothing equipment, and forms.
Building Installation	Once the piles and foundations are in place, the buildings will be installed. Equipment used during this activity includes cranes, semi-trailers and trucks.
Electrical and Pipeline Connections	The electrical and piping connections will be completed once the buildings have been installed.
Potential Ancillary Infrastructure	Activities associated with construction of the new permanent access road and power line at Black Pines Pump Station and power line at Kingsvale Pump Station are described under permanent pipeline facilities above.
Testing	All systems and processes will be connected and tested. All piping will be pressure tested during fabrication and/or after installation.
Clean-Up and Reclamation	Upon completion of building activities, clean-up and reclamation procedures will be initiated using bulldozers, excavators and graders. Debris remaining at the pump stations will be removed and disposed of in compliance with local regulations. Surface water controls, recontouring, erosion controls and terrain stabilization will be incorporated where necessary. Gravel surfaces will be placed over high-traffic areas of the pump stations (including on-site gravel roads) and fencing will be installed around the sites where none is currently present.
Reactivated Pump Stations	
Inspection, Cleaning and Testing	Reactivation will involve the removal of the existing pumps, motors and valves; inspection, servicing, refurbishment and then reinstallation of these components, testing of the system, and then commissioning of the station, including mechanical, electrical, instrumentation and control systems.
Deactivated Pump Stations	
Inspection and Shut Down	Deactivation will involve shutting-in the pump station; isolating the pump station facilities from the pipeline; purging the pump station facility with nitrogen; maintaining existing power supply; and protecting the equipment as per the manufacturer's recommendations.
Storage Tanks	
Construction Survey	Activities include staking the tank boundaries and temporary workspace as well as marking hot lines and existing utilities.
Clearing and Disposal	Activities associated with vegetation clearing and disposal at terminals are described above under new pipeline segments.
Topsoil or Root Zone Material Salvage	Topsoil and root zone material, where present, will be salvaged as described above under new, expanded and reconfigured pump stations.

TABLE 2.2-1 Cont'd

Construction Phase	Associated Activities
Site Preparation	Following topsoil or root zone material salvage, grading will be conducted on irregular ground surfaces to provide a safe work surface and level tank foundation and to establish suitable drainage at the site. Low wet areas will be dewatered and suitable fill material will be imported as necessary. Graders, excavators and bulldozers will be used for this activity. Ripping may be required where hard bedrock is encountered.
Piles, Foundations and Tank Installation	Once the site is graded, piles will be installed. In some instances, concrete foundations will be poured using concrete trucks, smoothing equipment and forms. Tanks and buildings will be installed on prepared foundations. Secondary containment consisting of compacted clay or a geosynthetic liner will be constructed under and around the tanks. All necessary fire suppression and vapour recovery equipment will be installed. Equipment used during this activity includes welders, cranes, semi-trailers and trucks.
Electrical and Pipeline Connections and Testing	Piping connections will be completed once the tanks have been installed, and all systems and processes will be connected and tested.
Testing	Tanks will be hydrostatically tested. All piping will be pressure-tested during fabrication and/or after installation. Wherever possible, test water will be released to land within a containment structure (*e.g.*, into a lined tank bay). From there, it will be tested for contaminants before being treated and either trucked away or released to a natural water body or the municipal sewer system. If naturally occurring water is likely to be used for an extended period of time (*i.e.*, for multiple tanks), it may need to be treated to prevent the growth of algae or other organic contaminants. Depending on what treatment is used, there may be special requirements for discharge, particularly if the planned discharge is to the environment.
Clean-Up and Reclamation	Upon completion of building activities, clean-up and reclamation procedures will be initiated using bulldozers, excavators and graders. Debris remaining at the terminals will be removed and disposed of in compliance with local regulations. Surface water controls, recontouring, erosion controls and terrain stabilization will be incorporated where necessary. Gravel surfaces will be placed over high traffic areas of the terminals (including on-site gravel roads).
Westridge Marine Terminal	
Construction Survey	Activities include staking all boundaries of the marine terminal land and foreshore footprint and additional temporary workspace as well as marking hot lines and existing utilities.
Dredging	Dredging may be required for foreshore preparation. Equipment used during dredging activities will include barges and clamshell buckets.
Material Disposal	Dredge material will be collected and disposed of in accordance with provincial regulations and municipal bylaws and, if suitable, may be used if suitable for reclamation of the foreshore area and to increase the land base needed for the expansion of the facility.
Dock Construction	Marine structures will likely be supported by tubular steel piles installed into the seabed. Dock structures will be constructed of steel mooring dolphins and catwalks will be constructed of steel that span between the piles. Once the dock structures are completed, the topside equipment such as piping systems, loading arms, vapour recovery piping, and fire protection systems, will be installed. Construction of the docks will mostly be done using floating equipment such as barge-mounted pile drivers and marine derricks.
Existing Dock	Operations at the existing dock are anticipated to continue during construction of the new berths. Once the new docks are in-service, the existing dock will be completely decommissioned and removed. The structures will be removed from the water by removing topside equipment, demolishing the deck structures and extracting the piles from the seabed. If complete removal of the piles is not feasible, they will be cut off at or slightly below the seabed. The demolition material would be removed from site on a barge. Some materials, such as steel and concrete, may be reclaimed and recycled for use in other projects, and some will be disposed in a landfill.
Electrical and Pipeline Connections and Testing	All systems and processes will be connected and tested.
Testing and Inspection	All piping will be pressure-tested during fabrication and/or after installation and all process piping welds will be inspected using either x-ray or ultrasonic methods.
Clean-Up and Reclamation	Upon completion of building activities, clean-up and reclamation procedures will be initiated using barges, bulldozers, excavators and graders. Debris remaining at the terminal will be removed and disposed of in compliance with local regulations. Surface water controls, recontouring, erosion controls and terrain stabilization will be incorporated where necessary. Asphalt or gravel surfaces will be placed over high traffic areas of the terminal (including on-site gravel roads) and fencing will be installed around the sites where none is currently present.

2.2.2 Construction Schedule and Workforce

Pending regulatory approval of the Project, construction of the pipeline and facilities is scheduled over an approximately 24 month period to achieve the planned in-service date of late 2017. Preliminary plans provide for seven pipeline construction spreads, ranging from approximately 34.2 km to 290.4 km in length. It is anticipated that all seven spreads will generally be constructed concurrently during the following consecutive construction seasons: summer 2016; winter 2016/2017; and summer 2017. The length of the construction period for each spread depends on, among other variables, length, land uses, terrain and construction techniques for each spread.

Front-end preparatory activities such as construction right-of-way clearing and access preparation will commence within the first month or second month on any given spread, or earlier to avoid migratory bird windows, followed by topsoil or root zone material salvage, grading, stringing and welding, trenching, pipeline installation, backfilling, machine clean-up and pressure testing. Water crossing installations requiring instream activity will take place outside instream restricted activity periods (RAPs) in Alberta and within least risk windows in BC, unless otherwise approved by the appropriate regulatory authorities for specific watercourse crossings. Segments through wetlands will typically be constructed during dry conditions or frozen conditions to reduce disturbance. Final clean-up and reclamation activities will occur on dry, non-frozen ground throughout summer months of 2017 and 2018, with the exception of inaccessible wet areas, where activities will occur during frozen conditions. Localized remedial activities will occur over the following years for minor restoration repair and maintenance as dictated by weather events.

Pipeline construction activities are progressive. Consecutive phases of the pipeline construction process are expected to overlap as construction progresses along the construction right-of-way within a spread and amongst spreads (*i.e.*, right-of-way preparation, trench excavation, pipeline installation, backfilling and initial clean-up activities will all occur concurrently at different locations along the pipeline route). Crews will be working approximately three months at any given location on the right-of-way. Tie-in locations generally take longer to complete since they are routinely completed last, immediately before and after testing. Certain late stage activities such as testing and final clean-up may be postponed until suitable weather and soil conditions occur.

Activities associated with reactivation of the existing pipeline segments from Hinton to Hargreaves and Darfield to Black Pines will take place over a period of several months, with in-line inspection activities planned for Q3 2016, and excavation, repair and testing activities taking place in Q2 and Q3 of 2017, with operations planned during late 2017.

Construction and equipment installation at pump stations and tank terminals is expected to begin in Q1 2016 and take approximately 8 to 10 months for each pump station and between 14 and 23 months at the terminals, depending on, among other variables, scope, land use and construction techniques for each facility. The construction period for the Westridge Marine Terminal is expected to commence in Q4 2015 with the first berth expected to be in-service by Q3 2017. The second and third new berths are expected to be in-service by late 2017. Demolition of the existing berth is planned to commence in late 2017 after the new berths are commissioned.

A summary of the conceptual construction schedule for each pipeline spread and reactivated pipeline segments is provided in Tables 2.2-2 and 2.2-3, respectively, while Table 2.2-4 summarizes the conceptual construction schedule for pump stations, tanks and the Westridge Marine Terminal. The proposed schedules are subject to modification in response to regulatory approval conditions, outcomes of consultation and engagement, business considerations and market forces, as well as site-specific limitations and constraints, such as the influence of weather conditions on construction activities. For additional information, see Volume 4B.

TABLE 2.2-2

PROPOSED PIPELINE CONSTRUCTION SCHEDULE

Pipeline Spread[1]	From	To	2016												2017											
			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Alberta																										
A1	RK 0	RK 49.0																								
A2	RK 49.0	RK 339.4																								
BC																										
BC1	RK 489.6	RK 769.0																								
BC2	RK 811.8	RK 1018.0																								
BC3	RK 1018.0	RK 1078.1																								
BC4	RK 1078.1	RK 1148.0																								
BC5	RK 1148.0	RK 1179.8																								

TABLE 2.2-2 Cont'd

Pipeline Spread[1]	From	To	2016												2017											
			J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Special Works																										
Lower Fraser River Crossing (RK 1168)																										
Ledgeview Golf Course Crossing (RK 1119)																										
Burnaby Terminal to Westridge Marine Terminal (RK 0 to RK 3.6)																										

Note: 1 Access and clearing activities may start as early as January 2016 at any given location.

TABLE 2.2-3

PROPOSED PIPELINE REACTIVATION SCHEDULE

Reactivation Activities	2016												2017											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Preparation for In-Line Inspection Tool Runs																								
In-Line Inspection Tool Runs																								
Excavation and Repair																								
Hydrostatic Testing																								

TABLE 2.2-4

PROPOSED FACILITIES CONSTRUCTION SCHEDULE

Facility[1]	2015	2016				2017			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Edmonton Terminal									
Edmonton Pump Station									
Gainford Pump Station									
Wolf Pump Station									
Edson Pump Station									
Hinton Pump Station									
Rearguard Pump Station									
Blue River Pump Station									
Blackpool Pump Station[2]									
Black Pines Pump Station[2]									
Kamloops Pump Station									
Kingsvale Pump Station									
Sumas Pump Station									
Sumas Terminal									
Burnaby Terminal									
Westridge Marine Terminal									

Notes: 1 Access and clearing activities may start as early as January 2016 at any given location.

2 Activities at Darfield Pump Station (valve modifications and installation of a new scraper trap) will be conducted in conjunction with construction activities at either Blackpool or Black Pines pump stations.

It is estimated that the Project will require a construction workforce to provide over 1,324,000 worker-days in the 2016 to 2017 construction period, or over 60,000 full-time equivalent worker months.

Pipeline spreads will require approximately 400 to 600 workers per spread depending on, among other variables, length and timing of each spread, region and construction techniques utilized. Construction at terminals will require in the range of approximately 60 to 370 workers, depending on the number of new tanks to be installed and other activities. Construction activities at pump stations will require in the range of 55 to 80 workers, depending on the number of new pumps required and other activities. Construction at the Westridge Marine Terminal will require approximately 95 workers over much of the construction period.

Peak construction workforce for the entire Project (*i.e.*, peak activities combined between all Project components) is anticipated to be 4,475 workers during July 2017 (Figure 2.2-1).

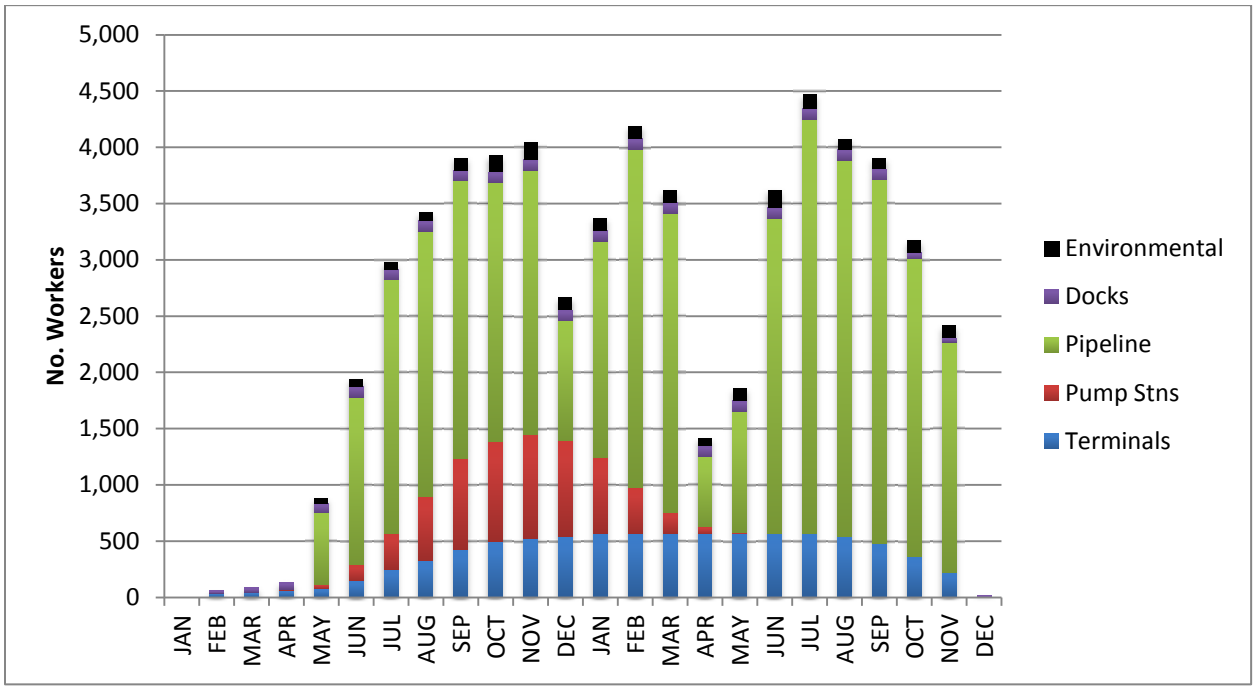


Figure 2.2-1 Estimated Direct Construction Workforce, 2016-2017 (Full-time Equivalent Worker-Months)

Required workforce skills will be varied and will include surveyors, heavy equipment operators, welders, electricians, mechanics, skilled labourers, truck drivers, supervisors, inspectors and monitors. The number of personnel working at any location along the pipeline or facility site will depend on the respective construction phase (*e.g.*, clearing, soil handling, grading, pump and tank installation, dock construction, testing and clean-up).

Large mainline crews construct most of the pipeline within each spread, while smaller specialty crews, working in parallel with mainline crews, complete construction in non-standard sections of the pipeline such as at road, rail, utility and watercourse crossings. Specialty contractors will likely be used for construction in urban or industrial development areas to ensure safe pipeline and facilities installation given the existing utilities and infrastructure situated in the Project area.

2.3 Project Operation

Operations and maintenance activities along the existing TMPL system will be expanded to include the new pipeline and facilities over the operating life of the Project (anticipated to extend beyond 50 years). The following subsections provide an overview of operation and maintenance activities for the Project as well as the anticipated operations schedule and estimated workforce. Additional details regarding Trans

Mountain's operation and maintenance activities, policies, programs and procedures are provided in Volume 4C.

2.3.1 Pipeline

Scheduling of operations and maintenance activities will coincide with periodic aerial and ground patrols of the existing TMPL system and associated facilities. All pipeline patrols are conducted by personnel familiar with the location and operation of the pipeline. Flow in the pipeline will be remotely monitored and controlled from Trans Mountain's existing control centre at the Edmonton Terminal. The pipeline will be maintained from existing bases at Edmonton, Edson, Jasper, Blue River, Clearwater, Kamloops, Hope, Abbotsford and Burnaby. No new pipeline maintenance bases will be required.

Pipeline and right-of-way operations and maintenance activities that could result in potential environmental and socio-economic effects include works associated with regular line patrols, vegetation management and integrity digs.

2.3.2 Pump Stations and Tanks

Routine facility inspections will be performed daily at storage tanks and twice per week at pump stations. The facilities will require periodic mowing of vegetation as well as occasional application of gravel on access roads and the sites. Non-residual herbicides will be used only where mowing and other mechanical methods of vegetation management are impractical, upon approval of the appropriate authority.

All Trans Mountain pump stations and storage tanks have automated leak detection and containment systems that are continuously monitored from the existing control centre at the Edmonton Terminal. Operating staff located at pump stations and terminals are trained in leak detection and emergency response as well as early identification of any potential site hazards such as potential erosion and ground instability. Storage tanks are also taken out of service periodically according to American Petroleum Institute requirements, and are cleaned, inspected and, if required, repaired before being returned back to service.

2.3.3 Westridge Marine Terminal

At the Westridge Marine Terminal, all vessel screening and loading operations have been, and will continue to be, directed by experienced loading masters, who have tanker command experience and are on-site during all vessel loadings. Additional operational details including activities performed by the loading master and preventative and site maintenance activities are provided in Volume 4C.

2.3.4 Operations Schedule and Workforce

Based upon construction beginning in Q1 2016, the operations phase of the Project is expected to begin in Q4 2017.

In addition to the existing Trans Mountain staff, once fully operational, the Project is expected to require 90 full-time personnel, of which 50 are anticipated to be located in BC and 40 are anticipated to be located in Alberta.

2.4 Decommissioning and Abandonment

It is difficult at this time to predict when or how the pipeline and facilities will be decommissioned and abandoned at the end of the Project's useful life. The existing TMPL system has been operating successfully for 60 years and will be safe and reliable for many more as a result of continuing proactive maintenance and integrity programs. The operational life of the new pipeline is anticipated to be as long or longer.

Trans Mountain is participating in and will comply with the process established by Stream 3 of the NEB Land Matters Consultation Initiative and Reasons for Decision RH-2-2008. In addition, as part of this application, Trans Mountain filed with the NEB a preliminary abandonment plan (see Volume 4C) providing a discussion of the abandonment planning strategy for the pipelines and facilities to be constructed for TMEP. The plan discusses general activities for the types of facilities that would be

abandoned in place, abandoned in place with special treatment or removed. The plan also discusses general reclamation objectives and principles that would be applied during abandonment to return the right-of-way and facility sites to a state comparable with the surrounding environment. The methods of abandonment and reclamation that will ultimately be implemented for the Project will be determined at the time the pipeline is removed from operation, however, those determinations will be based on the most current sound scientific studies and accepted industry practice at that time. Any decommissioning or abandonment activities will require prior approval by the NEB and other applicable regulatory authorities. Decommissioning and abandonment is discussed further in Section 7.0, and also in Volume 4C, Section 12.0 Preliminary Abandonment Plan.

3.0 PUBLIC CONSULTATION, ABORIGINAL ENGAGEMENT AND LANDOWNER RELATIONS

Trans Mountain Pipeline ULC (Trans Mountain) has implemented and continues to conduct open, extensive and thorough public consultation, Aboriginal engagement and landowner relations programs. These programs were designed to reflect the unique nature of the Trans Mountain Expansion Project (TMEP or the Project) as well as the diverse and varied communities along the proposed pipeline and marine corridors. These programs were based on Aboriginal community, stakeholder and landowner groups' interests and inputs, knowledge levels, time and preferred method of engagement. In order to build relationships for the long-term, these programs were based on the principles of accountability, communication, local focus, mutual benefit, relationship building, respect, responsiveness, shared process, sustainability, timeliness and transparency.

This section provides a summary of the design of the public consultation (Section 3.1), Aboriginal engagement (Section 3.2) and landowner relations (Section 3.3) programs, as well as outcomes specific to socio-economic elements considered in the Environmental and Socio-Economic Assessment (ESA). The full description of the public consultation, Aboriginal engagement and landowner relations programs are located in Volume 3. The outcomes of the consultation and engagement activities for the pipeline and facilities component of the Project specific to biophysical elements and for the marine transportation component of the Project that was assessed pursuant to the NEB's instruction in their List of Issues, issued July 29, 2013, are located in other sections and volumes of the application. Table 3.0-1 provides information on where these other consultation and engagement considerations are located.

TABLE 3.0-1

CONSULTATION INFORMATION LOCATION

Consultation Information	Application Location
Pipeline and Facilities	
Public Consultation	Volume 3A Section 3.1 of Volume 5A
Aboriginal Engagement	Volume 3B Section 3.2 of Volume 5A
Landowner Relations	Volume 3C Section 3.3 of Volume 5A
Marine Transportation	
Public Consultation	Volume 3A Section 3.1 of Volume 8A
Aboriginal Engagement	Volume 3B Section 3.2 of Volume 8A

3.1 Public Consultation

The principles of the stakeholder engagement program are based on public input as well as various stakeholder groups' interests, knowledge levels, time and preferred method of engagement. This subsection provides information on the stakeholder engagement program for the pipeline corridor and describes how stakeholder and public comments relating to the ESA were gathered as well as how these comments have been incorporated into the application.

3.1.1 Design of the Socio-Economic Environment Public Consultation Program

As part of the stakeholder engagement program, Trans Mountain has taken on an open, extensive and thorough public consultation process, commonly known as stakeholder engagement. Engagement touched on all aspects of the Project along the proposed pipeline corridor from Strathcona County, Alberta (near Edmonton, Alberta) to Burnaby, BC and marine communities from Nanaimo to Sooke, Vancouver Island and Salt Spring Island. Trans Mountain has reached out to the general public, community and business organizations, community leaders, elected officials and environmental groups to

receive their input. Open houses and public presentations provide opportunities for public input and queries.

The Project team received feedback from public open houses (also referred to as information sessions), workshops, one-on-one meetings, public presentations, online discussion, comment forms, email and phone calls that have helped shape aspects of the Project. Key topics and issues are relayed to the appropriate Project team representative to be considered and incorporated in the application, where applicable. For more information on feedback from all engagement, refer to Volume 3A. Overall, engagement activities have provided feedback on the following:

- determining the scope of the ESA;
- identifying potential mitigation measures to reduce environmental and socio-economic effects;
- identifying potential benefits associated with the Project; and
- routing alternatives where it is not practical to follow the existing Tran Mountain pipeline system (TMPL) right-of-way.

The stakeholder engagement program is designed to foster participation from members of the public who have an interest in the scope, activities and routing of the Project. The program seeks meaningful input from stakeholders regarding the proposed pipeline corridor and potential socio-economic effects and benefits. The stakeholder engagement program will also share timely information with stakeholders to keep them informed throughout the process. Through preliminary evaluation of the proposed pipeline corridor and surrounding communities, stakeholder groups that have a potential interest in the Project have been identified in the Table 3.1-1.

TABLE 3.1-1

IDENTIFIED STAKEHOLDER GROUPS FOR PIPELINE CORRIDOR

Stakeholder Type	Stakeholder Type Sub-Categories
Government Authorities	• Government of Canada (federal agencies) • Government of Alberta • Government of BC • municipal governments • regional governments • Transit Authority • Universities and colleges
Environmental Non-Government Organizations (ENGOs)	• local ENGOs • provincial ENGOs • national ENGOs
Interest Groups	• chambers of commerce • economic development associations • recreation groups • labour groups • local and regional associations and organizations • business/industry associations • agricultural/environmental associations • local interest groups
Industry	• oil and gas industry • pipeline industry • potential suppliers and contractors • other infrastructure (*e.g.*, CN Rail) • construction industries • terminal operators in Burrard Inlet (including other product terminals)
Public	• public living or working in pipeline corridor communities • public living outside of pipeline corridor communities

3.1.1.1 Public

The stakeholder engagement program includes public involvement in order to build awareness and understanding of the Project, manage information flow, identify concerns and issues, as well as gather public input into Project plans and design. Trans Mountain's target audience included all interested and potentially affected parties along the proposed pipeline corridor.

3.1.1.2 Focus Participants

The stakeholder engagement program involved focused discussions with small groups of directly affected interested stakeholders. Stakeholders had the opportunity to provide feedback on the proposed pipeline corridor as well as important issues related to the ESA. These participants included representatives from local governments, community organizations, economic development organizations, recreational groups, and ENGOs. Through building relationships with the focus participants, Trans Mountain gathered informed input, identified issues or concerns and, where appropriate, developed early mitigation measures.

3.1.1.3 Geographic Reach of Public Consultation Program

Trans Mountain recognizes that the extensive scope and scale of the Project will result in interest by members of the broader public as well as stakeholders directly affected by the Project. In order to ensure that communications and engagement opportunities are appropriately tailored to the needs and interests of local communities, engagement activities were divided into pipeline corridor communities (those potentially affected directly by the proposed pipeline and related facilities) and marine communities, which were assessed pursuant to the NEB's instruction in their List of Issues, issued July 29, 2013. In addition, pipeline corridor and marine communities were further divided into the following five regions:

- Alberta;
- BC Interior;
- Lower Mainland/Fraser Valley;
- Mainland Coastal; and
- Island Coastal communities.

As Trans Mountain proceeded through the pre-application phase of the Project, the stakeholder engagement program allowed for the identification of new information and additional stakeholders. The grouping of these communities was completed following preliminary conversations with stakeholders and municipal governments to identify local interests and needs. Table 3.1-2 provides the regional breakdown as well as the core communities associated with the proposed pipeline corridor and marine areas.

TABLE 3.1-2

STAKEHOLDER ENGAGEMENT – PIPELINE CORRIDOR AND MARINE COMMUNITIES

Pipeline Corridor			Marine	
Alberta	BC Interior	Lower Mainland/Fraser Valley	Mainland Coastal	Island Coastal
• Strathcona County • Hamlet of Sherwood Park • City of Edmonton • Parkland County • City of Spruce Grove • Town of Stony Plain • Village of Wabamun • Yellowhead County • Town of Edson • Town of Hinton • Municipality (Town) of Jasper	• Village of Valemount • Community of Blue River • Community of Avola • Community of Vavenby • District of Clearwater • Community of Little Fort • District of Barriere • City of Kamloops • City of Merritt • District of Hope[1] • Regional District of Fraser Fort George (RDFFG) • Thompson-Nicola Regional District (TNRD)	• District of Hope[1] • Fraser Valley Regional District (FVRD) • City of Chilliwack • City of Abbotsford • Township of Langley • City of Coquitlam • City of Port Coquitlam • City of Burnaby[2] • City of Surrey • City of Vancouver • Metro Vancouver Regional District[2]	• City of Burnaby[2] • Village of Anmore • Village of Belcarra • City of North Vancouver • City of Port Moody • City of Richmond • City of Vancouver • City of White Rock • Corporation of Delta • District of North Vancouver • District of West Vancouver • Bowen Island Municipality • University Endowment Lands/Metro Vancouver Electoral Area "A" • Metro Vancouver Regional District[2] • Squamish Lillooet Regional District • Village of Lions Bay • District of Squamish	• Corporation of the City of Duncan • City of Nanaimo • Nanaimo Regional District • Alberni – Clayoquot Regional District • Corporation of the City of Victoria • Cowichan Valley Regional District • Corporation of the District of Central Saanich • District of Metchosin • District of North Saanich • Corporation of the District of Oak Bay • Corporation of the District of District of Saanich • District of Sooke • Islands Trust Areas • Capital Regional District • Sunshine Coast Regional District • Town of Sidney • Corporation of the Township of Esquimalt

Notes: 1 The District of Hope, while a member of FVRD, is allocated for the purposes of stakeholder engagement activities under the BC Interior Region and the FVRD is allocated under the Lower Mainland/Fraser Valley Region.

2 Due to the location of the City of Burnaby and the Metro Vancouver Regional District, these two communities have been engaged under the Lower Mainland/Fraser Valley Region as well as the Mainland Coastal Region.

3.1.2 Phased Activities

The stakeholder engagement program adopted a phased approach to public and stakeholder engagement. Each phase was developed in response to information gathered from the previous phase as well as identified interests and needs. The current stakeholder engagement program consists of six phases, which include:

- Phase 1 Engagement: Stakeholder and Issue Identification, May to September 2012;
- Phase 2 Engagement: Public Information and Input Gathering, October 2012 to January 2013;
- Phase 3 Engagement: Community Conversations, February to July 2013;
- Phase 4 Engagement: Feedback to Stakeholders and Application Filing, August to December 2013;
- Phase 5 Engagement: Regulatory Process to In-Service, January 2014 to in-service; and
- Phase 6 Engagement: Operational Consultation.

3.1.3 Stakeholder Engagement Program Execution

The stakeholder engagement program was designed to foster positive relationships with the public and stakeholders as well as provide opportunities for stakeholders to be involved in the engagement process. The following section provides information on the activities that have taken place during the three phases of engagement activities conducted from the time of the Project announcement in May 2012 to the end of Phase 3 on July 31, 2013.

3.1.3.1 Enhanced Communications Initiatives

The communications initiatives support the consultation activities by providing notification about the various engagement opportunities including public open houses, Community Workshops and online discussion activities.

From producing printed newsletters to talking about Project details on social media channels to answering public and media inquiries to participating in speaking opportunities, the stakeholder engagement and communications team uses a variety of methods to reach various audiences. The communications initiatives include:

- a comprehensive website with information about various components of the Project and the industry;
- proactively distributing Project updates via email to people who have signed up through the Project website at open houses or through other means;
- Twitter and YouTube posts to reach people who use social media channels;
- providing various forums for people to ask questions: toll-free phone line, email, a website question and answer forum, and direct letters;
- a full media relations service including a dedicated media toll-free phone line; and
- a modest advertising campaign aimed at notifying people about ways they can engage with members of the Project team – in person or online.

The Trans Mountain stakeholder engagement and communications team provides those interested in the Project with a range of sources of information and platforms to encourage discussion and education. For more information on the Project stakeholder engagement and communication strategy, refer to Volume 3A.

<u>Phase 1 Engagement: Stakeholder and Issue Identification, May to September 2012</u>

Phase 1 of the stakeholder engagement program focused on Project introduction and the flow of Project information to the government, municipalities and key stakeholders. This phase included identifying stakeholders with interest in participating in the stakeholder engagement program, local community interests and concerns, and appropriate consultation methods. Trans Mountain provided information through mail and email, website posts, as well hand delivering information to stakeholders at Project introduction meetings.

<u>Phase 2 Engagement: Public Information and Input Gathering, October 2012 to January 2013</u>

Phase 2 of the stakeholder engagement program continued the outreach and discussions with municipalities and other stakeholders. In addition, Trans Mountain conducted a series of public information sessions along the proposed pipeline corridor. Content and format varied by the needs and interests of the communities. Trans Mountain provided Project overview information as well as the scope of the proposed pipeline corridor socio-economic assessment. Trans Mountain focused on engaging the public through open house style information sessions and seeking input through conversation, feedback forms, online discussion, and a Project-specific Twitter channel. Trans Mountain continued meeting with stakeholders and government representatives.

Trans Mountain attended the 2012 Union of British Columbia Municipalities (UBCM) convention in Victoria, BC, and later hosted a full day open house for UBCM delegates. In addition, Trans Mountain sent letters to local governments along the marine corridor offering individual meetings with representatives in Victoria, for which seven meetings with councils were arranged.

Environmental Non-Government Organizations

Research and early conversations guided the scope of engagement with stakeholders on environmental issues in different ways, based on the level of control and responsibility Trans Mountain has over each issue. Some common marine environmental concerns identified by stakeholders in this phase include effects of marine oil spills on the biodiversity, the fishery industry, human health as well as costs related to clean up of potential marine spills, among others.

Public Open Houses

Public open houses were structured as drop-in events where members of the public were invited to attend, gain information and ask questions about the Project. Project information was displayed on story boards positioned throughout the venue. Technical experts including representatives from environment, routing, geotechnical, regulatory, operations, stakeholder engagement and media relations were on hand to answer questions and receive comments and concerns from attendees. In addition, material was available as handouts and posted on the Project's website.

Phase 3 Engagement: Community Conversations, February to July 2013

Phase 3 of the stakeholder engagement program focused on seeking meaningful input from stakeholders on the proposed approach to the ESA. Engagement meetings in this phase of the program included ESA Workshops, Community Workshops and focused public information sessions in some communities on proposed Project routing. Community meetings focused on sharing updated Project information, seeking meaningful input from affected stakeholders on proposed route alternatives in areas where it is likely that the route will deviate from the existing TMPL right-of-way as well as seeking input from local stakeholders on potential Project effects and mitigation measures.

Environmental Non-Government Organizations

Engagement efforts in Phase 3 focused on local environmental groups based in communities along the pipeline and shipping corridor. Feedback from these local groups was particularly important during routing and ESA Workshops where local environmental knowledge helped to identify issues of concern in study areas as well as possible mitigation measures, and possible compensation or net benefit initiatives to consider as part of the overall Project proposal.

ESA Workshops

In Phase 3, Trans Mountain hosted ESA Workshops to provide information on the proposed approach used for the Project ESA and to seek input from stakeholders regarding study approach, methodology and regions. The Project traverses distinct geographic regions that include diverse ecosystems ranging from grasslands to rainforest. Regional experts were asked to attend ESA Workshops in representative communities in order to capture specialist knowledge for each region. The ESA Workshops targeted local and regional subject matter experts from municipal, federal and provincial governments, local ENGOs and other environmental interest groups. Trans Mountain hosted the ESA Workshops for Alberta in Edmonton and for BC in Kamloops, Surrey and Abbotsford.

The Project team provided attendees with a proposed overview of the ESA approach for the Project and sought the feedback of attendees on particular modules of the ESA including air, land and water. The ESA Workshop in Abbotsford focused on soil and agriculture as these subjects were of greatest concern to the community. Input was solicited online for 2 weeks after each workshop; information presented at the workshops was made available online following each session. Feedback received at these sessions was shared with the relevant environmental disciplines and was considered in setting the scope and methodologies for the Project's socio-economic assessment.

Community Workshops

In Phase 3, Trans Mountain hosted a series of Community Workshops along the proposed pipeline corridor to provide an opportunity for local stakeholders to receive updated information and provide feedback on issues and concerns relative to their community. Community Workshops were attended by stakeholders that held expertise on community interests, the environment, economic activity, recreation and land use. Participation included municipal representatives, local community representatives, business groups, recreational representatives and guides and outfitters. Community Workshops comprised ESA poster presentations and oral presentations on land, air, water and human activity, as well as an exit survey. All information presented at the workshops was made available online the day following each session and was live for three weeks. Trans Mountain hosted Community Workshops for Alberta in Edmonton, Parkland County (Wabamun), Edson and Hinton. Trans Mountain hosted Community Workshops for BC in Valemount, Blue River, Clearwater, Kamloops, Merritt, Hope, Chilliwack, Abbotsford, Langley, Surrey, Coquitlam and Burnaby.

Phase 4 Engagement: Feedback to Stakeholders and Application Filing, August to December 2013

The goals of the Phase 4 stakeholder engagement program include sharing the results of the marine studies, environmental field studies with stakeholders, commencing communications on the application and next steps for engagement, and communications following the filing of the application. Further details regarding refined Project plans prior to filing the application with the NEB will be shared with the public.

Engagement activities will include community and economic benefit presentations in conjunction with the Chambers of Commerce, attending events, one on one meetings, emergency response workshops and presentations/speaking opportunities. Meetings with local government and interested parties will be ongoing. Trans Mountain will continue digital engagement efforts and seek out more public opportunities to share information and gather feedback.

Planned Consultation on Reactivation

Trans Mountain is planning to reactivate two 610 mm (24 inch) segments of existing pipeline (from Hinton, Alberta to Hargreaves, BC and from Darfield, BC to Black Pines, BC) as part of the TMEP. Stakeholders include Parks Canada, the Town of Jasper, the Town of Hinton, Yellowhead County, BC Parks, local stewardship groups and the public. Project planning is currently underway and further stakeholder input will be sought as technical requirements for deactivation are further defined.

Phase 5 Engagement: Regulatory Process to In Service, January 2014 to In-Service

Additional engagement phases will be developed to support the regulatory process and, if successful, the construction phases of the Project. The goals of these engagement phases will include sharing results of any new studies or work being completed on the Project, to communicate any changes to Project plans, to share information with stakeholders on the regulatory process and to engage on construction effects and mitigation measures. Additional objectives include communicating about the benefits of the Project to local stakeholders and engaging on environment offsets.

Engagement continues with environmental groups related to the Project in regards to refining environmental input for consideration in the environmental assessment process, feedback on the approach to ecological compensation (conservation offsets), and the development and communication of geographic spill response plans. Engagement also continues with coastal stakeholders and Aboriginal communities related to the environmental aspects of the Project. Trans Mountain is also encouraging new relationships between these groups and certified spill responders so that more information can be shared about areas of high ecological value on BC's southwest coast.

Phase 6 Engagement: Ongoing Operational Consultation, Post-Construction Throughout Operational Life

Trans Mountain is committed to respectful, transparent and collaborative interactions with communities to develop long-term effective relationships. Once the pipeline becomes operational, engagement opportunities will continue through the hosting open houses, providing newsletters and Project updates,

making safety and public awareness presentations, participating in community events, regulatory processes and through ongoing informal meetings with stakeholders.

Initiatives to be activated during this phase will be developed in the lead up to construction. Trans Mountain, however, is committed to ongoing consultation in the communities in which it operates.

3.1.4 Summary of Outcomes of the Public Consultation Program as it Relates to Socio-Economic Elements

Trans Mountain designed the stakeholder engagement program to involve people who may be affected or have interest in the Project. Through the first three phases of engagement, Trans Mountain has had the opportunity to provide Project information through various methods and receive general comments as well as specific information for route and Project planning. Trans Mountain has engaged stakeholders in dialogue to discover the social and environmental issues or concerns that matter most to them. Trans Mountain has tracked these conversations and relayed the key topics to the Project representative to be considered and incorporated in the application, where applicable. Tables 3.1-3 to 3.1-9 provide information on the key topics relating to the socio-economic assessment and where these topics are addressed in the application.

3.1.4.1 Social and Cultural Well-Being

TABLE 3.1-3

INTERESTS OR CONCERNS RELATED TO SOCIAL AND CULTURAL WELL-BEING

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Proximity to schools, hospitals Concern for routing near schools	Where practical, the alignment of the proposed expansion route will parallel the existing TMPL. Trans Mountain recognizes that many regional changes have occurred since the pipeline was installed 60 years ago and that some routing decisions made today would be different. In some areas, Trans Mountain is looking at options that go beyond the current operational corridor. Alternate routes for the proposed expanded pipeline may be necessary — especially in areas where land use has changed since the pipeline was built nearly 60 years ago. The selection of the proposed pipeline corridor included both field and desktop assessments of the existing TMPL right-of-way and alternative routing locations, which resulted in a proposed pipeline corridor. The proposed pipeline corridor will be designed and constructed in accordance with all applicable standards, and was chosen on the basis of minimal new disturbance and effects to the public. Where land use has changed since the pipeline went into operation in 1953, there may be a need to route parts of the new line away from the existing TMPL right-of-way. In these cases, Trans Mountain will look at alternatives through comprehensive routing studies in combination with its consultation process. To minimize effects to the urban landscape and landowners, the proposed route of the new pipeline would follow existing linear infrastructure to the extent practical, such as municipal streets or highway, railway or utility corridors, or in some cases parklands. In communities where routing may deviate from the existing TMPL right-of-way, Trans Mountain will discuss and apply routing considerations and decision-making criteria in discussions with local stakeholders. Trans Mountain will continue to engage and communicate with communities as new information becomes available. Trans Mountain will continue to contact landowners along the existing TMPL right-of-way, and when route alternatives are selected, Trans Mountain will work with landowners to identify mutually agreeable solutions to concerns. Trans Mountain will inform landowners and lessees of the route location and construction schedule, to allow sufficient time to plan and implement alternative land use decisions. Particular attention will be paid to specialized agricultural production systems (*e.g.*, poultry, nursery or berry crop operations). Trans Mountain will locate and flag all existing buried utility lines and cables to be crossed by the pipeline prior to the commencement of ground disturbance activities by using "one call" services in addition to direct contact with utility owners. A discussion of routing principles and selection of the proposed pipeline corridor is provided in Section 4.0. Schools and hospitals are considered community assets that contribute to community way-of-life and are discussed under social and cultural well-being in Sections 5.3 and 7.2.3.	Volume 5B Sections 4.0, 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report

TABLE 3.1-3 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Awareness/mitigation of potential social issues with influx of workers into communities, and increase in traffic. Does Trans Mountain have a traffic management plan?	Socio-economic studies have been conducted to assess existing conditions and types of land use in the Project area, as well as possible effects. Mitigation strategies and management plans are being developed through discussions with regulatory authorities, Aboriginal communities and stakeholders to help minimize the potential effects of the Project on biophysical and human environments. Trans Mountain's engagement process will continue throughout the development of the facilities application to the NEB, as well as after it is filed in late 2013. Opportunities for stakeholders to provide feedback, express concerns and submit suggestions will be available through the entire process until the proposed expanded pipeline operations begin, if the Project is approved. The influx of workers into communities and the potential effects on community way-of-life are discussed under social and cultural well-being in Sections 5.3 and 7.2.3 as well as under community health as it relates to socio-economic health effects, public safety and health care service provision in Sections 5.8 and 7.2.8. Traffic concerns are discussed under infrastructure and services in Sections 5.5 and 7.2.5 as well as under community health as it relates to public safety in Sections 5.8 and 7.2.8. The Pipeline and Facilities Environmental Protection Plans (EPPs) (Volumes 6B and 6C, respectively) contain a traffic management plan.	Volume 5B Sections 5.3, 5.5, 5.8, 7.2.3, 7.2.5 and 7.2.8 Volume 5D Socio-Economic Technical Report Community Health Technical Report Volume 6B Volume 6C
Fear of spills near schools and residential neighbourhoods	Pipeline safety is a common interest and a value shared by Trans Mountain. Trans Mountain has heard some specific questions about the pipeline and its safe operation near homes and schools and welcomes any opportunity to provide information and respond to questions. Since the TMPL began operating in 1953, many communities have grown and developed around the pipeline right-of-way. It is important to understand that while the pipeline may be near homes and schools, it does not run under any buildings. Living or being active near a pipeline does not pose a health risk. There are community trails, sporting events, community gardens and all kinds of businesses and agricultural activities safely co-existing near the TMPL. Safety is a top priority and at the core of who Trans Mountain is as a company. Dedicated staff work to maintain the integrity of the pipeline through maintenance, inspection and awareness programs. While no spill is acceptable to Trans Mountain, accidents can happen. Trans Mountain has a comprehensive response plan that includes working with local regulatory authorities to make sure the public and the environment are kept safe. Where the pipeline runs near schools, Trans Mountain is open to working with individual schools or districts to fully support their safety efforts and ensure their emergency response plans and Trans Mountain's are coordinated. Community perspectives of an oil pipeline as it pertains to community way-of-life are discussed under social and cultural well-being in Sections 5.3 and 7.2.3. Large onshore spill scenarios are discussed in Volume 7.	Volume 5B Sections 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report Volume 7

3.1.4.2 Human Occupancy and Resource Use

TABLE 3.1-4

INTERESTS OR CONCERNS RELATED TO HUMAN OCCUPANCY AND RESOURCE USE

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Concerns about effects to community recreation grounds on existing right-of-way Use of the Project right-of-way as a recreational trail Effect to the enjoyment of existing right-of-way as recreational green space Is there potential for shared use (recreational) around the Sumas Terminal?	Trans Mountain is aware that people use the existing TMPL right-of-way for recreational purposes. This can be challenging as the community believes it is a part of the open space and park system when it is a major utility corridor and Trans Mountain is only there as a secondary land use. Trans Mountain is open to discussing recreational use of the right-of-way; activities such as walking, hiking and biking would be great recreational uses for the right-of-way. Trans Mountain does restrict motorized vehicle access like snowmobiles and all-terrain vehicles (ATVs) because they can cause disturbance to the ground. Trans Mountain is open to discussing opportunities to leave infrastructure post-construction to benefit recreational users. A discussion of routing principles and selection of the proposed pipeline corridor is provided in Section 4.0. Parks and protected areas and recreation trails are addressed as part of outdoor recreation under human occupancy and resource use (HORU) Sections 5.4 and 7.2.4.	Volume 5B Sections 4.0, 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report
Routing through residential areas	Since the TMPL began operating in 1953, many communities have grown and developed around the pipeline right-of-way. It is important to understand that while the pipeline may be near homes and private property, it does not run under any buildings. Living or being active near a pipeline does not pose a health risk. There are community trails, sporting events, community gardens and all kinds of businesses and agricultural activities safely co-existing near the TMPL. Trans Mountain recognizes that many regional changes have occurred since the pipeline was installed 60 years ago and that some routing decisions made today would be different. Where new roads and infrastructure have been built, and patterns of land use have changed with the growth of communities, Trans Mountain is listening to landowners and will consider deviating from the existing route while balancing operational, engineering, environmental, community and economic factors. It is Trans Mountain's intention to find a route for the proposed pipeline that minimizes effects to residences and communities. Where privately-held land is needed for the proposed new route, land agents from Trans Mountain have ongoing discussions regarding the proposed pipeline corridor with landowners. Trans Mountain's goal is to reach mutually-acceptable agreements with landowners to allow Trans Mountain to build and maintain the proposed new pipeline. A discussion of routing principles and selection of the proposed pipeline corridor is provided in Section 4.0. Residential use areas are discussed under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 4.0, 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report
Mitigations for trail-users during and after construction	Trans Mountain conducted environmental and socio-economic studies along the proposed pipeline corridor to gather data for the ESA. This assessment will consider: the potential environmental and socio-economic effects of the construction, operations and maintenance of the pipeline; ways in which these effects can be minimized or avoided altogether; and mitigation and reclamation strategies that will further reduce these effects. Overall, Project-related effects on recreation use are addressed in the ESA. This will include development of mitigation measures to reduce effects and optimize opportunities to enhance recreational use. Proposed mitigation/enhancement measures form part of the ESA, which was completed in late 2013, and then will be carried forward into the planning and design of the Project. This issue is addressed as part of outdoor recreation under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report
Effects to outdoor recreation and tourism as well as sportfishing	Outdoor recreational activities, such as hunting, camping, hiking, mountain biking, trail rides, wildlife viewing and snowmobiling are expected to occur at numerous locations along the proposed pipeline corridor. Additionally, outdoor water-based recreational activities along the proposed pipeline corridor include canoeing, kayaking, rafting, rowing, tubing and fishing. Recreational fishing occurs on large watercourses and lakes. Outdoor recreation activities are discussed under HORU in Sections 5.4 and 7.2.4.	

TABLE 3.1-4 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Potential effects to water-based recreation and tourism	During construction Trans Mountain will provide advanced and ongoing notification to users of the area to ensure they are fully aware of the activities that will occur and are occurring. Should the Project affect recreational users' infrastructure during construction, mitigation processes will ensure the infrastructure is left in the same, if not better condition. Actual methods will be discussed with landowners and or permit holders. Trans Mountain is open to discussing opportunities to leave infrastructure post-construction to benefit recreational users. As with all of its construction Projects, Trans Mountain will reclaim any areas that are affected by the proposed pipeline including the pipeline right-of-way and surrounding areas following construction. This could include adding new footpaths, developing new habitats, improving water crossings or bettering migration corridors. Post-construction environmental monitoring and ongoing right-of-way maintenance will continue following construction. Water-based recreation is considered as part of outdoor recreation under HORU in Sections 5.4 and 7.2.4 as well as Navigation and Navigation Safety in Sections 5.6 and 7.2.6.	Volume 5B Sections 5.4, 5.6, 7.2.4 and 7.2.6 Volume 5D Socio-Economic Technical Report
Potential opportunity to leave infrastructure (*e.g.*, swamp mats, crossing structures) behind to benefit users of recreational trails	Project-related effects on recreation use have been addressed in the ESA. This includes development of mitigation measures to reduce effects and optimize opportunities to enhance recreational use. Outdoor recreation use is discussed under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report
Agricultural and resource extraction land uses (HORU – disruption to agricultural and grazing activities and farm productivity)	Agriculture land uses such as grazing pastures, field crops, organic and specialty crops (*e.g.*, blueberries, raspberries, nurseries) and livestock facilities are located along the proposed pipeline corridor. Trans Mountain is working with landowners to reduce the potential disturbance to agricultural lands and disruption of agricultural practices during construction. Appropriate mitigation (*e.g.*, soil handling, erosion control) and monitoring activities will be implemented during construction to maximize reclamation success. Additional special reclamation measures will be applied, as required, to return the disturbed areas to a stable and maintenance-free condition. As part of the proposed post-construction environmental monitoring (PCEM) program, Trans Mountain will monitor revegetation growth on the construction right-of-way and implement remedial measures where necessary. A discussion of agriculture is provided under HORU in Sections 5.4 and 7.2.4 while the PCEM program is provided in Volume 6A.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report Agricultural Assessment Technical Report: Volume 6A
Future land use	The primary design objective is to construct the Project within or adjacent to the existing TMPL right-of-way and, where this is not possible, minimize any new linear disturbance. The proposed pipeline corridor was selected to minimize effects on the environment, maximize worker and public safety, and minimize other social effects. Appropriate mitigation (*e.g.*, soil handling, erosion control) and monitoring activities will be implemented during construction to optimize reclamation success. Additional special reclamation measures will be applied, as required, to return the disturbed areas to a stable and maintenance-free condition. Primary road and railway crossings will be bored to minimize interference with existing activities and usage. Land use activities are addressed under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report

TABLE 3.1-4 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Aesthetic effects around the Westridge Marine Terminal	The TMEP Team has worked extensively with Port Metro Vancouver (PMV), the Pacific Pilotage Authority (PPA) and the BC Coast Pilots (BCCP) to determine a preferred dock layout at the Westridge Marine Terminal. Trans Mountain has also incorporated feedback from the City of Burnaby and community discussions into the ESA. The team considered approximately 20 layouts during the evaluation and study process. The layout currently being evaluated is considered to be the most favourable. The team's technical goal was to develop a layout that would provide: • three Aframax-capable berths, reducing the percentage of time that tankers visiting Westridge use anchorages west of the Second Narrows; • the highest level of navigational safety (for berthing, for other vessel traffic in the inlet and considering the existing anchorages); • the ability to keep the existing dock in service during construction of the new dock; • ways to minimize the overall footprint to provide the least impact to community views; • opportunities to minimize or eliminate dredging in order to provide the least impact to the marine environment; and • ways to minimize noise disturbances. A conceptual design for Westridge Marine Terminal, based on preliminary engineering is available on the Trans Mountain website (http://www.transmountain.com/marine-westridge-terminal). The design may change after further developmental and detailed engineering. Aesthetic attributes are discussed under HORU in Sections 5.4 and 7.2.4 and 7.6.4.	Volume 5B Sections 5.4, 7.2.4 and 7.6.4 Volume 5D Socio-Economic Technical Report Viewshed Modeling Analysis Technical Report
If artificial lighting is used to extend construction hours, participants asked that care be taken to avoid 'light pollution' in their neighbourhood	Noise, dust and other disturbances will be mitigated to avoid the effects on people near the construction. Every effort is made to minimize effects to landowners and neighbours from surveying and staking the right-of-way to final clean-up. In areas where there may be a concern regarding the safety of the public, restricted areas are established. During the construction phase, Trans Mountain will schedule work for daylight hours, where feasible. The Environmental Inspector(s), in consultation with Trans Mountain's environmental staff, will determine appropriate procedures to be implemented to limit light pollution during the dark hours during construction, such as directing the lighting for all construction activities downward and, where feasible, positioning lighting to avoid or reduce effects to nearby residents. Similar procedures will be followed during the operational phase. Guidelines have been established in the Pipeline EPP (Volume 6B).	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report Volume 6B
Crop insurance and compensation	Trans Mountain's compensation plan will provide for valid effects, losses or damages to crops within the construction footprint and temporary access routes, as may be required. Further discussion is provided under the HORU indicator, Agricultural Use, in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Agricultural Assessment Technical Report
How will construction affect organic farming certification?	Mitigation measures that addresses equipment cleaning, the restriction of herbicides for weed management, disposal of construction materials and garbage and soil management considerations have been identified within the Agricultural Management Plan for construction on organic fields (see Pipeline EPP of Volume 6B). Further discussion is provided under the HORU indicator, Agricultural Use, in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6B

TABLE 3.1-4 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Routing through recreational areas and facilities	Where practical, the alignment of the proposed pipeline corridor will parallel the existing TMPL. Trans Mountain recognizes that many regional changes have occurred since the pipeline was installed 60 years ago and that some routing decisions made today would be different. In some areas, Trans Mountain is looking at options that go beyond the current operational corridor. Alternate routes for the proposed expanded pipeline may be necessary — especially in areas where land use has changed since the pipeline was built nearly 60 years ago. The selection of the proposed pipeline corridor included both field and desktop assessments of the existing TMPL right-of-way and alternative routing locations that resulted in a proposed pipeline corridor. The proposed pipeline corridor will be designed and constructed in accordance with all applicable standards, and was chosen on the basis of minimal new disturbance and public impact. Where land use has changed since the pipeline went into operation in 1953, there may be a need to route parts of the new line away from the existing TMPL right-of-way. In these cases, Trans Mountain will look at alternatives through comprehensive routing studies in combination with its consultation process. To minimize effects to the urban landscape and landowners, the proposed route of the new pipeline would follow existing linear infrastructure to the extent practical, such as municipal streets or highway, railway or utility corridors, or in some cases parklands.	Volume 5B Sections 4.0, 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report
Municipal land use and development plans	In communities where routing may deviate from the existing TMPL right-of-way, Trans Mountain will discuss and apply routing considerations and decision-making criteria in discussions with local stakeholders. Trans Mountain will continue to engage and communicate with communities as new information becomes available. Trans Mountain will continue to contact landowners along the existing TMPL right-of-way, and when route alternatives are selected, Trans Mountain will work with landowners to identify mutually agreeable solutions to concerns. Trans Mountain will inform landowners and lessees of the route location and construction schedule to allow sufficient time to plan and implement alternative land use decisions. Particular attention will be paid to specialized agricultural production systems (*e.g.*, poultry, nursery or berry crop operations). Trans Mountain will locate and flag all existing buried utility lines and cables to be crossed by the pipeline prior to the commencement of ground disturbance activities by using "one call" services in addition to direct contact with utility owners. A discussion of routing principles and selection of the proposed pipeline corridor is provided in Section 4.0. Recreational areas, schools and hospitals are considered community assets that contribute to community way-of-life and are discussed under social and cultural well-being in Sections 5.3 and 7.2.3.	Volume 5B Sections 4.0, 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report
Golf course disruption, construction and remediation (Abbotsford)	Trans Mountain is evaluating ways to reduce the effects to the Ledgeview Golf Course and other golf courses potentially encountered along the proposed pipeline corridor. Golf courses are considered a community asset that contribute to community way-of-life and are discussed under social and cultural well-being in Sections 5.3 and 7.2.3.	Volume 5B Sections 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report

3.1.4.3 Infrastructure and Services

TABLE 3.1-5

INTERESTS OR CONCERNS RELATED TO INFRASTRUCTURE AND SERVICES

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Use of infrastructure and services by construction crews (*e.g.*, roads, hotels, food services) and potential effects	Trans Mountain recognizes that the Project is a major infrastructure project and, as such, the public will have an interest in the Project's scope, environmental assessment and routing. Trans Mountain has begun and will continue to engage in meaningful consultation with affected stakeholders regarding socio-economic effects and benefits. The Project's objective, where feasible, is to maximise local sourcing and content. This will be undertaken in discussion and engagement with local communities and businesses. Discussion on infrastructure and services is provided in Sections 5.5 and 7.2.5.	Volume 5B Sections 5.5 and 7.2.5 Volume 5D Socio-Economic Technical Report

TABLE 3.1-5 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Concern about inadequate power supply in North Thompson Valley	From initial discussions with BC Hydro, Trans Mountain understands that additional power infrastructure will be required in the North Thompson Valley. Trans Mountain is also aware some community residents have expressed concerns about the power supply in the North Thompson Valley and that BC Hydro has addressed the issue with local governments. By the end of 2013, BC Hydro will inform Trans Mountain of what infrastructure is required in the North Thompson Valley to supply the additional power while maintaining the public utility's existing customer service standards and commitments. It is anticipated the required infrastructure will be a combination of additions and upgrades to the current BC Hydro system, primarily within BC Hydro's existing rights-of-way. Trans Mountain is not participating directly in any major new power infrastructure projects in the North Thompson Valley. Linear infrastructure and power supply are addressed under infrastructure and services in Sections 5.5 and 7.2.5.	Volume 5B Sections 5.5 and 7.2.5 Volume 5D Socio-Economic Technical Report
Utility crossings Routing across roads and intersections	Where practical, the alignment of the proposed expansion route will parallel the existing TMPL. Trans Mountain recognizes that many regional changes have occurred since the pipeline was installed 60 years ago and that some routing decisions made today would be different. In some areas, Trans Mountain is looking at options that go beyond the current operational corridor. Alternate routes for the proposed expanded pipeline may be necessary — especially in areas where land use has changed since the pipeline was built nearly 60 years ago. The selection of the proposed pipeline corridor included both field and desktop assessments of the existing TMPL right-of-way and alternative routing locations, which resulted in a proposed pipeline corridor. The proposed pipeline corridor will be designed and constructed in accordance with all applicable standards. Where land use has changed since the pipeline went into operation in 1953, there may be a need to route parts of the new line away from the existing TMPL right-of-way. In these cases, Trans Mountain will look at alternatives through comprehensive routing studies in combination with its consultation process. To minimize effects to the urban landscape and landowners, the proposed route of the new pipeline would follow existing linear infrastructure to the extent practical, such as municipal streets or highway, railway or utility corridors, or in some cases parklands. In communities where routing may deviate from the existing TMPL right-of-way, Trans Mountain will discuss and apply routing considerations and decision-making criteria in discussions with local stakeholders. Trans Mountain will continue to engage and communicate with communities as new information becomes available. Trans Mountain will continue to contact landowners along the existing TMPL right-of-way, and when route alternatives are selected, Trans Mountain will work with landowners to identify mutually agreeable solutions to concerns. Trans Mountain will inform landowners and lessees of the route location and construction schedule to allow sufficient time to plan and implement alternative land use decisions. Particular attention will be paid to specialized agricultural production systems (*e.g.*, poultry, nursery or berry crop operations). Trans Mountain will locate and flag all existing buried utility lines and cables to be crossed by the pipeline prior to the commencement of ground disturbance activities by using "one call" services in addition to direct contact with utility owners. A discussion of routing principles and selection of the proposed pipeline corridor is provided in Section 4.0. Discussion on utility lines and roads is provided under infrastructure and services in Sections 5.5 and 7.2.5.	Volume 5B Sections 4.0, 5.5 and 7.2.5 Volume 5D Socio-Economic Technical Report

3.1.4.4 Employment and Economy

TABLE 3.1-6

INTERESTS OR CONCERNS RELATED TO EMPLOYMENT AND ECONOMY

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Concern about decreased property values near terminals Potential decreases in property values and marketability of houses near the right-of-way Private Land – loss of property value	Treating landowners, the people who have land agreements with Trans Mountain, and neighbours fairly and equitably is a cornerstone of the relationships Trans Mountain has developed and maintained in communities along the TMPL system. Through respectful dialogue, Trans Mountain's goal is to negotiate mutually-agreeable arrangements with each landowner who may be affected by the Project. In cases where Trans Mountain is unable to reach a mutually-agreeable arrangement, the NEB has a multi-step process that Trans Mountain will follow to address differences of opinions as part of the routing review and approval process. More information about the process is available on the NEB website (http://www.neb-one.gc.ca/clf-nsi/rthnb/pblcprtcptn/pplnrgltncnd/pplnrgltncnd-eng.pdf). Trans Mountain appreciates the concern about loss of property values and has been investigating potential effects upon properties for sale – both with and without easements. To date, Trans Mountain's investigation has not shown a measurable effect, however, this situation will continue to be monitored. Trans Mountain appreciates that most homes with the existing pipeline were built after the pipeline was in-place and the easement would have been disclosed to the buyer at that time. Looking ahead to the proposed new pipeline, under the *NEB Act*, companies are required to compensate landowners for any new easement and pay for any damages and inconvenience associated with the new pipeline. Included within the determination of compensation is any change in the value of the property before and after the pipeline was built. The effects of the Project on housing prices in general will not be worked through the assessment of employment and economy in Section 7.2.7. However, factors that may be of concern to residential property owners/occupants are considered in various parts of the ESA including noise (Section 7.2.6 Acoustic Environment of Volume 5A), air quality (Section 7.2.4 Air Emissions of Volume 5A), sensory/visual disturbance (Section 7.2.4 HORU) and community way-of-life (Section 7.2.3 Social and Cultural Well-being).	Volume 5A Sections 7.2.4 and 7.2.6 Volume 5B Sections 7.2.3, 7.2.4 and 7.2.7 Volume 5D Socio-Economic Technical Report
Increases in municipal taxes in Alberta	Municipalities that the pipeline will pass through will accrue property tax increases of approximately $1,583,000 annually in Alberta. The increase in municipal taxes is discussed under employment and economy in Section 7.2.7.	Volume 5B Section 7.2.7 Volume 5D Socio-Economic Technical Report
Increases in municipal taxes in BC What municipal taxes will expanded pipeline pay to City of Coquitlam	The Project is anticipated to generate substantial provincial and municipal tax revenue for BC. Over the life of the Project, it is estimated that the municipalities, counties/regional districts, and Indian Reserves crossed by the Project will accrue aggregate property tax increases of approximately $3.4 million annually in Alberta (a 116% increase over current Trans Mountain taxes paid) and approximately $23.2 million annually in BC (a 101% increase). The increase in municipal taxes is discussed under employment and economy in Section 7.2.7.	Volume 5B Section 7.2.7 Volume 5D Worker Expenditures Along the Pipeline Corridor Technical Report
Economic effects in the event of a spill Availability of insurance for landowners in the case of an oil spill	The cost of cleaning up an oil spill is difficult to estimate, as it depends on a variety of factors: • type of oil; • amount of oil; • spill location; • environmental effects; • socio-economic effects; • weather; • water conditions; • rate of spill; and • efficiency of response operations.	Volume 7

TABLE 3.1-6 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Economic effects in the event of a spill Availability of insurance for landowners in the case of an oil spill (cont'd)	Trans Mountain carries liability insurance to provide coverage for all aspects of spill management, including compensation and remediation. To ensure there are sufficient funds to remediate a spill, Trans Mountain is covered by the insurance necessary to respond to all spills or releases from pipelines and facilities. Trans Mountain monitors the insurance program continuously, and makes annual adjustments, as necessary, to ensure adequate coverage. As part of an ongoing commitment to safety and environmental protection, Trans Mountain takes responsibility for the clean-up and remediation of spills by responding immediately to any release from the pipeline system. Trans Mountain works with qualified and trained consultants and contractors to ensure any spill is cleaned up as quickly as possible while ensuring the safety of the public and minimizing effects to the environment. Although ultimately, liability for an oil spill depends on the cause of the spill, Trans Mountain will always initiate and cover costs for clean up and restoration. Depending on circumstances, Trans Mountain will then seek to recover costs from insurance or from a third party.	See above
Benefits to Canada as a whole and to communities/municipalities along the route (*e.g.*, Hope)	As the world's third-largest oil producer, Canada benefits greatly from the export of national resources. Twinning the TMPL will increase Canada's capacity to export these resources by facilitating the movement of oil to the west coast for marine transport to market. It will further secure the supply of oil products to the lower mainland for use by BC's residents and businesses. These items are further discussed in the Conference Board of Canada report called, the Trans Mountain Expansion Project: Understanding the Economic Benefits for Canada and its Regions Section (Volume 2). The Project will also lead to new jobs in the short and long-term, job-related training opportunities, and increases in taxes collected through all three levels of government. A discussion of the benefits of the Project to Canada is provided in detail in Volume 2 and summarized under employment and economy in Section 7.2.7. A discussion of the benefits to municipal economies is also provided under employment and economy in Section 7.2.7.	Volume 2 Trans Mountain Expansion Project: Understanding the Economic Benefits for Canada and its Regions Volume 5B Section 7.2.7 Volume 5D Worker Expenditures Along the Pipeline Corridor Technical Report Socio-Economic Technical Report
Awareness of the positive benefits of the Project What are the benefits for non-pipeline communities Economic benefits resulting from construction activities	Overall, the proposed expansion will enhance Canada's ability to reach diversified markets with its oil, while also increasing tax revenues that can be used to fund government projects and services Canadians depend on such as health care, education, roads and infrastructure. Trans Mountain plans to spend $5.4 billion by the end of 2017 to construct the line and associated facilities, and a further $2.4 billion to operate it for the first 20 years. BC's economy is forecast to grow by $2.8 billion (GDP) through construction-related spending, and up to $11.3 billion including Project operations through to 2037. The Project is also anticipated to generate substantial provincial and municipal tax revenue. Provincial governments' revenues associated with the Project are anticipated to be in the order of $1.7 billion, with BC provincial government receiving $1 billion in provincial taxes and Alberta receiving over $0.4 billion in provincial taxes. Municipal tax revenues that can support community services and infrastructure are estimated to increase approximately $23 million annually, or $460 million over 20 years of operations. In Alberta, municipal property taxes are estimated to increases approximately $3.4 million annually, or $68 million over 20 years of operations. In communities along the proposed pipeline corridor, annual property tax payments to more than 20 local governments and more than 24 Aboriginal communities would jump to $52.4 million from $25.9 million per year at present. The estimated tax revenues to the Government of Canada are $2.1 billion over the life of the Project. Construction is scheduled in 2016 and 2017 with an estimated 4,500 workers at peak manpower. Trans Mountain expects to create 108,000 person years of employment, from construction and the first 20 years of operations across Canada; of this, at least 66,000 person years of employment will be in BC and at least 25,000 will be in Alberta (related to direct project spending as well as supply chain effects and spending of wages). The proposed expanded operations are anticipated to create 40 new full-time permanent positions in Alberta and 50 new full-time permanent positions in BC. Economic benefits of the Project are discussed in detail in Volume 2 and are summarized under employment and economy in Section 7.2.7.	Volume 2 Volume 5B Section 7.2.7 Volume 5D Socio-Economic Technical Report

TABLE 3.1-6 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Use of local materials during construction	The Project will take active steps to maximize regional, Aboriginal, provincial and Canadian contracting and procurement, as outlined in its procurement policy and Aboriginal procurement policy. The Project will give first consideration to qualified regional suppliers of goods and services, where practical, and continue to engage with Aboriginal communities regarding regional Aboriginal businesses/contractors, including available business services and capacity. Contracts, service agreements and materials that are not deemed critical to sustain the Project will first be sought from regional resources. Some of the procurement opportunities that are more likely to be filled by regional suppliers include: water hauling; fuel supply; reclamation (*e.g.*, seeding, shrub planting); emergency medical services; security services; flag personnel; equipment rental and lease; gravel supply and hauling; worker accommodation and temporary housing; catering; and miscellaneous equipment supply (*e.g.*, generators, lighting towers, pumps).	Volume 5B Section 7.2.7 Volume 5D Socio-Economic Technical Report
Long-term employment opportunities in BC Effects to local business activity	Expanding the TMPL system will create both short and long-term job opportunities in BC communities along the proposed pipeline corridor and will contribute to an increase in tax revenue for the Province of BC and local governments. Construction is scheduled in 2016 and 2017 with an estimated 4,500 workers at peak manpower. Trans Mountain expects to create 108,000 person years of employment, from construction and the first 20 years of operations across Canada; of this at least 66,000 person years of employment will be in BC and at least 25,000 will be in Alberta (related to direct project spending as well as supply chain effects and spending of wages). In communities where construction activities concentrate, the economic impacts are significant. During the peak construction period of the TMEP and associated facilities, construction hubs are to be established along the route for the staging of work and accommodation of workers. Construction workers residing in construction hub communities will spend dollars on accommodation, meals and other goods and services which will create spin-off benefits for local businesses and economies. Trans Mountain anticipates a large number of the total construction workforce will come from the communities directly along the corridor, including nine communities in BC, particularly in larger communities where up to 30 percent of the workforce is estimated to be local hires. The proposed expanded operations are anticipated to create approximately 50 new full-time permanent positions in BC. Long-term employment as well as potential effects of the Project on local businesses is discussed under employment and economy in Sections 5.7 and 7.2.7.	Volume 5B Sections 5.7 and 7.2.7 Volume 5D Socio-Economic Technical Report
How will Trans Mountain work with trade schools on skills development?	Trans Mountain is exploring opportunities to provide and support education and training initiatives for Aboriginal communities along the proposed pipeline corridor, and has begun dialogue with local training institutions. Education and training for Aboriginal communities in areas such as trades, maintenance, operations and environmental management will enhance the capacity of the local labour force to participate in Project opportunities. This will also build transferrable skills that can be used across other industries, and enhance the overall community capacity. The enhancement of training opportunities is discussed under employment and economy in Sections 5.7 and 7.2.7.	Volume 5B Sections 5.7 and 7.2.7 Volume 5D Socio-Economic Technical Report

3.1.4.5 Community Health

TABLE 3.1-7

INTERESTS OR CONCERNS RELATED TO COMMUNITY HEALTH

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
An influx of temporary workers into a community and the effects on health and health care services	Trans Mountain recognizes that the construction of the Project will require a large workforce and may exert an influence on health in nearby communities. The effects of an influx in temporary workers would primarily manifest in those communities acting as a construction hub for construction workers and in particular, those communities that have relatively small resident populations compared to the size of the temporary Project workforce. Engagement will be ongoing as the Project Team continues its detailed design of the Project. The influx of workers into communities and the potential effects on community health as it relates to socio-economic health effects and health care service provision are provided in Sections 5.8 and 7.2.8.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report

3.1.4.6 Human Health

TABLE 3.1-8

INTERESTS OR CONCERNS RELATED TO HUMAN HEALTH

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Health effects of airborne chemicals	Working openly and co-operatively with all levels of government, Aboriginal communities and stakeholders, Trans Mountain is committed to minimizing effects to the local environment, health, and community. A screening level human health risk assessment was initiated for the Project to assess potential effects of pipeline operations on human health. A human health risk assessment will be submitted to the NEB in Q2 2014. Potential human health effects are discussed in Sections 6.0 and 7.5.8.	Volume 5B Sections 6.0 and 7.5.8 Volume 5D Screening Level Human Health Risk Assessment of Pipeline and Facilities
Health effects from odors at Sumas Terminal	New prevention and community notification measures have been established in response to the release of oil at the Trans Mountain storage facility in Abbotsford. On January 24, 2012, oil from a storage tank at the Sumas Terminal spilled and was fully contained within a bermed area on the property that was lined with an impermeable membrane. The containment worked as designed, and all of the oil was recovered on the same day as the release. It was later determined that damage caused by freezing of the internal roof drain system caused the spill. Odors were reported in the area, which caused concern in the community. As a result, Trans Mountain has taken a number of steps to improve air quality monitoring and its process for communicating with local residents. Steps include the following. • Enhanced Odor Complaints and Investigation Process – Taking steps to minimize odors and investigate their cause is a top priority. Odors can be reported to 1-888-876-6711 around the clock. All odor reports will be thoroughly investigated and addressed. As a result of the January incident, additional measures will include notification of the local fire department dispatch. • Air Quality Monitoring and Reporting – An air monitoring station will be installed at the Sumas Terminal by the end of this year and an independent, rapid response service provider will conduct air monitoring sampling and analysis if needed in the event of an incident. In addition to the measures to improve air quality monitoring and notification processes, the drain system – found to be the cause of the incident – has been repaired and tested. Procedures have been put in place to prevent a similar incident. Later this fall, a heating system will be installed on the valves at each of the six tanks at the Sumas Terminal to prevent potential freezing during the winter.	Volume 5B Sections 6.0 and 7.5.8 Volume 5D Screening Level Human Health Risk Assessment of Pipeline and Facilities

TABLE 3.1-8 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Concern that residents are dealing with ongoing residual effects of 2012 spill (odors) re: Sumas Terminal Potential increase in odors with increase in tankers and/or tank farms	When crude oil arrives at the Sumas Terminal through the TMPL, it is held temporarily in storage tanks before being shipped to its next destination. Since the crude contains sulphur compounds, often described as having a rotten-egg smell, moving oil into and out of the tanks can cause nuisance odors near the terminal. Petroleum odors can be a nuisance for Trans Mountain's neighbours, and can sometimes also signal a problem with operations. Since safe operations and protection of the environment are always top of mind in this line of work, Trans Mountain investigates and follows up on all odor reports. Continuous air monitoring equipment has been installed at the Sumas Terminal and a new air monitoring program has been implemented for monitoring petroleum vapour concentrations in local neighbourhoods in the event of an incident. Additionally, the drain system – found to be the cause of the spill – has been repaired and tested. Procedures have been put in place to prevent a similar incident. These include: • the installation of a heating system on the external roof drain system valves to prevent potential freezing; and • all drainage valves are now maintained in the closed position when the drainage system is not in use. Finally, changes were made in the control centre process to initiate immediate field response for any observed deviations in tank volume. A tank level monitoring device has been designed to improve the accuracy of tank level changes and minimize false alarms. Trans Mountain strives to minimize the effects of its operations on their neighbors by incorporating odor mitigation measures in its day-to-day activities and project work. In addition, Trans Mountain is taking steps to enhance its early leak detection system and air monitoring/sampling protocol. Trans Mountain is also looking into procuring technology to facilitate automated calls to residents in the area in the event of an emergency and will provide more information on this initiative to local area residents.	Volume 5B Sections 6.0 and 7.5.8 Volume 5D Screening Level Human Health Risk Assessment of Pipeline and Facilities
What are the human health effects from odors, and pipeline products? Is there a carcinogenic link? Risk of carcinogenic effects from products in pipeline	There are no known carcinogenic health related risks related to products within the pipeline. In support of the ESA for the Project, Trans Mountain has commissioned a Human Health Risk Assessment (HHRA), the principal aim of which is to identify and understand the potential short-term and long-term health risks, including carcinogenic risks, to people exposed to the chemicals that could be released to the environment from the pipeline and associated facilities.	Volume 5B Sections 6.0 and 7.5.8 Volume 5D Screening Level Human Health Risk Assessment of Pipeline and Facilities

3.1.4.7 Traditional Land and Resource Use

TABLE 3.1-9

INTERESTS OR CONCERNS RELATED TO TRADITIONAL LAND AND RESOURCE USE

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Effects to traditional lands and disruption of pristine forests, Raft River crossing	As a long-time industry and community member, Trans Mountain is committed to working with Aboriginal and local communities, residents, regulatory authorities and other stakeholders on environmental initiatives. Trans Mountain helped stabilize the Raft River near the existing TMPL right-of-way in Clearwater, BC. This enhancement project involved stabilizing more than 700 m of river bank to prevent erosion, improving the local fish habitat, as well as planting native trees and shrubs. When Trans Mountain was seeking certification through the Wildlife Habitat Council, work began with a landowner on the existing TMPL right-of-way who was interested in being involved. Trans Mountain determined ways to improve the landowner's property to provide a more hospitable environment for local species. A discussion of traditional land and resource use is provided in Sections 5.2 and 7.2.2.	Volume 5B Sections 5.2 and 7.2.2 Volume 5D Traditional Land and Resource Use Technical Report

Additional concerns raised regarding traditional land and resource use can be found in Section 3.2, Aboriginal Engagement, which provides a comprehensive list of consultation conducted and a summary of interests and concerns.

3.1.4.8 Consultation Activities with Federal and Provincial Authorities

Specific disciplines consulted with federal, provincial, regional and municipal regulatory authorities throughout the proposed pipeline corridor. For each socio-economic element, a summary table provides detailed information on the agency contacted, name and title of contact, method of contact, date of engagement, reason for engagement, key interests and concerns as well as any commitments or follow-up actions required.

Heritage Resources

TABLE 3.1-10

SUMMARY OF CONSULTATION ACTIVITIES FOR HERITAGE RESOURCES

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/ Follow-Up Actions/ Comments	Where Issue is Addressed in the Application
PROVINCIAL CONSULTATION - ALBERTA							
Alberta Culture	OPAC	Email	November 24, 2012	Application for *Historical Resources Act* Clearance - Application No. 003203756	Review of the application for *Historical Resources Act* clearance has completed.	Signed Clearance Application HRM File: 4780-12-0066 Schedule "A" Project File: 4780-12-0066	Volume 5B Sections 5.1 and 7.2.1
Alberta Culture	OPAC	Email	March 18, 2013	Application for Archaeological Permit	Application has been received and review of application initiated.	Application Re: 7894 Application No 003104602 Revision No 2 Original Submission Date: September 24, 2012	Volume 5B Sections 5.1 and 7.2.1
Alberta Culture	OPAC	Email	March 23, 2013	Application for Archaeological Mitigative Permit - Application No 003104602	An approved Archaeological Research Permit was received.	Archaeological Permit No. 13-018	Volume 5B Sections 5.1 and 7.2.1
Alberta Culture	Caroline Hudecek-Cuffe (Archaeologist)	Email	May 24, 2013	Requesting Approval for Methodology Changes to Permit No. 13-018	Approval of changes to the original methodologies for Permit No. 13-018 to include the use of multiple crews in the assessment of the Project Study Area Corridor, and to incorporate geotechnical borehole testing into the testing methodology.	Archaeological Permit No. 13-018	Volume 5B Sections 5.1 and 7.2.1
Alberta Culture	OPAC	Email	June 4, 2013 to June 18, 2013	Application for *Historical Resources Act* Clearance - Application No. 003988910	Application for *Historical Resources Act* clearance has been received and review of the application has been initiated and completed.	Application No : 003988910, Revision No : 02 Original Submission Date: June 10, 2013	Volume 5B Sections 5.1 and 7.2.1
Alberta Culture	Pauline Bodevin (Heritage Resource Management Planning Assistant)	Email	November 1, 2012	Clarification of project shapefile	Request for clarification of size and location of study corridor.	TMEP	Volume 5B Sections 5.1 and 7.2.1
PROVINCIAL CONSULTATION – BRITISH COLUMBIA							
Archaeology Branch	Ewan Anderson	Email	June 13, 2012	Mapping Requirements	Received detailed list of mapping requirements from BC portion of the TMEP line	Application File: 11200-30/12A0290	Volume 5B Sections 5.1 and 7.2.1

TABLE 3.1-10 Cont'd

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/ Follow-Up Actions/ Comments	Where Issue is Addressed in the Application
Archaeology Branch	Ewan Anderson	Email	July 23, 2010	Request regarding Heritage Inspection Permit Application	Request that Ewan Anderson to review this Permit Application as the Project Officer.	Permit Application No. 11200-30/12A0290	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Ewan Anderson	Email	July 23, 2010	Request regarding Heritage Inspection Permit Application	Request that Ewan Anderson to review this Permit Application as the Project Officer.	Permit Application No. 11200-30/12A0290	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Jim Spafford (Project Officer)	Email, phone	August 7, 2012 to July 24, 2013	Submission of project shapefile, permit application 12A0290/13A0290 and feedback, Archaeological Permit 2013-0165, permit amendment	Initial permit application, shapefiles and feedback for permit application, addressing Aboriginal community concerns with regards to Permit Application 12A0290/13A0290, issue of Archaeological Permit 2013-0165, formal request that the following condition be added to Permit 2013-0165.20: In areas to be surveyed employing 100% coverage of proposed line and ancillary developments, for which all concerned Aboriginal communities have been contacted with respect to the scheduling of fieldwork and personnel, a map indicating areas of archaeological potential will not be required 15 days before the initiation of field work. Advised the permit holder that Condition 18 does not apply if the permit holder has advised an Aboriginal Community that 100% of the proposed development area within their consultative area will be inspected. In such cases, it will be sufficient to notify that First Nation of the scheduling of proposed field work within their consultative area at least 10 days before field work is initiated. Documentation of the relevant communications with the First Nation must be provided to the Archaeology Branch, upon request.	Permit Application No. 11200-30/12A0290 Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Al Makie (Heritage Resource Specialist)	Email	April 11, 2013	Permit Application	Permit Application Review v2.	Application Review 12AO290	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Doug Glaum (Manager, Archaeology Branch)	Email	July 5, 2013	Permit Application:12A0290/13A0290 (TMEP) Status	Confirmation that Archaeological Permit 2013-0165 has been issued.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1

TABLE 3.1-10 Cont'd

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/ Follow-Up Actions/ Comments	Where Issue is Addressed in the Application
AMEC Environment and Infrastructure	Diana Alexander (Archaeology Group Lead and Senior Archaeologist)	Email	July 5, 2013	Permit 2013-0165 Issue	AMEC sending Archaeological Permit 2013-0165 and the Branch's response to Aboriginal communities' letters and the permit application they sent to Aboriginal communities. The Branch requires that a map of areas to be field inspected is provided to Aboriginal communities 15 days in advance.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1
AMEC Environment and Infrastructure	Ian Franck (Project Manager and Senior Archaeologist)	Email	July 22, 2013	NTA Response to Permit Application: 12A0290/13A0290	Distribution of NTA's response to the Permit Application: 12A0290/13A0290, and their request to be involved in the Project.	Permit Application:12A0290/ 13A0290	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Eric Forgeng (Project Officer)	Email	August 30, 2013	Suggested Edits to Aboriginal Consultative List	Suggested edits to the original permit regarding Aboriginal Consultative List to include Adams Lake, Canim Lake, Hulquminum Treaty Group [core area] and six member nations: Stz'uminus, Cowichan, Lake Cowichan, Hahalt, Lyackson and Penelakut.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Eric Forgeng (Project Officer)	Email	September 4, 2013	TMPL Centre lines for Application 11200-3012A0290	Request for project GIS centre line for Application 11200-3012A0290.	Application No. : 11200-30/12A0290	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Eric Forgeng (Project Officer)	Email	September 12, 2013	Permit Amendment Request No. 2	Email chain between Eric Forgeng and Aaron Osicki discussing Amendment request to Permit 2013-0165 to amend route skirting the Coldwater Reserve near Merritt. Also a request for shapefiles for only the re-route segment of the TMEP line.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1
AMEC Environment and Infrastructure	Ian Franck (Project Manager and Senior Archaeologist)	Email	October 24, 2013	Permit Amendment No. 1	Permit amendment indicating that the TMEP will exclude the Coldwater Reserve.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Eric Forgeng (Project Officer)	Email	November 4, 2013	Discussion regarding Consultative Area Boundaries	Eric Forgeng initiated conversation with Aaron Osicki and Ian Franck regarding Simpcw First Nation issue of involving Adams Lake Indian Band on TMEP pipeline right-of-way south of RK 594.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1
Archaeology Branch	Eric Forgeng (Project Officer)	Email	November 26, 2013	Permit Amendment Request No. 3	The amendment focuses on the request of several First Nations Communities to use repositories other than the RBCM for artifacts and samples collected within their traditional territories.	Archaeological Permit 2013-0165	Volume 5B Sections 5.1 and 7.2.1

TABLE 3.1-11

SUMMARY OF CONSULTATION ACTIVITIES FOR SOCIAL AND CULTURAL WELL-BEING, HUMAN OCCUPANCY AND RESOURCE USE, INFRASTRUCTURE AND SERVICES, NAVIGATION AND NAVIGATION SAFETY, AND EMPLOYMENT AND ECONOMY ELEMENTS

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
FEDERAL CONSULTATION							
Port Metro Vancouver (PMV)	Jennifer Natland, Manager Development Strategies Sarah McPherson, Manager Project Communications Carrie Brown, Manager Environmental Programs	Meeting	April 9, 2013	Project and ESA review. Overview of Socio-Economic Assessment. RSA boundaries. Marine commercial, recreational and tourism use data collection and issues scoping.	Project providing additional community investments. Would like application to be logically structured so it is easy to find all sections pertinent to PMV. Methodology for analysis of economic benefits of tanker traffic is logical. Clarification of the RSA for marine commercial, recreational and tourism use related to the Westridge Marine Terminal assessment and tanker traffic assessment.	Follow-up with PMV, as required, as the Project proceeds.	Volume 5B Sections 7.6.4 and 7.6.5 Volume 5D Socio-Economic Technical Report Volume 8A Section 4.3.11
PMV	Jennifer Natland, Manager Development Strategies	Email correspondence	July 12 to 16, 2013	Project and ESA overview. Questions about marine use in PMV: anchorage regulations, small vessel numbers, log handling activities, recreational waterfront management.	Requested to remain informed as the Project proceeds.	Follow-up with PMV, as required, as the Project proceeds.	N/A
Royal Canadian Mounted Police (RCMP), Hope Community Policing Office	Constable Lara Davidsen	Meeting	July 2, 2013	Project introduction. Overview of Socio-Economic Assessment. Social and Cultural Well-being data collection and issues scoping.	Suggested any camps be alcohol and drug free.	Follow-up with RCMP, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.8 Volume 5D Socio-Economic Technical Report
RCMP, Upper Fraser Valley Regional Detachment	Superintendent Deanne Burleigh Inspector Grant Wilson Staff Sergeant Jim Simmill	Meeting	July 3, 2013	Project introduction. Overview of Socio-Economic Assessment. Social and Cultural Well-being and Infrastructure and Services data collection and issues scoping.	Historical incidents of theft at staging areas. Potential protests. Off-duty activities of workers.	Follow-up with RCMP, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.8 Volume 5D Socio-Economic Technical Report
RCMP, Edson Community Policing Office	Constable Bruce Chomeakwich	Meeting	July 18, 2013	Project introduction. Overview of Socio-Economic Assessment. Social and Cultural Well-being data collection and issues scoping.	No issues with work crews other than small noise/nuisance complaints. Workers come into town to drink. More skilled workers are less problematic than entry-level workers.	Follow-up with RCMP, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.8 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
RCMP, Hinton Community Policing Office	Corporal Danny Knight	Meeting	July 19, 2013	Project introduction. Overview of Socio-Economic Assessment. Social and Cultural Well-being data collection and issues scoping.	Housing capacity will be an issue. Increase in bar fights and impaired driving. Suggested a dry camp. Construction noise can be an issue. RCMP is first responder to worksite issues, which can take up RCMP resources.	Follow-up with RCMP, as required, as the Project proceeds.	Volume 5B Sections 7.2.3. 7.2.4 and 7.2.8 Volume 5D Socio-Economic Technical Report
RCMP, Division 'E' (Surrey, BC)	Unnamed member of RCMP	Phone (attempt)	June 19, 2013	Project introduction. Overview of Socio-Economic Assessment. Social and Cultural Well-being data collection and issues scoping for Metro Vancouver region.	Suggested contact RCMP Media Relations; requested call back.	Follow-up with RCMP, as required, as the Project proceeds.	N/A
PROVINCIAL CONSULTATION - ALBERTA							
Alberta Environment and Sustainable Resource Development (AESRD) - Foothills Area	Sharad Karmacharya, Land Management Planner	Meeting	October 18, 2012	Project introduction. Overview of Socio-Economic Assessment. Land and resource use data collection and issues scoping.	No concerns with RSA boundaries presented. Construction of the Project should not negatively impact the development of commercial recreational tourism in the area proposed in the forthcoming area structure plan. Project will need to have stringent reclamation plans that are on par with end land use goals for each specific area.	Follow-up with AESRD, as required, as the Project proceeds.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report
Alberta Transportation	Mark Svenson, Environmental Coordinator	Phone Call, Email	July 11, 2013	Overview of Socio-Economic Assessment. Highway infrastructure capacity.	No issues identified. Requested that the Socio-economic team send an email with specific questions and information needs.	Socio-economic team sent email with information needs. Did not receive a response.	N/A
PROVINCIAL CONSULTATION – BRITISH COLUMBIA							
Tourism BC	Krista Morten, Manager, Policy and Legislation Carol Jenkins, Senior Tourism Development Officer	Meeting	September 25, 2012	Project introduction. Overview of Socio-Economic Assessment. RSA boundaries. Land and resource use data collection and issues scoping.	Consultation with tenure holders and tourism operators is important. Discussions with BC Parks should occur. Tourism businesses that support tenured operators. Tenured operators. Viewsheds. Noise pollution. Light pollution. Water quality. General perception of BC as a tourism destination. Competing land uses.	Follow-up with Tourism BC, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.4 Volume 5D Socio-Economic Technical Report Volume 8A Section 4.3.11

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
BC Ministry of Forest, Lands and Natural Resource Operations (BC MFLNRO), Thompson Okanagan Region	Peter Lishman, Director, Resource Authorizations Megan Williams, Senior Natural Resource Officer Alan Hicks, Project Manager, Authorizations John McQueen, First Nations Relations Manager Noelle Kekula, Recreation Officer Robyn Reudink, Ecosystems Biologist	Meeting	October 31, 2012	Project introduction. Overview of Socio-Economic Assessment. RSA boundaries. Land and resource use data collection and issues scoping.	Messaging regarding off-highway vehicle use on utility corridors. Minimizing disturbance to native grasses and successful restoration, particularly in Lac du Bois Protected Area. Any restriction to forestry is an issue. Cumulative effects regarding caribou migration and fish.	Follow-up with BC MFNLRO, Thompson Okanagan Region, as required, as the Project proceeds.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report
BC MFLNRO, South Coast Region	Alec Drysdale, Director, Resource Authorizations Allan Johnsrude, District Manager, Resource Operations, Chilliwack	Meeting	November 16, 2012	Project introduction. Overview of Socio-Economic Assessment. RSA boundaries. Land and resource use data collection and issues scoping.	No concerns with RSA boundaries presented. RSA should consider visual impact, access and impact to other businesses/users. Most interest is in areas where the proposed route deviates from the existing right-of-way.	Follow-up with BC MFNLRO, South Coast Region, as required, as the Project proceeds.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report
BC Ministry of Children and Family Development (MCFD)	Bev (surname unknown), Coast Fraser Surrey Office	Phone	June 19, 2013	Project introduction. Overview of Socio-Economic Assessment. Social and cultural well-being data collection and issues scoping.	BC MCFD suggested TERA speak with members of the public to understand potential social impacts. BC MCFD chose to refrain from discussing the Project.	None.	Volume 5B Section 7.2.3 Volume 5D Socio-Economic Technical Report
BC Ministry of Transportation and Infrastructure (MOTI), South Coast Region	Brian Atkins, Lower Mainland District Manager, Transportation Mike Kelly, Operations Manager Roanna Cruz, Senior District Development Technician	Meeting	June 24, 2013	Overview of Socio-Economic Assessment. Highway infrastructure capacity.	No concerns from a socio-economic perspective. BC MOTI requires more detailed information to provide feedback on specific issues. A comprehensive Traffic Management Plan was strongly encouraged.	None.	Volume 5B Section 7.2.5 Volume 5D Socio-Economic Technical Report
BC MFLNRO, Chilliwack District	Allan Johnsrude, District Manager, Resource Operations, Chilliwack Mike Peters, Recreation Officer	Meeting	July 3, 2013	Overview of Socio-Economic Assessment. RSA boundaries. Land and resource use data collection and issues scoping.	No concerns with RSA boundaries presented. Most interest is in areas where the proposed route deviates from the existing right-of-way; concerns regarding access. Any restriction to forestry and other industry is an issue. Heavy undesignated recreational use between the old toll booth on the Coquihalla Highway and Hope.	Follow-up with BC MFNLRO, Chilliwack, as required, as the Project proceeds.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report
BC MOTI, South Coast Region	Edison Ting, Area Development and Operations Technician	Email	July 2013	BC highways inventory report.	None identified.	None.	N/A

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
MUNICIPAL CONSULTATION – ALBERTA							
Village of Wabamun	Linda Hannah, Chief Administrative Officer (CAO)	Meeting	October 9, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Sensitive since the CN rail spill (2005). Lake Wabamun, issues regarding water quality and recreational activities such as fishing and sailing. Open, transparent and easily understood and available information is important. Winter construction is preferred. Concern surrounding disruption to road access; boring roads is preferred over open cut. Aging infrastructure.	Follow-up with the Village of Wabamun, as required, as the Project proceeds.	Volume 5A Section 7.2.3 Volume 5B Section 7.2.3 Volume 5D Socio-Economic Technical Report
City of Spruce Grove	Debra Irving, Director of Planning and Development Jeff Mustard, Director of Engineering Lindsey Butterfield, Long Range Planner	Meeting	October 10, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Prefer Project to go south along existing linear disturbances such as the planned Highway 628. Wetlands/peat lands.	Follow-up with the City of Spruce Grove, as required, as the Project proceeds.	Volume 5A Section 7.2.8 Volume 5B Section 7.2.5 Volume 5D Socio-Economic Technical Report
Town of Stony Plain	Louise Frostad, Finance and Administration Matthew Clause	Meeting, Email, Phone Call	October 2012 to March 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Sensitivity regarding oil spills has grown since the 2005 CN rail spill. Environmentally conscious community. Not opposed a camp as long as it is not within the town limits.	Follow-up with the Town of Stony Plain, as required, as the Project proceeds.	Volume 5B Section 7.2.3 Volume 5D Socio-Economic Technical Report
Strathcona County	Lori Mills, Energy Exploration Liaison	Email	October 16, 2012 to July 15, 2013	Given feedback from certain communities, the socio-economic team postponed meetings in the area until a better understanding of routing has been reached.	N/A	Follow-up with Strathcona County, as required, as the Project proceeds.	N/A
		Meeting	July 15, 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Construction could be an issue for residents because of noise and traffic. Cumulatively the Project overlaps with a number of other projects in the area.		Volume 5B Sections 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
Parkland County	Pat Vincent, CAO	Email	October 16, 2012	Given feedback from certain communities, the socio-economic team postponed meetings in the area until a better understanding of routing has been reached.	N/A	Follow-up with Parkland County, as required, as the Project proceeds.	N/A
	Paul Hanlan, Manager of Planning and Development Ken Van Buul, General Manager, Community Services	Meeting	July 17, 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Identified commercial recreation businesses on the Pembina River. Any activity that affects Highway 16 may restrict access in the county. Winter is the preferred construction period. Fire services are at capacity. Vehicle accidents are an issue; any temporary increase in traffic may be an issue.		Volume 5B Sections 7.2.4 and 7.2. Volume 5D Socio-Economic Technical Report
Yellowhead County	Jack Ramme, CAO Barb Lyons, Director of Corporate & Planning Services	Meeting	October 17, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	RCMP capacity. Overlap with proposed Coalspur Mines Ltd. Vista Coal Mine Project. Lack of skilled labour. Positive tax benefits.	Follow-up with Yellowhead County, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.5 and 7.2.7 Volume 5D Socio-Economic Technical Report
Town of Edson	Brigitt Lemieux, Assistant CAO	Meeting, Email	October 2012 to March 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Do not follow existing easement, instead go south of municipality. Reduce risk from a spill/incident close to residents. New residential development (Hillendale Phase II) very near the existing route. Lack of skilled labour. Trans Mountain should partner with local organizations. Use route as recreation corridor. Positive tax benefits.	Follow-up with the Town of Edson, as required, as the Project proceeds.	Volume 5B Sections 7.2.4 and 7.2.7 Volume 5D Socio-Economic Technical Report
Town of Hinton	Bernie Kreiner, Town Manager	Meeting Email	October 2012 to March 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Routing through east, residential areas. Ensure emergency management is practiced with Trans Mountain. Trans Mountain should partner with local organizations. Use route as recreation corridor. Overlap with proposed Coalspur Mines Ltd. Vista Coal Mine Project. Positive tax benefits.	Follow-up with the Town of Hinton, as required, as the Project proceeds.	Volume 5B Sections 7.2.4, 7.2.5 and 7.2.7 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
City of Edmonton	Simon Farbrother, City Manager Gord Jackson, Director Policy Section- Sustainable Development Department	Email	October 18, 2012	Given feedback from certain communities, the socio-economic team postponed meetings in the area until a better understanding of routing has been reached.	None identified.	No follow-up required. Given the level of broader Project engagement with the City of Edmonton and feedback from the city, the socio-economic team did not meet with the city.	N/A
Municipality of Jasper	Peter Waterworth, CAO Cathy Jenkins, Manager Municipal and Realty Services-Parks Canada B. Christopher Read, Inspiration Manager (Recreation) Don Pickle, Infrastructure Manager Thea Mitchell, Environmental Assessment Specialist-Parks Canada Mabaye Dia, Environmental Assessment-Parks Canada Jurgen Deagle, Environmental Management Specialist-Parks Canada	Meeting	October 19, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Housing market. Local contract procurement. No interference with transfer station access. Overlap with proposed Coalspur Mines Ltd. Vista Coal Mine Project near the Town of Hinton. Increased rail traffic. Environmentally conscious community. Labour shortage in services industries.	Follow-up with the Municipality of Jasper, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.5 and 7.2.7 Volume 5D Socio-Economic Technical Report
Family and Community Support Services - Spruce Grove	Lorraine Berry, Supervisor Amber Nicol, Sustainability Planner, City of Spruce Grove	Phone, Meeting	July 17, 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Social and cultural well-being data collection and issues scoping.	Housing limitations with no available rentals in the City of Spruce Grove. Disconnection from families can cause temporary workers to be susceptible to mental health and addiction issues. Limited capacity for waste management.	Follow-up with Family and Community Support Services - Spruce Grove, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.5 Volume 5D Socio-Economic Technical Report
Edson Community Services	Mike Butler, Director	Meeting	July 18, 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Social and cultural well-being data collection and issues scoping.	Impacts to municipal trails. Some concern regarding influx of workers. Could be a strain on infrastructure depending on number of workers and where they are housed. Effects to Vision Park.	None.	Volume 5B Sections 7.2.3, 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report
Hinton Community and Protective Services Division	Don Engerdahl, Arts and Culture Coordinator	Meeting	July 19, 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Social and cultural well-being data collection and issues scoping.	Importance of working with local employment agencies. Potential effects to the local trail system. In past project, locals have been displaced due to construction crews.	None.	Volume 5B Sections 7.2.3, 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
MUNICIPAL CONSULTATION – BRITISH COLUMBIA							
Tourism Industry Association of British Columbia (TIABC)	Lana Denoni, Chair	Meeting	September 25, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Early and open consultation is important. Incremental increase of tankers is important to discuss.	Follow-up with TIABC, as required, as the Project proceeds.	Volume 5D Socio-Economic Technical Report Volume 8A Section 4.3.11
City of Kamloops	Jen Fretz, Sustainability and Environmental Services Manager Marvin Kwiatkowski, Development and Engineering Services Director Randy Lambright, Planning and Development Manager Mike Doll, Parks Planning Supervisor	Meeting	October 29, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Routing through the Westsyde neighbourhood. South Thompson River crossing. Overlap with Ajax Mine. Disruption of single access roads.	Follow-up with the City of Kamloops, as required, as the Project proceeds.	Volume 5B Sections 7.2.4, 7.2.5 and 7.2.6 Volume 5D Socio-Economic Technical Report
Thompson-Nicola Regional District (TNRD)	Sukh Gill, CAO Ron Storie, Manager of Community Services Regina Sadilkova, Director of Development Services Peter Hughes, Director of Environmental Services	Meeting	October 29, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Timing and location of the proposed route in relation to services, infrastructure and parks planned. Providing access to land users. Proximity of proposed route to the Little Fort cemetery.	Follow-up with the TNRD, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.4 Volume 5D Socio-Economic Technical Report
Tourism Kamloops	Lee Morris, Chief Executive Officer	Meeting	October 29, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Lac du Bois Grasslands Protected Area. Alteration of viewscapes. Reputation and public perception in the event of a spill.	Follow-up with the Tourism Kamloops, as required, as the Project proceeds.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report Volume 7

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
City of Merritt	Susan Roline, Mayor Matt Noble, CAO Pat Sibilleau, Manager of Financial Services James Umpherson, Business and Economic Development Manager Sean O'Flaherty, Development Services Officer	Meeting, Email	October 2012 to March 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Conflicting land use regarding the existing right-of-way and the Merritt Airport. Ability to run services (such as water) to a work camp. Opportunities for local businesses. Preference of a pipeline over trucking oil.	Follow up with the City of Merritt, as required, as the Project proceeds.	Volume 5B Sections 7.2.4, 7.2.5 and 7.2.7 Volume 5D Socio-Economic Technical Report
Community Futures Nicola Valley	Jean Perog, Chair, Governance and Board Development David Brown, Lending Committee Member	Meeting	October 30, 2012	Project introduction. Overview of ESA Approach. Employment and economy data collections and issues scoping.	Merritt has areas for temporary housing. Watershed Use and Management Program (WUMP), a subset of Nicola Valley Watershed is an active group in the areas.	Follow-up with Community Futures Nicola Valley, as required, as the Project proceeds.	Volume 5B Section 7.2.5 Volume 5D Socio-Economic Technical Report
Venture Kamloops	Anita Grover, Manager, Economic Development	Meeting	October 31, 2012	Project introduction. Overview of ESA Approach. Employment and economy data collection and scoping.	Kamloops is an environmentally sensitive community. Home builders association, construction association and BC Bid are best ways to communicate procurement contracts with local companies. Venture Kamloops is very proactive for labour in the community.	Follow-up with the Venture Kamloops, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.7 Volume 5D Socio-Economic Technical Report
Mike Wiegele Helicopter Skiing	Mike Wiegele, Owner Michelle Wiegele, President	Meeting	November 6, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Routing through the property. Disruption of summer business. Potential for housing workers during summer construction.	Follow-up with Mike Wiegele Helicopter Skiing, as required, as the Project proceeds.	Volume 5B Sections 7.2.4, 7.2.5 and 7.2.7 Volume 5D Socio-Economic Technical Report
Valemount Chamber of Commerce	Tammy VandeNobelen, Chair Jeanette Townsend, Vice Chair Marie Birkbeck, Secretary-Treasurer	Meeting	November 6, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Social well-being of the community, with reference to the potential for escort services during the TMX Anchor Loop Project. Housing during the winter. Valemount's entrepreneurial spirit and the community's interest in the Project.	Follow-up with the Valemount Chamber of Commerce, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.5 and 7.2.7 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
Valemount Area Recreation Development Association (VARDA)	Curtis Pawliuk	Meeting	November 6, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Disruption of winter recreational activities. Negative occurrence during the TMX Anchor Loop Project: destruction of a wetland by non-local crews using ATVs. Interest in educating crews regarding recreational opportunities. Summer use of snowmobile trails. Right-of-way recreational use requests.	Follow-up with VARDA, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.4 Volume 5D Socio-Economic Technical Report
Village of Valemount	Andru McCracken, Mayor Anne Yanciw, CAO Silvio Gislimberti, Economic Development Officer Sandy Salt, Councillor Victor LaBoucane, Public Works Superintendent Christine Latimer, Councillor	Meeting	November 6, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Invasive species along right-of-way. Limited housing capacity. Any full-time employment would be positive for the community. Food for crews (currently only one grocery store). Swift Creek crossing.	Follow-up with the Village of Valemount, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.5 and 7.2.6 Volume 5D Socio-Economic Technical Report
Village of Valemount	Anne Yanciw, CAO	Phone call	July 11, 2013	Social and health discussion.	Issues encountered during construction of TMX Anchor Loop Project: food availability at grocery stores, lack of consideration for outdoor spaces, social concerns, parking and housing.	Ms. Yanciw may try to arrange another phone call with other local police and social service providers. Follow-up with the Village of Valemount, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report
TNRD	Willow Macdonald, Director, Electoral Area "B" (Thompson Headwaters)	Open House	November 6, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Concern regarding drug use. Communication of construction timing to the community is important. Winter is the busy tourist season. Limited capacity of health services.	Follow-up with the TNRD, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.5 and 7.2.8 Volume 5D Socio-Economic Technical Report
District of Clearwater	Leslie Groulx, CAO Sherri Madden, Services Coordinator (TNRD) Jared Brounstein, Public Works Superintendent Brad Bradbury, Tourism and Marketing Manager	Meeting, Email	November 2012 to March 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Land use/residential constraints. Raft River crossing. Municipal infrastructure regarding timing of construction and Yellowhead Mine development. Disruption of summer tourist season. Simpcw First Nation sites. North Thompson River Provincial Park. Proposed regional park near the Blackfoot Community Centre.	Follow-up with the District of Clearwater, as required, as the Project proceeds.	Volume 5B Sections 7.2.4, 7.2.5 and 7.2.6 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
City of Coquitlam	Verne Kucy, Acting Manager for Environmental Services Division Bill Susak, Engineering and Public Works General Manager Steve Golley, Planning and Development Mark, Engineering and Capital Projects Jim McIntyre, General Manager, Planning and Development Margaret Birch, Environmental Services Coordinator Dana Soong, Manager Utility Programs Rob Thurrott, Lands and Properties Heather Bradfield, Manager, Legal and Bylaw Enforcement Carl Johannsen, Manager, Community Planning	Email, Meeting	November 2012 to April 2013	Project introduction. Overview of ESA Approach and Socio-Economic Assessment.	Future operating implications of City infrastructure and future planning implications. Routing.	Follow-up with the City of Coquitlam, as required, as the Project proceeds.	Volume 5B Section 7.2.5 Volume 5D Socio-Economic Technical Report
District of Barriere	Bill Humphreys, Mayor Colleen Hannigan, CAO	Meeting	November 8, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Highway traffic, particularly equipment/heavy load vehicles' use of Highway 5.	Follow-up with the District of Barriere, as required, as the Project proceeds.	Volume 5B Section 7.2.5 Volume 5D Socio-Economic Technical Report
City of Abbotsford	Jay Teichroeb, General Manager, Economic Development and Planning Services Reuben Koole, Social Planner	Meeting, Phone Call	November 2012 to March 2013	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Two spills on Sumas Mountain. Odour from tank farm. Important to communicate clearly to residents whose property will be impacted. New developments on Sumas Mountain. Annual Abbotsford Airshow in August results in fully booked hotels in the region.	Follow-up with the City of Abbotsford, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.4 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
City of Chilliwack	David Blain, Director of Engineering Roderick Sanderson, Manager of Transportation and Drainage Karen Stanton, Manager of Long Range Planning Tara Friesen, Assistant Manager of Environmental Services	Meeting	November 13, 2012 and July 4, 2013	Project introduction. Review ESA approach. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Groundwater and the Vedder River Fan (Sardis) Aquifer, particularly in relation to an accident or malfunction. Municipal infrastructure. Chilliwack/Vedder River crossing regarding fisheries and environmental concerns. School properties crossed by the proposed pipeline corridor.	Follow-up with the City of Chilliwack, as required, as the Project proceeds.	Volume 5A Section 7.2.3 Volume 5B Sections 7.2.3, 7.2.5, 7.2.6 Volume 5D Socio-Economic Technical Report Volume 7
District of Hope	Susan Johnston, Mayor John Fortoloczky, CAO Ian Vaughan, Director of Operations	Meeting	November 13, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Municipal roads and bridges, in particular Othello Road. Groundwater regarding municipal wells. Archaeological sites of importance. Employment and business opportunities associated with construction of the pipeline.	Follow-up with the District of Hope, as required, as the Project proceeds.	Volume 5A Section 7.2.3 Volume 5B Sections 7.2.1, 7.2.5, 7.2.7 Volume 5D Socio-Economic Technical Report
District of Hope	John Fortoloczky, CAO Scott Misumi, Director of Community Development	Meeting	July 2, 2013	Employment and Economy, Social and Cultural Well-Being, Infrastructure and Services and Human Occupancy and Resource Use data collection and scoping.	Municipal roads, in particular Othello Road. Groundwater regarding municipal wells. Commercial accommodations in Hope would not be able to house estimated workforce. Recreational locations crossed by proposed pipeline corridor.	None.	Volume 5B Sections 7.2.3, 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report
Township of Langley	Ramin Seifi, General Manager Engineering and Community Development Roeland Zwaag, Director of Public Works Stephen Richardson, Director Development Services Scott Thompson, Manager Property Services Bernice Fara, Manager, Legal Services	Meeting	November 15, 2012	Project introduction. Review ESA approach. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	Pipeline spill. Disruption to residents during construction (*e.g.*, pile driving). Would like to provide input on potential re-route options. Coordinating river crossings with municipal infrastructure would be preferred. Engagement of environmental groups important. Northwest Langley and Port Kells industrial area.	Follow-up with the Township of Langley, as required, as the Project proceeds.	Volume 5B Sections 7.2.3, 7.2.5 Volume 5D Socio-Economic Technical Report Volume 7
City of Surrey	Carrie Baron, Drainage and Environment Manager Lee-Ann Pitcairn, Planner Daniel Chow, Senior Planner	Meeting	November 16, 2012	Project introduction. Overview of ESA and Socio-Economic Assessment. Land and resource use, employment and economy, infrastructure and services and social and cultural well-being data collection and issues scoping.	City of Surrey Council is opposed to an increase in tanker traffic. Disruption to residents during construction. Constrained land use of existing right-of-way in both residential and industrial areas. Upcoming large-scale infrastructure projects. Bon Accord Creek.	Follow-up with the City of Surrey, as required, as the Project proceeds.	Volume 5B Sections 7.2.3 and 7.2.4 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
City of Surrey	Don Luymes, Manager, Community Planning Carrie Baron, Drainage and Environment Manager Jason Daviduk, Project Engineer	Meeting	June 25, 2013	Employment and Economy, Social and Cultural Well-Being, Infrastructure and Services and Human Occupancy and Resource Use data collection and scoping.	Infrastructure corridor near Surrey Bend Park: the landscape will change in the near future due to other linear projects. Compensation plans are important. No issues regarding temporary workforce. Municipal access to existing infrastructure.	None.	Volume 5B Sections 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report
FVRD	Linda Machmer, Executive Assistant	Phone Call, Meeting	November 2012 to March 2013	Project update. Overview of Socio-Economic Assessment.	Air quality. Aboriginal consultation. Routing.	Follow-up with the FVRD, as required, as the Project proceeds.	Volume 3B Volume 4A Volume 5A Section 7.2.4 Volume 5D Socio-Economic Technical Report
FVRD	Paul Gipps, CAO Suzanne Gresham Siri Bertelsen	Meeting	July 3, 2013	Project update. Overview of Socio-Economic Assessment.	FVRD is collecting all issues and concerns from Electoral Areas and municipalities to present questions to Trans Mountain. Conducting internal assessment of Project.	Follow-up with the FVRD, as required, as the Project proceeds.	N/A
AdvantageHOPE	Tyler Mattheis	Meeting, Email	January to March 2013	Project introduction. Overview of Socio-Economic Assessment. Employment and Economy, Infrastructure and Services and Social and Cultural Well-Being data collection and scoping.	Trail building as legacy.	Follow-up with AdvantageHOPE, as required, as the Project proceeds.	N/A
City of Burnaby	Dipak Dattani Lily Ford Heather Edwards Dion Doepker Alekxo Sarter Zeralynne Te	Meeting, Email	February to March, 2013	Project introduction. Overview of Socio-Economic Assessment. Employment and Economy, Infrastructure and Services and Social and Cultural Well-Being data collection and scoping.	City of Burnaby Council is opposed to the Project. Spills. Impacts and disruption to neighbourhoods. Long-term community impacts and benefits. Environmental risk.	Follow-up with the City of Burnaby, as required, as the Project proceeds.	Volume 5A Sections 7.2.3 and 7.2.4 Volume 5D Socio-Economic Technical Report Volume 7
Free Rein Associates	Peter Bailey, Director Jodi McBride, Proposals	Meeting, phone call	July 2 and 9, 2013	Project introductions. Overview of the Socio-Economic Assessment. Employment and Economy and Social and Cultural Well-Being data collection and scoping.	The combination of recruitment through a guided process is effective in Hope.	None.	Volume 5B Section 7.2.7 Volume 5D Socio-Economic Technical Report

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
RDFFG	Terry McEachen, General Manager of Development Services Marija Soklic, Manager of Sustainable Development Marisa Nightingale, Planner	Meeting	July 22, 2013	Project introductions. Employment and Economy, Social and Cultural Well-Being, Infrastructure and Services and Human Occupancy and Resource Use data collection and scoping.	Housing/accommodation of temporary construction workers. Routing. Environmentally-sensitive areas.	Follow-up with RDFFG, as required, as the Project proceeds.	Volume 5B Section 7.2.5 Volume 5D Socio-Economic Technical Report
COMMERCIAL RECREATION TENURE HOLDERS							
Interior White Water Expedition Ltd	Claudia (surname not given)	Phone (attempt)	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders' package to discuss potential overlap with their tenure.	None identified. Owners were not available for discussion.	None.	N/A
Maligne Rafting Adventures	Trevor (surname not given)	Phone	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders' package to discuss potential overlap with their tenure.	Winter construction preferred; do not want to be shut down during short summer season. If they are to be shut down, they would expect to be compensated.	None.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report
Mount Robson White Water Rafting Ltd.	Terri (surname not given)	Phone	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders' package to discuss potential overlap with their tenure.	Concerned about any delays due to increased traffic on highways and roads. During the TMX Anchor Loop Project construction, there was noticeable destruction of alpine areas with ATVs by pipeline workers; providing information to workers about recreational opportunities/regulations is important. Minimize impacts on short summer season.	None.	Volume 5B Sections 7.2.4 and 7.2.5 Volume 5D Socio-Economic Technical Report
Reo Rafting Ltd.	Michelle (surname not given)	Phone (attempt)	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders' package to discuss potential overlap with their tenure.	None identified. Owners not available for discussion.	None.	N/A
Stellar Descents Backcountry Adventures Ltd.	Tyler (surname not given)	Phone	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders package to discuss potential overlap with their tenure.	Biggest concern is if the section of the Fraser River used will have to be shut down during their season. Traffic delays. Concerned about the construction crossing methods of the Fraser River.	None.	Volume 5B Sections 7.2.4, 7.2.5 and 7.2.6 Volume 5D Socio-Economic Technical Report
Thompson Rivers University (Adventure Studies Department)	Sheila (surname not given)	Phone (attempt)	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders package to discuss potential overlap with their tenure.	None identified. Not available for discussion.	None.	N/A

TABLE 3.1-11 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Methods of Contact	Date Range of Consultation Activities	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
David Wabnegger (Guide Outfitter)	David Wabnegger	Phone (attempt)	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders package to discuss potential overlap with their tenure.	None identified. Not available for discussion.	None.	N/A
West Canada Bike Tours Ltd	Unknown	Phone (attempt)	August 14, 2013	Follow-up to TMEP commercial recreation tenure holders package to discuss potential overlap with their tenure.	None identified. Not available for discussion.	None.	N/A

Community Health

TABLE 3.1-12

SUMMARY OF CONSULTATION ACTIVITIES FOR COMMUNITY HEALTH

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
FEDERAL CONSULTATION							
First Nations Inuit Health Branch	Peter Mazey, Acting Regional Manager for the Environmental Health Program	Teleconference	July 11, 2013	Project introduction. Discussion of health issue areas.	No specific concerns identified.	None.	N/A
Health Canada	Carl Alleyne, BC Regional Environmental Assessment Coordinator Gladis Lemus, Regional Manager, Environmental Health Program, BC Region	Meeting	January 28, 2013	Project introduction. Discussion of health issue areas.	HHRA methodology. Accidents, malfunctions and releases. Aboriginal health. ESA review process.	None.	Volume 5B Section 7.2.8 Volume 5D Community Health Technical Report
PROVINCIAL CONSULTATION - ALBERTA							
Alberta Health	Dr. Karina Thomas, Environmental Health Scientist, Health Protection Branch Dr. James Talbot, Chief Medical Officer of Health for Alberta	Meeting	February 4, 2013	Project introduction. Discussion of the planned HHRA methodology and community health issues.	No specific concerns identified.	None.	N/A
Alberta Health	Krista Berezowski, Director, Emergency Preparedness and Planning, Emergency Management Unit	Teleconference	May 23, 2013	Project introduction. Discussion of emergency management in Alberta.	No specific concerns identified.	None.	N/A
Alberta Health Services (AHS)	Edith Zuidhof-Knoop, Manager, Addictions and Mental Health Services	Teleconference	April 25, 2013	Project introduction; Discussion of health issue areas.	Mental health first aid program for employers. Mental health/addictions problems. Employer worker support. Limited capacity.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report

TABLE 3.1-12 Cont'd

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
PROVINCIAL CONSULTATION – BRITISH COLUMBIA							
British Columbia Ambulance Service	Paul Vallely, District Manager, Cariboo Fraser Rural Operations	Teleconference	July 19, 2013	Discussion of emergency management systems and ambulance services in BC.	Communication. Medical response. Clean up during spill incidents.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7
Vancouver Coastal Health Authority Fraser Health Authority	Dr. Paul VanBuynder, Chief Medical Health Officer, Fraser Health Authority Dr. Nadine Loewen, Medical Health Officer, Fraser Health Authority Dr. Goran Krstic, HHRA Specialist, Fraser Health Authority Dr. Patricia Daly, Chief Medical Health Officer, Vancouver Coastal Health Dr. James Lu, Medical Health Officer, Vancouver Coastal Health Richard Taki, Regional Director, Health Protection, Vancouver Coastal Health	Meeting	January 28, 2013	Project introduction. Discussion of health issue areas.	Spill prevention and clean up. Health monitoring. Contents of pipelines. Exposure pathways. Air quality. Public engagement. Non-chemical pathways: disease, injury, etc.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7
REGIONAL-LEVEL CONSULTATION - ALBERTA							
Hinton Community Health Services	Kelly Armstrong, Aboriginal Health Liaison	Email	April 17, 2013	Discussion of Aboriginal Health Liaison role.	No specific concerns identified.	None.	N/A
Hinton Health Care Centre	Marilyn Lodder, Acute Care Nurse Manager Valerie Spencer, Administrative Assistant	Teleconference	April 16, 2013	Project introduction. Discussion of health issue areas.	Size of Project workforce and schedule. Material Data Safety sheets to accompany workers to hospital. Communication with health system in case of emergency. Communication of emergency response plan.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7
REGIONAL-LEVEL CONSULTATION – BRITISH COLUMBIA							
Fraser Canyon Hospital	Keith McBain, Executive Director, Fraser Canyon Hospital Catherine Wiebe, Site Manager, Fraser Canyon Hospital	Teleconference	June 26, 2013	Project introduction. Discussion of health issue areas.	Size of Project workforce and schedule. Increase in service demand. First aid responders onsite. Emergency management plans.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7

TABLE 3.1-12 Cont'd

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
Fraser Health Authority	Mark Welch, Manager of Psychiatry, Royal Columbian Hospital Helena Summers, Regional manager of substance use programs, Royal Columbian Hospital	Teleconference	Aug 15, 2013	Discussion of mental health and addictions service capacity near Westridge Marine Terminal.	Planning for housing. Healthy worker policies. Job stress. Partnership development.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7
Fraser Health Authority	Elizabeth Robbins, Manager, Stakeholder Relations	Email	Sept 26, 2013	Project introduction. Discussion of health issue areas for Burnaby Hospital.	Communication with hospital during emergency situations. Preparation for spill response. Community-based programs.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7
Interior Health Authority	Greg Baytalan, Senior Public Health Inspector	Teleconference	March 20, 2013	Discussion of environmental health effects and emergency preparedness.	No specific concerns discussed.	None.	N/A
Valemount Healthcare Centre & McBride Hospital	Debbie Strang, Health Service Administrator	Teleconference	April 25, 2013	Project introduction. Discussion of health issue areas.	First aid responders onsite. Traffic issues. Size of Project workforce and schedule. Emergency management plans. Cooperation.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7
Village of Valemount	Anne Yanciw, CAO	Teleconference	July 11, 2013	Social and health discussion.	Food availability at grocery stores. Lack of consideration for outdoor spaces. Social concerns. Parking and housing.	None.	Volume 5B Sections 5.8 and 7.2.8 Volume 5D Community Health Technical Report Volume 7

TABLE 3.1-13

SUMMARY OF CONSULTATION ACTIVITIES FOR FOREST HEALTH

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
PROVINCIAL CONSULTATION - ALBERTA							
Alberta Environment and Sustainable Resource Development	Aaron McGill	Telephone Email	May 14, 2013	Requested annual forest health aerial overview spatial data and Forest Management Unit/Forest Management Area (FMU/FMA) data.	Received all forest health data. No FMA/FMU data provided.	None. Information provided May 14 and 15, 2013.	Volume 5B Section 7.2.4 Volume 5D Managed Forests Areas and Forest Health Technical Report
Alberta Environment and Sustainable Resource Development	Dave Sadowsky	Telephone Email	July 30, 2013	Requested spatial data to identify FMU/FMAs and requested contact information.	--	None. Information provided July 30, 2013.	N/A
PROVINCIAL CONSULTATION – BRITISH COLUMBIA							
Ministry of Forest, Lands and Natural Resource Operations	Megan Williams, Senior Natural Resource Specialist	Email Telephone	December 13, 2012	Requested most up to date timber licensee data for cross-checking with Land and Resource Data Warehouse data.	Community Forest Tenures, Tree Farm Licences and Woodlots not provided.	None. Community Forest Tenures, Tree Farm Licences and Woodlots obtained from Land and Resource Data Warehouse.	N/A
Ministry of Forests, Lands and Natural Resource Operations Kamloops Forest District/Headwaters Forest District	Doug Campbell, Tenures Officer	Email	June 28, 2013	Requested verification and contact information for all timber licensees and woodlot operators in the Chilliwack Forest District.	Additional information provided by Deanna Horvath (Tenures Clerk) on July 10, 2013.	None. Information provided on July 10, 2013.	Volume 5B Section 7.2.4 Volume 5D Managed Forests Areas and Forest Health Technical Report
Ministry of Forests, Lands and Natural Resource Operations Kamloops Forest District	Bage Singh, Tenures Technician	Email	July 11, 2013	Requested verification and contact information for all timber licensees and woodlot operators in the Kamloops Forest District.	Have not received confirmation or contact information for woodlot operators in the Kamloops Forest District. Initial request sent to Dirk Trigg (Tenures) on June 28, 2013 via telephone and email.	--	Volume 5B Section 7.2.4 Volume 5D Managed Forests Areas and Forest Health Technical Report
Ministry of Forests, Lands and Natural Resource Operations Cascades Forest District	Dave Horne, Tenures Officer	Telephone Email	July 26, 2013	Requested verification and contact information for all timber licensees and woodlot operators in the Cascades Forest District.	Waiting for licensee and woodlot contact information. Initial request sent to Len Marsh (Tenures) on July 15, 2013 via telephone and email.	--	Volume 5B Section 7.2.4 Volume 5D Managed Forests Areas and Forest Health Technical Report

TABLE 3.1-14

SUMMARY OF CONSULTATION ACTIVITIES RELATED TO THE HUMAN HEALTH RISK ASSESSMENT

Stakeholder Group/ Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/ Follow-Up Actions/ Comments	Where Issue is Addressed in the Application
FEDERAL CONSULTATION							
Health Canada (BC Region)	Dr. Carl Alleyne, BC Regional Environmental Assessment Coordinator Dr. Gladis Lemus, BC Regional Manager	Meeting	January 28, 2013	Project introduction. Discussion of the planned HHRA methodology.	Health Canada advised that they will be directing particular attention to Aboriginal health. Health Canada expressed an interest in knowing the potential health effects associated with accidents and malfunctions. Health Canada will be interested in knowing the potential short-term as well as long-term health effects associated with the Project, with consideration given to all relevant exposure pathways.	None.	Volume 5B Section 7.5.8 Volume 5D Screening Level Human Health Risk Assessment for Pipelines and Facilities
PROVINCIAL CONSULTATION - ALBERTA							
Alberta Health	Dr. Karina Thomas, Environmental Health Scientist, Health Protection Branch Dr. James Talbot, Chief Medical Officer of Health for Alberta	Meeting	February 4, 2013	Project introduction. Discussion of the planned HHRA methodology.	No specific issues/concern regarding the planned HHRA methodology were identified.	Alberta Health requested that the HHRA team keep them informed of progress as the HHRA is completed.	Volume 5B Section 7.5.8 Volume 5D Screening Level Human Health Risk Assessment for Pipelines and Facilities
LOCAL CONSULTATION - BRITISH COLUMBIA							
Fraser Health Authority (FHA)	Dr. Paul Van Buynder, Chief Medical Health Officer Dr. Nadine Loewen, Medical Health Officer Dr. Goran Krstic, Human Health Risk Assessment Specialist, Health Protection Tim Shum, Regional Director	Meeting	January 28, 2013	Project introduction. Discussion of the planned HHRA methodology.	FHA and VCHA expressed an interest in knowing whether any long-term monitoring of health is planned. FHA and VCHA expressed an interest in knowing the historical effects of the Legacy Line. FHA and VCHA expressed an interest in knowing the potential health effects associated with a spill to an urban environment. FHA and VCHA will be interested in knowing the potential short-term as well as long-term health effects associated with the Project, with consideration given to all relevant exposure pathways.	None.	Volume 5B Section 7.5.8 Volume 5D Screening Level Human Health Risk Assessment for Pipelines and Facilities
Vancouver Coastal Health Authority (VCHA)	Dr. Patricia Daly, Chief Medical Health Officer Dr. James Lu, Medical Health Officer, Richmond Public Health Dr. Richard Taki, Regional Director, Health Protection						
Fraser Valley Regional District (FVRD)	Alison Stewart, Senior Planner, Strategic Planning and Initiatives	Telephone call	March 20, 2013	Project introduction. Discussion of the planned HHRA methodology.	FVRD expressed an interest in knowing the potential effects of the Project on air quality, and subsequently human health, in the FVRD. From a health perspective, Ms. Stewart indicated that the FVRD would be taking their direction from FHA.	None.	Volume 5B Section 7.5.8 Volume 5D Screening Level Human Health Risk Assessment for Pipelines and Facilities

TABLE 3.1-15

SUMMARY OF CONSULTATION ACTIVITIES RELATED TO THE AGRICULTURAL ASSESSMENT

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
FEDERAL CONSULTATION							
Canadian Food Inspection Agency	Elizabeth Powles, Horticulture Specialist	Phone	August 30, 2013	Information on movement of people and equipment.	Biosecurity.	None.	N/A
Canadian Food Inspection Agency	Dr. Ann Allain, Animal Products and By-Products	Phone	August 30, 2013	Animal health.	Biosecurity.	None.	N/A
Canadian Food Inspection Agency	Dominique Pelletier, Senior Horticultural Specialist	Phone	August 30, 2013	Quarantine pests.	Biosecurity.	None.	N/A
PROVINCIAL CONSULTATION – ALBERTA							
Alberta Agriculture and Rural Development	Dale Kaleil, Senior Production Economist	Phone	July 5, 2013	Economic effects of pipeline construction on agriculture.	Financial effects and quantification of effects.	None.	Volume 5B Section 7.2.7 Volume 5D Agricultural Assessment Technical Report
PROVINCIAL CONSULTATION – BRITISH COLUMBIA							
BC Ministry of Agriculture	Geoff Hughes-Games, Provincial Soil Specialist	Meeting	June 11, 2013	Discussions on impact of pipeline construction on agriculture.	Soil handling. Communication. Drainage. Pipe depth. Field access.	None.	Volume 5A Sections 5.2 and 7.2.2 Volume 5B Section 7.2.4 Volume 5C Soils Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
BC Ministry of Agriculture	Orlando Schmidt, Provincial Environmental Soil Specialist	Meeting	June 11, 2013	Discussions on effect of pipeline construction on agriculture.	Soil handling. Communication. Drainage. Pipe depth. Field access.	None.	Volume 5A Sections 5.2 and 7.2.2 Volume 5B Section 7.2.4 Volume 5C Soils Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B

TABLE 3.1-15 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
BC Ministry of Agriculture	Francis Mienga Manager Agriculture and Wildlife Program	Phone	July 3, 2013	Effect of pipeline construction on ranches.	Water access. Weeds and invasive plants. Fencing.	None.	Volume 5A Sections 5.3, 5.9, 7.2.3 and 7.2.9 Volume 5B Section 7.2.4 Volume 5C Groundwater Technical Report Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
BC Ministry of Agriculture	Jim Forbes, Rangeland Specialist	Phone	July 10, 2013	Effect of pipeline construction on ranches.	Invasive species. Soil handling. Disruption to operations.	None.	Volume 5A Sections 5.2, 5.9, 7.2.2 and 7.2.9 Volume 5B Section 7.2.4 Volume 5C Soils Technical Report Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
BC Ministry of Agriculture	Leila Salm, Thompson area Range Officer	Phone	July 3, 2013	Effect of pipeline construction on ranches.	Weeds and invasive plants.	None.	Volume 5A Sections 5.9 and 7.2.9 Volume 5B Section 7.2.4 Volume 5C Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
BC Ministry of Agriculture	Kathleen Zimmerman, District Agrologist	Phone	July 30. 2013	Effect of pipeline construction on berry crops.	Dust and dust control.	None.	Volume 5B Section 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6B

TABLE 3.1-15 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
BC Agriculture Land Commission	Colin Fry Brain Underhill Executive Directors	Meeting	July 15, 2013	General discussion on impact of pipeline construction on agriculture.	Depth of pipe. Proper soil handling. Fair compensation to farmers. Duration of construction. Weed control. Disruption to farm infrastructure (drainage and irrigation). Dust on blueberries.	None.	Volume 5A Sections 5.2, 5.9, 7.2.2, 7.2.4 and 7.2.9 Volume 5B Sections 7.2.4 and 7.2.7 Volume 5C Soils Technical Report Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
OTHER CONSULTATION							
Organic Dairy Farmer	David Janssen, Owner	Phone	July 26, 2013	Impact of noise on dairy cows.	Noise effect on milk production.	None.	Volume 5A Section 7.2.6 Volume 5C Agricultural Assessment Technical Report Volume 6B
Blueberry farmer and processor	Dave Sandu, Owner	Meeting	July 26, 2013	Effects of pipeline construction on blueberry harvesting and fruit quality.	Dust effects. Routing angle through fields.	None.	Volume 5A Section 7.2.4 Volume 5B Volume 7.2.4 Volume 5C Air Quality and Greenhouse Gas Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
Nursery owner Past President BC Landscape & Nursery Association	Gord Mathies, owner	Meeting	June 18, 2013	Effects of pipeline construction on field nurseries.	Irrigation lines. Drain lines. Routing angle through fields. Consultation early. Compensation. Access.	None.	Volume 5A Section 7.2.3 Volume 5B Section 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6B

TABLE 3.1-15 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
BC Landscape & Nursery Association	Hedy Dyck, CEO	Meeting	June 23, 2013	Effects of pipeline construction on field and container nurseries.	Irrigation lines. Drain lines. Routing angle through fields. Consultation early. Compensation. Access.	None.	Volume 5B Section 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6B
Nursery owner Past President BC Landscape & Nursery Association	Bill van Belle Owner on TMPL	Meeting	June 23, 2013	Financial effects of pipeline construction on container nurseries.	Compensation. Damage to infrastructure including irrigation, water recirculation and automated systems.	None.	Volume 5B Section 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6B
Poultry Farmer including organic, broilers, and specialty birds	Garrett Broatch, Owner	Phone	July 25, 2013	Financial impact of pipeline construction on poultry farms.	Financial effect. Biosecurity impact.	None.	Volume 5B Section 7.2.7 Volume 5D Agricultural Assessment Technical Report
Agricultural Advisory Committee Abbotsford Greenhouse Vegetable Industry	Marcus Janzen Member Abbotsford Agricultural Advisory Committee	Phone	August 15, 2013	Financial impact of pipeline construction on farms.	Consultation with farmers.	None.	Volume 3C
Owner/manager Guichon Ranch	Allison Guichon Owner	Meeting	July 29, 2013	Effect of pipeline construction on ranches.	Weeds. Reclamation. Consultation with landowners and tenure holders. Water and irrigation. Fencing. Public access. Biosecurity.	None.	Volume 3C Volume 5A Sections 5.3, 5.9, 7.2.3 and 7.2.9 Volume 5B Section 7.2.4 Volume 5C Groundwater Technical Report Fisheries (British Columbia) Technical Report Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Socio-Economic Technical Report Volume 6B

TABLE 3.1-15 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
Owner/manager Pine Ranch	Bill Strand, Owner	Meeting	July 29, 2013	Effect of pipeline construction on ranches.	Weeds. Reclamation. Consultation with landowners and tenure holders. Water and irrigation. Fencing. Public access.	None.	Volume 3C Volume 5A Sections 5.3, 5.9, 7.2.3 and 7.2.9 Volume 5B Section 7.2.4 Volume 5C Groundwater Technical Report Fisheries (British Columbia) Technical Report Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
Southern Interior Weed Management Committee	Jo-Anne Fox Program Manager	Phone	July 3, 2013	Effect of pipeline construction on weeds.	Weed management. Consultation with owners and tenure holders. Fencing. Water supply. Access roads.	None.	Volume 3C Volume 5A Sections 5.3, 5.9, 7.2.3 and 7.2.9 Volume 5B Section 7.2.4 Volume 5C Groundwater Technical Report Fisheries (British Columbia) Technical Report Vegetation Technical Report Volume 5D Agricultural Assessment Technical Report Volume 6B
Greenbelt Veterinary Services Ltd.	Dr. Dick Clegg, Veterinary	Phone	July 25, 2013	Effect of pipeline construction on animal health.	Economic effect of pipeline expansion on dairy cows in the disturbance zone. Mitigation measures. Biosecurity.	None.	Volume 6B Volume 6C

TABLE 3.1-15 Cont'd

Stakeholder Group/Agency Name	Name and Title of Contact	Method of Contact	Date of Consultation Activity	Reason for Engagement	Issues/Concerns	Commitments/Follow-Up Actions/Comments	Where Issue is Addressed in the Application
BC Chicken Marketing Board	Kathy Erickson	Meeting	July 17, 2013	Effect of pipeline construction on poultry health and productivity.	Noise. Vibration. Biosecurity.	None.	Volume 5B Section 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6B
Dairy Farmer	Bill Kools	Phone	July 25, 2013	Financial effect of construction of dairy farms.	Value of forage. Short term and long term effects.	None.	N/A

3.2 Aboriginal Engagement

Since April 2012, Trans Mountain has engaged with Aboriginal communities that might have an interest in the Project or have Aboriginal interests potentially affected by the Project, based on the proximity of their community and their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. Trans Mountain respects the Aboriginal and treaty rights, unique culture, diversity, languages and traditions of Aboriginal people. Trans Mountain acknowledges the importance of teaching, the significance of culture and language and the considerable traditional knowledge that has been passed on for generations and, as such, is committed to continued listening, learning and working with Aboriginal people to ensure that knowledge and advice is considered and incorporated in the Project. The Aboriginal Engagement Program is based on mutual respect, timeliness, accountability and transparency in order to build positive and productive relationships for the long-term.

This subsection provides information on the Aboriginal Engagement Program for the Project and describes how the results of Project engagement activities relating to the ESA were gathered as well as how these results have been incorporated into the application. The Aboriginal Engagement Program was developed in accordance with the KMC Aboriginal Policy and Volume 3B provides detailed information on Trans Mountain's approach to the Aboriginal Engagement Program as well as detailed information on the Trans Mountain vision and the principles and goals of the engagement program and engagement activity to date.

For purposes of this application, the engagement activities conducted to date are reported up to November 30, 2013. The results of ongoing engagement efforts will be reported in supplemental filings.

3.2.1 Design of Aboriginal Engagement Program

3.2.1.1 Identification of Aboriginal Communities and Aboriginal Groups

Beginning in 2012, Trans Mountain worked in collaboration with the federal government and provincial ministries to identify Aboriginal communities and groups for engagement. Aboriginal communities in BC were identified as those within a 10 km buffer of the corridor. Of these, there are Aboriginal communities who are negotiating treaties within the BC Treaty Commission process and those that are not currently engaged in the BC treaty process. Aboriginal communities in Alberta were identified as those within a 100 km buffer of the corridor.

Trans Mountain also contacted each of the provincial government ministries – the BC Ministry of Aboriginal Relations and Reconciliation and the Alberta Ministry of Aboriginal Affairs and received guidance on the development of engagement lists for the Project. In addition to engagement with the federal and provincial ministries, further engagement took place in early 2012 with representatives from the Major Projects Management Office (MPMO), NEB, and BC Oil and Gas Commission (OGC) regarding communities and groups to include in the Aboriginal Engagement Program.

The result was a comprehensive list of 103 Aboriginal communities with traditional territories located within 10 km of the corridor in BC and 100 km in Alberta, and two non-land based BC Métis groups included in the engagement list: the BC Métis Federation (BCMF); and the Métis Nation of BC (MNBC). In total, Trans Mountain is engaged with 105 Aboriginal communities and Aboriginal groups. Geographically, in Alberta and BC, there are substantial areas of shared territory with the 103 communities engaged.

Details regarding the identification of communities that might have an interest in the Project or having Aboriginal interests potentially affected by the Project are provided in Volume 3B.

3.2.1.2 Aboriginal Communities and Aboriginal Groups Engaged

The following is a list of the 103 Aboriginal communities and two non-land based BC Métis groups in proximity to the pipeline corridor and marine corridor that was assessed pursuant to the NEB's instruction in their List of Issues, issued July 29, 2013, that might have an interest in the Project or have Aboriginal interests potentially affected by the Project.

Aboriginal Communities Located in the Edmonton to Alberta/British Columbia Border Region

Alexander First Nation	Louis Bull Tribe	Samson Cree Nation
Alexis Nakota Sioux Nation	Métis Regional Council Zone IV of the Métis Nation of Alberta (Region 4)	Sturgeon Lake Cree Nation
Aseniwuche Winewak Nation	Montana First Nation	Sunchild First Nation
Enoch Cree Nation	Nakcowinewak Nation of Canada	
ErmineskinCree Nation	O'Chiese First Nation	
Foothills Ojibway First Nation	Paul First Nation	
Horse Lake First Nation	Saddle Lake Cree Nation	

Aboriginal Communities Located in the Alberta/British Columbia Border to Kamloops Region

Adams Lake Indian Band	Lhtako Dene Nation	Splatsin First Nation
Aseniwuche Winewak Nation	Neskonlith Indian Band	Tk'emlúps te Secwepemc
Ashcroft Indian Band	Oregon Jack Creek Band	Toosey Indian Band
Canim Lake Band (Tsq'escenemc Nation)	Shuswap Indian Band	Whispering Pines (Clinton Indian Band)
Little Shuswap Indian Band	Simpcw First Nation	Xat'sull First Nation (Soda Creek)
Lheidli T'enneh	Skeetchestn First Nation	

Aboriginal Communities Located in the Kamloops to Hope Region

Boothroyd Band	Lower Similkameen Indian Band	Siska Indian Band
Boston Bar Band	Lytton First Nation	Skuppah Indian Band
Coldwater Indian Band	Nicomen Indian Band	Spuzzum First Nation
Cook's Ferry Indian Band	Nooaitch Indian Band	St'uxwtews (Bonaparte Indian Band)
Kanaka Bar	Penticton Indian Band	Upper Nicola Indian Band
Lower Nicola Indian Band	Shackan Indian Band	Upper Similkameen Indian Band

Aboriginal Communities Located in the Hope to Burnaby Terminal/Burrard Inlet Region

Aitchelitz First Nation	Popkum First Nation	Squamish First Nation
Chawathil First Nation	Qayqayt First Nation	Squiala First Nation
Cheam First Nation	Scowlitz First Nation	Sts'ailes Band (Chehalis Indian Band)
Katzie First Nation	Seabird Island Band	Sumas First Nation
Kwantlen First Nation	Semiahmoo First Nation	Tsawwassen First Nation
Kwaw-kwaw-aplit First Nation	Shxw'ow'hamel First Nation	Tsleil-Waututh Nation
Kwikwetlem First Nation	Shxwha:y Village	Tzeachten First Nation
Leq'á:mel First Nation	Skawahlook First Nation	Union Bar First Nations
Matsqui First Nation	Skowkale First Nation	Yakweakwioose First Nation
Musqueam First Nation	Skwah First Nation	Yale First nation
Peters Indian Band	Soowahlie First Nation	

Aboriginal Communities Located in the Marine Corridor

Cowichan Tribes	Pacheedaht First Nation	Songhees Nation
Esquimalt Nation	Pauquachin First Nation	Stz'uminus First Nation (Chemainus)
Halalt First Nation	Pacheedaht First Nation	T'Sou-ke First Nation
Hwlitsum First Nation	Scia'new Indian Band (Beecher Bay)	Tsartlip First Nation
Lake Cowichan First Nation	Sechelt Indian Band	Twawout First Nation
Lyackson First Nation	Snaw-Naw-As (Nanoose)	Tseycum First Nation
Malahat First Nation	Snuneymuxw First Nation	Stz'uminus First Nation (Chemainus)

Aboriginal Groups – Non-Boundary Specific

BC Métis Federation
Métis Nation of BC

3.2.1.3 Associations, Councils and Tribes

Trans Mountain has also engaged with multiple Aboriginal associations, councils and tribes, of which many of the Aboriginal communities listed in Section 3.2.1.3 are members. Additional details are provided in Volume 3B.

Cowichan Nation Alliance

The Cowichan Nation Alliance is an organization that was identified by Trans Mountain as an entity that might have an interest in the Project or having Aboriginal interests potentially affected by the Project. Made up of eight member communities, for the purposes of the Project, Trans Mountain is engaging with the following member communities who have indicated an interest in the Project:

- Cowichan Tribes;
- Halalt First Nation;
- Hwlitsum First Nation;
- Penelakut Tribe; and
- Stz'uminus First Nation.

Trans Mountain continues to engage with individual member communities and the Cowichan Nation Alliance to further enhance the Aboriginal Engagement Program.

Okanagan Nation Alliance

The Okanagan Nation Alliance is an organization that was identified by Trans Mountain as an entity that might have an interest in the Project or having Aboriginal interests potentially affected by the Project. Made up of eight member communities, for the purposes of the Project, Trans Mountain is engaged with the following four member communities who have indicated an interest in the Project:

- Lower Similkameen Indian Band;
- Penticton Indian Band;
- Upper Nicola Band; and
- Upper Similkameen Indian Band.

Trans Mountain continues to engage with the individual member communities and the Okanagan Nation Alliance to further enhance the Aboriginal Engagement Program.

Nicola Tribal Association

The Nicola Tribal Association is an organization that was identified by Trans Mountain as an entity that might have an interest in the Project or having Aboriginal interests potentially affected by the Project. Made up of seven member nations, for the purposes of the Project, Trans Mountain is engaged with the following Nicola Tribal Association member communities who have indicated an interest in the Project:

- Nicomen Indian Band;
- Nooaitch Indian Band; and
- Shacken Indian Band.

Trans Mountain continues to engage with the individual member communities and the Nicola Tribal Association to further enhance the Aboriginal Engagement Program.

Stkemlupsemc Te Secwepemc

Stkemlupsemc Te Secwepemc is an organization that was identified by Trans Mountain as an entity that might have an interest in the Project or having Aboriginal interests potentially affected by the Project.

As an administrative body working with communities with shared territories, for the purposes of the Project, Trans Mountain is engaged with the following Stkemlupsemc Te Secwepemc member communities who have indicated an interest in the Project:

- Skeetchestn First Nation; and
- Tk'emlups te Secwepemc.

Trans Mountain continues to engage with the individual member communities and the Stkemlupsemc Te Secwepemc to further enhance the Aboriginal Engagement Program.

Ts'elxweyeqw Tribe Management Limited

Ts'elxweyeqw Tribe Management Limited is an organization that was identified by Trans Mountain as an entity that might have an interest in the Project or having Aboriginal interests potentially affected by the Project. Ts'elxweyeqw Tribe Management Limited comprises the following communities (all of which are engaged with the Project):

- Aitchelitz First Nation;
- Shxwha:y Village;
- Skowkale First Nation;
- Soowahlie Indian Band;
- Squila First Nation;
- Tzeachten First Nation; and
- Yakweakwioose First Nation.

For the purposes of a Capacity Funding Agreement, the following Aboriginal communities are engaged with Ts'elxweyeqe Tribe:

- Kwaw-kwaw-apilt First Nation; and
- Shwah First Nation.

Additionally, for the purposes of an Integrated Cultural Assessment, the following two Aboriginal communities are engaged with the Project:

- Cheam First Nation; and
- Sumas First Nation.

Trans Mountain continues to engage with the individual member communities and Ts'elxweyeqw Tribe Management Limited to further enhance the Aboriginal Engagement Program.

3.2.1.4 Engagement Method

The Aboriginal Engagement Program uses a comprehensive Aboriginal engagement process led by experienced engagement advisors in Alberta and BC, working with a group of professionals who are specialised in the areas of Aboriginal relations, law, economic development, education, training,

employment and procurement. Trans Mountain's engagement process for the Project is flexible, allowing each community and group to engage in meaningful dialogue in the manner they choose and in a way that meets their objectives and values.

In May 2012, the Trans Mountain Aboriginal engagement team was created and Aboriginal engagement team field advisors were assigned to each of the groups based on their knowledge and experience. Each advisor is a professional experienced in engagement.

The Aboriginal Engagement Program focuses on:

- enhancing trusting and respectful relationships;
- sharing Project information – Project scope, routing options, safety and emergency response, scheduling, environmental field study components;
- negotiating group and community-specific protocols, capacity agreements, Letters of Understanding and Mutual Benefit Agreements, as appropriate;
- facilitating Traditional Land Use (TLU) studies, socio-economic interviews and Traditional Ecological Knowledge (TEK) collection;
- identifying potential effects and addressing concerns;
- discussing the adequacy of planned mitigation and opportunities; and
- identifying education, training, employment and procurement opportunities.

3.2.1.5 Comprehensive Aboriginal Engagement Process

Acting as a framework for the engagement process, the following activities provide guidance to ensure a comprehensive and consistent process in working with each of the communities identified by Trans Mountain.

As outlined in Volume 3B, each community has the opportunity to engage with Trans Mountain in the manner they choose, depending on Project interests and potential effects:

- Project announcement;
- initial contact with Aboriginal community or Aboriginal group;
- meetings with Chief and Council and meetings with staff;
- negotiate and execute confidential letter of understanding/capacity agreement;
- host community information session(s);
- conduct TLU studies and socio-economic interviews;
- identify interests and concerns;
- identify mitigation options;
- provide additional capacity funding, if required; and
- negotiate and execute confidential mutual benefits agreement.

In December 2013, at the time of filing, Trans Mountain continues to actively engage with all Aboriginal communities that have been identified as having an interest in the Project or have Aboriginal interests potentially affected by the Project. Engagement with Aboriginal communities is at varying stages in the

engagement process. Specific detail about the engagement activities and the status of engagement with each group can be found in Section 1.5 of Volume 3B and within Appendix A of Volume 3B.

3.2.1.6 Incorporating Aboriginal Traditional Land Use Studies, Traditional Marine Resource Use Studies and Traditional Ecological Knowledge

Traditional Land and Resource Use/Traditional Marine Resource Use

TERA was commissioned to assist in the collection of traditional land and resource use information with potentially affected Aboriginal communities that focused on the current use of Crown lands and waters for traditional activities potentially disturbed by pipeline and facility construction and clean-up activities, including associated physical works and activities. Although regulation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in accordance with the NEB's direction from their List of Issues for the Project, released on July 29, 2013. The engagement activities with potentially affected Aboriginal communities in relation to the marine vessel traffic are described in Volume 8A.

Trans Mountain and TERA acknowledge the unique relationship that has evolved between the Aboriginal people and their surrounding physical environment. This physical environment includes the lands, waters, resources and events that have shaped and sustained the local Aboriginal people, their culture and their communities. In Volume 5B, TERA will refer to this relationship as "traditional land use" or "traditional land and resource use", and both shall be interpreted broadly, respectful of the Aboriginal worldview, not limited to lands, but be inclusive of all aspects of the terrestrial and marine environments.

The aim of the TLU studies is to assess and mitigate effects of the Project on current use of Crown lands for traditional activities and on identified TLU sites. This is achieved by meeting the following objectives:

- determine the extent and general nature of each community's current use of lands for traditional activities relative to the Project;
- identify existing concerns and potential effects of the Project on traditional land and resource use for baseline scoping and selection of social or environmental indicators for the effects assessment;
- provide traditional knowledge information, where appropriate, for the assessment of potential Project-related effects on traditional land and resource use; and
- establish appropriate site-specific mitigation measures to address concerns raised relative to the Project regarding traditional land and resource use.

Following Project initiation, Trans Mountain began facilitation of the TLU studies conducted by interested Aboriginal communities for the Project (see Traditional Land and Resource Use Technical Report of Volume 5D). The Project scope, timetable and location were discussed. Project information packages, which included a Project description, facts on the nature, timing, scope and location of the Project and relevant contact information for communication with Trans Mountain and TERA, were sent to each community and meetings were subsequently scheduled. Communities were also provided with copies of the proposed TLU study methods and a draft outline of TERA's TLU study work plan. The initiation of TLU studies, either as TERA-facilitated or community directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies.

Trans Mountain also provided funding to assist Aboriginal communities that elected to conduct their own community-directed TLU studies. These communities often engaged other consultants to provide technical support and assistance with their TLU studies for the Project. During these studies, community representatives are asked to contribute to the discussion of potential Project-related effects on TLU and to participate in the discussion of potential mitigation measures to reduce potential Project-related effects.

TERA has prepared a separate Traditional Land and Resource Use Technical Report that outlines Trans Mountain's information collection efforts for the assessment of potential adverse effects of the Project on

current land use for traditional purposes (Volume 5D). Volume 5D also provides a description of how TLU studies were developed for each interested Aboriginal community. The TLU information collected has been incorporated into the Traditional Land and Resource Use Technical Report and used to assist in the assessment of the potential effects of the Project.

Appendix A of Volume 3B provides a summary of the meetings and interviews that took place for the traditional land and resource use component of the socio-economic assessment. The issues that were raised and where they are considered in the traditional land and resource use assessment are also summarized in Table 3.2-2.

3.2.1.7 Traditional Ecological Knowledge

TEK does not have a stand-alone section in the ESA. However, TEK information has been incorporated throughout Volumes 5A and 5B, where appropriate. It has contributed by supplementing the methodology of the archaeological field study. TEK has also contributed by adding results that western science may not have gathered or considered, confirmed results that had been collected through scientific field studies as well as identifying and confirming issues of concern that would need to be addressed in the ESA.

Review of collected TEK and discussions of potential Project-related effects and mitigation strategies described in this ESA were conducted directly with participating community members during the field surveys. Approximately 28 Aboriginal communities were engaged in the TEK program with over 200 participants involved in field surveys. Confirmation of the accuracy of the information incorporated and approval of the inclusion of the confidential and proprietary information in Project planning occurred in the field during community follow-up results review (Table 3.2-1). The TEK collected has been incorporated into the heritage resources setting of this ESA (Section 5.1) and used to assist in the assessment of the potential effects of the Project. The issues that were raised and where they are considered in Volume 5B ESA – Socio-Economic are summarized in Table 3.2-2.

3.2.2 Implementation

A number of methods have been used to inform Aboriginal communities, obtain feedback and identify issues about the Project including: Project letters, meetings, phone conversations, email dialogue, newsletters; public information sessions; the Project website and over 4,000 engagement activities have been carried out to date. The results of these engagement efforts, in conjunction with the collection of Traditional Land Use (TLU), TEK and socio-economic information (Sections 3.2.1.5, 3.2.2.4, and 3.2.2.5) have contributed to the development of the ESA for the pipelines and facilities components of the Project (Volumes 5A and 5B), including mitigation and enhancement measures. A detailed overview of the engagement activities implemented to date and a detailed summary of engagement with each Aboriginal community is available in Volume 3B.

3.2.2.1 Employment, Education and Training

Trans Mountain is committed to supporting the sustainability of Aboriginal communities through the creation of employment opportunities over the life of the proposed Project and is committed to the development of an Aboriginal workforce through effective and accessible training programs to maximize participation in available employment opportunities.

As detailed in Volume 3B, Trans Mountain is working in partnership with communities to achieve the objectives of the Aboriginal Peoples Training Policy to enhance employment opportunities with all interested communities, including marine communities.

3.2.2.2 Project Letters, Update Newsletters and Trans Mountain Website

The communications materials forwarded communities that might have an interest in the Project or have Aboriginal interests potentially affected by the Project by Trans Mountain included the following:

- Project notification and introduction letter;

- advanced notice of field study work letter and field study process brochure;
- Project update letters and newsletters including updates to the Project website content, regulatory filings and participation funding;
- letter invitations to meet to discuss routing options for those communities where the existing TMPL system encounters Indian Reserve (IR) lands; and
- Project Description as filed with the NEB.

The formal kick-off for Project engagement began with a Project notification letter sent from Ian Anderson, President of KMC, on May 29, 2012. Three versions of the letter were created and distributed depending on community location and proximity to the pipeline right-of-way.

The ESA Approach Summary document issued in March 2013 intended to provide an overview of Trans Mountain's understanding of the environmental and socio-economic context of the Project at the time of its release. Since its release, Trans Mountain continues to actively engage with regulatory authorities, stakeholders and Aboriginal communities on the methods, indicators and spatial boundaries listed in the approach document. Methods, indicators, and spatial boundaries for many of the environmental and socio-economic elements were revised based on comments received. In May 2013 Trans Mountain filed the Project Description for the Project with the NEB, which included updated information on key issues and indicators.

Communication materials have been compiled to meet NEB filing requirements and details (including samples) of these materials are provided in Volume 3B.

3.2.2.3 Project Meetings

Following distribution of the Project notification letter, Trans Mountain contacted Aboriginal communities to set up in-person meetings to discuss the Project with Chief and Council, staff and community members. The primary purpose of Project meetings is to share Project-related information. For initial meetings specifically with Chief and Council or community staff, the primary objective is to determine the community's interest in engagement and to develop a process for involvement in Project activities. A presentation titled "Aboriginal Engagement Program: Trans Mountain Expansion Project" is used during initial meetings to share project details with attendees (see Volume 3B). Copies of the presentation were left with attendees post-meeting. Routing maps and operational information is also discussed at Project meetings and questions from meeting attendees are addressed.

Meetings and community gatherings were arranged with the assistance of community council leadership and staff. In general, open houses and introductory meetings were conducted by both Trans Mountain and TERA, while TERA conducted subsequent meetings as representatives of Trans Mountain.

Meetings with Aboriginal leadership and staff, harvesters and trappers were an important method of engagement. Meetings were held to:

- introduce the Project (timelines, Project description, regulatory requirements, process);
- provide a broad understanding of the NEB process;
- discuss methods for conducting engagement in the community;
- negotiate work plans and funding for those Aboriginal communities who propose to conduct their own TLU studies or socio-economic data collection;
- initiate environmental field work, TLU studies and socio-economic assessment discussions;
- identify economic development opportunities;

- identify capacity issues with Aboriginal communities to address ability of the community to participate in the Project review;
- identify community concerns, interests and opportunities;
- obtain input and feedback on environmental field studies;
- identify site-specific concerns and interests for harvesters;
- identify site-specific locations important for historical and cultural reasons; and
- determine the TLU approach.

Meetings with specific communities are summarized in Volume 3B. Table 3.2-2 provides further information regarding issues and concerns identified through Project-related meetings with Aboriginal communities.

3.2.2.4 Environmental Field Program Participation

The purpose of Aboriginal participation during the environmental field program is to incorporate Aboriginal views and the additional knowledge of the land that has accumulated over generations and passed down from the Elders into the consideration of potential Project-related environmental effects. The collection of TEK for the Project focused on Aboriginal additional knowledge of the land and field reconnaissance was conducted along Crown lands potentially disturbed by Project construction, including associated physical works and activities. The objectives of Aboriginal participation during the archaeological field surveys are to:

- document the TEK of Aboriginal communities;
- augment the design and execution of the field surveys;
- inform baseline/existing conditions;
- identify potential effects of the Project on environmental resources;
- integrate TEK into the consideration and mitigation of environmental effects; and
- contribute to final Project design.

TERA, on behalf of Trans Mountain, was commissioned to facilitate the participation of potentially affected Aboriginal communities during the archaeological field studies conducted for the Project. Engagement for the Project was initiated in spring 2012 and continued throughout 2013. Opportunities for Project participation were made available to potentially affected Aboriginal communities that have an interest in the Project, based on their proximity to the Project or their assertion of traditional and cultural rights of the land.

An important issue identified by the participating Aboriginal communities was the need for their participation and contribution to the archaeological field programs, while balancing capacity limitations in their respective lands departments. The field program was designed to provide Aboriginal community members with the opportunity to provide TEK information to the ESA. Translators were made available in the field upon the request of a given community, as warranted. Dates detailed in Table 3.2-1 may not correspond to dates noted in the heritage resource setting (Section 5.1). The reason for this discrepancy is that additional time was spent in the field with Aboriginal participants for mobilization and demobilization to study areas, pre-field work meetings, wrap up meetings and to evaluate alternate routes.

The methods used to determine how participants were to be involved in Project field surveys were common to all Aboriginal communities. Each field survey was discussed with the community, usually with

staff from the lands department. This discussion included the details regarding the type of work to be conducted, the timing and the proposed locations. Based on the described field work to be conducted, the Aboriginal communities chose their own members who would participate in each program. The participating Aboriginal communities are listed in Table 3.2-1 from east to west in relation to the Project.

TABLE 3.2-1

ARCHAEOLOGICAL FIELD STUDY PARTICIPATION FOR THE PROJECT

Aboriginal Community	Dates	Follow-Up Results Review
Edmonton to Hinton Segment		
Saddle Lake Cree Nation	May 22 to 31, 2013 June 10 to 19, 2013	November 28, 2013
Alexander First Nation	May 22 to 31, 2013 June 5 to 19, 2013	November 28, 2013
Samson Cree Nation	May 22 to 31, 2013 June 5 to 19, 2013	November 28, 2013
Ermineskin Cree Nation	May 22 to 31, 2013 June 5 to 19, 2013	October 31, 2013
Montana First Nation	May 22 to 31, 2013 June 5 to 12, 2013	November 28, 2013
Louis Bull Tribe	May 24 to 31, 2013	November 28, 2013
Alexis Nakota Sioux First Nation	May 22 to 31, 2013 June 5 to 19, 2013	To be determined
Paul First Nation	May 24 to 31, 2013 June 10 to 19, 2013	November 8, 2013
Nakcowinewak Nation of Canada	July 4 to 8, 2013 July 16 to 19, 2013	November 25, 2013
Sunchild First Nation	May 22 to 31, 2013 June 10 to 19, 2013 July 3 to 8, 2013 July 16 to 22, 2013	November 28, 2013
Black Pines to Hope Segment		
Lower Nicola Indian Band	July 26, 2013	November 28, 2013
Nicola Tribal Association	July 26, 2013	November 28, 2013
Hope to Burnaby Segment		
Chawathil First Nation	July 31, 2013	November 28, 2013

A Band Counsel Resolution was received by Trans Mountain, which delegated authority to the Nicola Tribal Association to act on behalf of Nooaitch Indian Band, Nicomen Indian and Shackan Indian Band for Project engagement.

During the field surveys, traditional methods of resource procurement were discussed, as well as modern methods currently employed. Seasonality of resource harvesting was also important information shared by the Aboriginal participants. Geographical locations were identified, as were areas that are not used and the reasons why. Potential mitigation measures to reduce any Project-related effects on a resource were also discussed during the archaeological field surveys. Open discussions occurred regularly between participants and archaeologists regarding the resources present and available to Aboriginal communities. These discussions were important to help build relationships among the field crews. Aboriginal participants spoke about aspects of the environment that were important to them and the importance of the resource from a western science perspective was also discussed. The TEK collected during the archaeological field surveys has added results that western science may not have gathered or considered, confirmed results that had been collected through the field surveys, as well as identified and confirmed issues of concern to be addressed in the ESA. The TEK collected is also used to assist in the review of potential Project-related effects on heritage resources.

3.2.2.5 Socio-Economic Interviews

Socio-economic engagement with participating Aboriginal communities occurred in parallel with Trans Mountain's Aboriginal Engagement Program. Activities included one-on-one meetings with leaders and staff members, and meetings, interviews and discussions with people living in the area. Additionally, while TLU studies have been initiated separately from the socio-economic assessment and TEK was provided and recorded during the various environmental field studies, it is often the case that information related to socio-economic elements (*e.g.*, cabin locations, resource use and employment and economy concerns) is provided during the meetings and discussion associated with TLU and TEK. As a result, information made available from the non-confidential TLU study reports and the TEK discussions as it relates to the socio-economic elements has been incorporated into the socio-economic assessment.

Trans Mountain also provided funding to assist Aboriginal communities that elected to conduct their own community directed socio-economic data collection. These communities often engaged other consultants to provide technical support and assistance with their socio-economic data collection for the Project.

TERA has prepared a separate Socio-Economic Technical Report that outlines Trans Mountain's information collection efforts for the assessment of potential adverse effects of the Project on socio-economic elements (Volume 5D). Volume 5D also provides a description of how socio-economic interviews and third-party socio-economic studies were developed for each interested Aboriginal community. The socio-economic information collected has been incorporated into the Socio-Economic Technical Report and used to assist in the assessment of the potential effects of the Project.

Appendix A of Volume 3B provides a summary of the meetings and interviews that took place for the socio-economic component of the ESA. The issues that were raised and where they are considered in the socio-economic assessment are also summarized in Table 3.2-2.

3.2.2.6 Economic Development

One of the goals of Aboriginal Engagement Program is to work collaboratively with Aboriginal communities to support access to economic development opportunities that will arise from the Project. These include employment and procurement opportunities and, where possible, education, training and community investments to maximize access to these opportunities. To identify procurement prospects, Project staff work with Aboriginal communities to identify Aboriginal businesses that are interested in contracting opportunities. Trans Mountain has developed, in partnership with KMC's procurement team, an Aboriginal Procurement Policy to provide guidance and allowances for facilitating Aboriginal participation in the Project.

With regard to employment, Trans Mountain recognizes that the fast growth rate of Aboriginal population will have a substantial effect on the available workforce in the future and there is a need for proactive program development in the areas of education and training to support employment opportunities. Through the Aboriginal Engagement Program, employment opportunities are being shared with each Aboriginal community and a capacity inventory for employment within the communities is being encouraged. The content will then be used for the realization of employment benefits with both Trans Mountain and prime contractors during the Project. In partnership with KMC, Trans Mountain has worked with Aboriginal communities regarding the Youth Summer Work Project at the Burnaby terminal. Three youths were hired during the summer of 2013, two from Kwikwetlem First Nation and one from Kwantlen First Nation.

Regarding Education and Training, the Project dedicates staff to work with Aboriginal communities to identify workforce development opportunities and enhance skill development related to the Project. Trans Mountain's Aboriginal Peoples' Training Policy is focused on creating initiatives that increase the long-term capability for Aboriginal people to participate in the economy and to share in the success of the Project. In partnership with the First Nation Emergency Services Society, Trans Mountain has engaged with a number of Aboriginal communities in BC to pilot an emergency response training program. Approximately 40 participants took part in the training in July and August, 2013.

Community Investment, through the Aboriginal Engagement Program, takes the form of sponsorships, cultural events and festivals, cultural awareness workshops and other community development initiatives. Specific to the Project, Trans Mountain will work with Aboriginal communities to support areas of importance that will drive benefits to the community pre-construction, during and post-construction.

Through the creation of partnerships and shared goals between Trans Mountain and Aboriginal communities, economic development will take place and all parties can work towards achieving mutually-beneficial Project-based or long-term goals.

3.2.3 Summary of Outcomes of the Aboriginal Engagement Program for Socio-Economic Elements

The results of engagement have helped refine the ESA for the Project. With this information, Trans Mountain identified issues, addressed concerns and responded to questions. Engagement has also provided Aboriginal communities with an understanding of the Project.

Although a wide range of issues were raised by community members and representatives throughout the Aboriginal engagement process, recurring themes have emerged, including the following:

- potential environmental effects of spills on land and in water and the related effects to traditional activities;
- potential construction and operation effects on traditional hunting and fishing areas, gathering areas, sacred sites and heritage resources;
- need to resolve historical issues first, before participating in the Project review;
- need for Project-related employment, skills development, contracting opportunities on both the existing and proposed expansion systems;
- additional economic incentives including preferred procurement opportunities, revenue sharing, community enhancement opportunities and equity participation; and
- ongoing respectful and meaningful engagement including participation in environmental field studies, capacity funding and TLU study funding.

Results of the engagement have been considered and incorporated throughout the socio-economic assessment, where relevant, including the effects assessment and mitigation and enhancement measures. The issues identified by participating Aboriginal communities through engagement activities for the Project are described in Table 3.2-2. References to where these issues are considered in the application are also provided Table 3.2-2. Detailed information on engagement activities conducted and opportunities provided for Project input to date with each Aboriginal community is presented in Appendix A of Volume 3B.

3.2.4 Future Aboriginal Engagement Activities

Following submission of the application to the NEB, including the ESA, Trans Mountain will continue engagement with Aboriginal communities to provide updates on the status of the Project and discuss proposed mitigation and enhancement measures. Information updates will continue to be sent to Aboriginal communities. From information sharing to continued environmental field studies to address interests and concerns, Trans Mountain is committed to the continuation of an effective engagement program that satisfies all parties. The outcomes of meetings and remaining TLU study engagement efforts will be documented and filed with the NEB (see Section 9.0). As described in Volume 3B, Trans Mountain will continue engagement through the regulatory process and Project development and operations. Trans Mountain will also continue its liaison with the Crown and provide updates regarding Trans Mountain's engagement activities with Aboriginal communities potentially affected by the Project.

TABLE 3.2-2

SUMMARY OF INTERESTS OR CONCERNS IDENTIFIED THROUGH ENGAGEMENT ACTIVITIES WITH ABORIGINAL COMMUNITIES FOR THE PROJECT

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Effects to archaeological artifacts	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Ermineskin Cree Nation Montana First Nation Louis Bull Tribe Alexis Nakota Sioux Nation Nakcowinewak Nation of Canada Paul First Nation Sunchild First Nation Aseniwuche Winewak Nation Simpcw First Nation Canim Lake Band Lower Nicola Indian Band Yale First Nation Chawathil First Nation Shx'ow'hamel First Nation Cheam First Nation Seabird Island Band Popkum First Nation	Trans Mountain is conducting studies along the proposed pipeline corridor to gather data for the environmental and socio-economic assessment. This assessment will consider: the potential environmental and socio-economic effects of the construction, operations and maintenance of the pipeline; ways in which these effects can be minimized or avoided altogether; and mitigation and reclamation strategies that will further reduce these effects. Overall, Project-related effects on heritage resources are being addressed in the ESA. This will include development of mitigation measures to reduce effects related to archaeological, palaeontological and historical sites. Trans Mountain will follow any conditions or recommendations identified in the permits for the HRIA for Alberta and AIA for BC. In the event archaeological, palaeontological or historical sites are discovered during construction, follow the contingency measures identified in the Heritage Resources Discovery Contingency Plan (Appendix B of Volume 6B). No work at that particular location shall continue until permission is granted by the appropriate regulatory authority. Further discussion is provided under heritage resources in Section 7.2.1.	Volume 5B Sections 7.2.1 and 7.2.4 Volume 6B Volume 6C
Effects on known sacred sites and burial sites	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Ermineskin Cree Nation Montana First Nation Louis Bull Tribe Alexis Nakota Sioux Nation Paul First Nation Sunchild First Nation Aseniwuche Winewak Nation Simpcw First Nation Lower Nicola Indian Band Ts'elxweyeqw Tribe Management Limited Yale First Nation Shx'ow'hamel First Nation Seabird Island Band Popkum First Nation	Trans Mountain has facilitated TLU studies with potentially affected Aboriginal communities to gather data for the environmental and socio-economic assessment. This assessment will consider: the potential environmental and socio-economic effects of the construction, operations and maintenance of the pipeline; ways in which these effects can be minimized or avoided altogether; and mitigation and reclamation strategies that will further reduce these effects. Overall, Project-related effects on traditional land and resource use are being addressed in the ESA. An environmental education program (Volume 6A) will be developed and implemented to ensure that all personnel working on the construction of the Project are informed of the location of known sacred sites and burial sites. All sensitive resources identified on the Environmental Alignments Sheets (Volume 6E) and environmental tables within the immediate vicinity or the right-of-way will be clearly marked before the start of clearing. In the event that previously unidentified sacred sites are discovered during clearing or construction measures outlined in the Traditional Land Use Sites Discovery Contingency Plan (Appendix B of Volume 6B) will be implemented. Further discussion is provided under traditional land and resource use in Section 7.2.2.	Volume 5B Section 7.2.2 Volume 6A Volume 6B Volume 6E

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Capacity Funding	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Métis Nation of Alberta (Region 4) Louis Bull Tribe Alexis Nakota Sioux Nation Paul First Nation Sunchild First Nation Simpcw First Nation Lower Nicola Indian Band Nooaitch Indian Band Pacheedaht First Nation Yale First Nation Shx'ow'hamel First Nation Scowlitz First Nation Semiahmoo First Nation	Trans Mountain is committed to ongoing respectful and meaningful engagement. Trans Mountain provides funding, as appropriate, to Aboriginal communities and Aboriginal groups who have an interest in the Project and who wish to engage in the Aboriginal Engagement Program. Ongoing TLU studies supported by the Project and any mutial benefit agreements established between Trans Mountain and Aboriginal communities may also contribute to and support broader Aboriginal community cultural objectives.	Volume 3B

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Employment opportunities	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Métis Nation of Alberta (Region 4) Ermineskin Cree Nation Montana First Nation Louis Bull Tribe Paul First Nation Sunchild First Nation Lheidli T'enneh Simpcw First Nation Neskonlith Indian Band Lower Nicola Indian Band Ts'elxweyeqw Tribe Management Limited Yale First Nation Shx'ow'hamel First Nation Popkum First Nation	One of the goals of Aboriginal Engagement Program is to work collaboratively with Aboriginal communities to support access to economic development opportunities that will arise from the Project. These include employment and procurement opportunities and, where possible, education, training and community investments to maximize access to these opportunities. To identify procurement prospects, Project staff work with Aboriginal communities to identify Aboriginal businesses that are interested in contracting opportunities. Trans Mountain has developed, in partnership with KMC's procurement team, an Aboriginal Procurement Policy to provide guidance and allowances for facilitating Aboriginal participation in the Project. With regard to employment, Trans Mountain recognizes that the fast growth rate of Aboriginal population will have a substantial effect on the available workforce in the future and there is a need for proactive program development in the areas of education and training to support employment opportunities. Through the Aboriginal Engagement Program, employment opportunities are being shared with each Aboriginal community and a capacity inventory for employment within the communities is being encouraged. The content will then be used for the realization of employment benefits with both Trans Mountain and prime contractors during the Project. The Trans Mountain Aboriginal engagement team continues to communicate with Aboriginal communities along the proposed pipeline corridor to identify education, training, employment and procurement opportunities. Trans Mountain will: • maximize the hiring of on-reserve and off-reserve Aboriginal community members; • liaise with communities, appropriate resources and with contractors; • initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project; • develop a mentorship program for Aboriginal workers to encourage work site integration and retention; • evaluate contractors' recruitment and selection processes to ensure opportunities will be available to Aboriginal workers; and • ensure contractors communicate upcoming employment opportunities directly to Project area employment offices, women's organizations and Aboriginal communities and organizations on a timely basis. Trans Mountain will continue to collaborate with regional training providers to identify ongoing opportunities to facilitate, support or participate in delivery of training for Aboriginal communities. Information will be provided in a timely manner to educators and governments about the types of Project-related jobs that will be available, and the required skills and qualifications, to assist training providers in developing and implementing appropriate training. Trans Mountain will work with contractors and labour organizations to encourage contractors to provide training and apprenticeship opportunities related to the work they perform, including opportunities for on-the-job training on the Project. The Project will collaborate with training providers to provide job preparation and Project specific training to Aboriginal residents. All training programs that are supported by the Project will be mutually agreeable with particular training providers. Trans Mountain's Aboriginal Peoples' Training Policy is focused on creating initiatives that increase the long-term capability for Aboriginal people to participate in the economy and to share in the success of the Project. Community Investment, through the Aboriginal Engagement Program, takes the form of sponsorships, cultural events and festivals, cultural awareness workshops and other community development initiatives. Specific to the Project, Trans Mountain will work with Aboriginal communities to support areas of importance that will drive benefits to the community pre-construction, during and post-construction. Through the creation of partnerships and shared goals between Trans Mountain and Aboriginal communities, economic development will take place and all parties can work towards achieving mutually-beneficial Project-based or long-term goals. Further discussion is provided in Section 7.2.7 Employment and Economy.	Volume 3B Volume 5B Section 7.2.7
Preferred procurement opportunities	Alexander First Nation Ermineskin Cree Nation Sunchild First Nation Simpcw First Nation Shx'ow'hamel First Nation Popkum First Nation Semiahmoo First Nation Kwantlen First Nation		
Educational opportunities	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Métis Nation of Alberta (Region 4) Foothills Ojibway First Nation Paul First Nation Sunchild First Nation Lower Nicola Indian Band Simpcw First Nation Ts'elxweyeqw Tribe Management Limited Yale First Nation Popkum First Nation Scowlitz First Nation Semiahmoo First Nation		

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Aboriginal monitors during construction	Enoch Cree Nation Métis Nation of Alberta (Region 4)	Aboriginal Monitors onsite through the construction of the Project will work with Environmental Inspectors to provide traditional knowledge to the construction program to ensure protection of the environment; to discuss upcoming traditional and western science elements with the Environmental Inspector to ensure protection and monitoring; and to monitor mitigation success in protecting the environment. Trans Mountain will continue to engage Aboriginal communities through all phases of the Project.	Volume 3B Volume 6A
Language barriers to engagement, employment, and education	Paul First Nation Nakcowinewak Nation of Canada	Trans Mountain understands that language barriers may limit Aboriginal peoples' employment opportunities. Trans Mountain considers employment readiness programs as an important training tool to reduce the barriers and provide increased access to employment or employment resources in general and for the Project.	Volume 3B
Effects on Aboriginal harvesting practices and subsistence living	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Métis Nation of Alberta (Region 4) Ermineskin Cree Nation Montana First Nation Louis Bull Tribe Alexis Nakota Sioux Nation Paul First Nation Nakcowinewak Nation of Canada Sunchild First Nation Aseniwuche Winewak Nation Simpcw First Nation Whispering Pines Clinton Indian Band Lheidli T'enneh Lhtako Dene Nation Canim Lake Band Nicola Tribal Association Lower Nicola Indian Band Yale First Nation Chawathil First Nation Shx'ow'hamel First Nation Ts'elxweyeqw Tribe Management Limited Popkum First Nation Cowichan Nation Alliance Chemainus First Nation Halalt First Nation Penelakut First Nation	Trans Mountain is conducting environmental studies along the proposed pipeline corridor to gather data for the environmental assessment. This assessment will consider the potential environmental effects of the construction, operations and maintenance of the pipeline; ways in which these effects can be minimized or avoided altogether; and mitigation and reclamation strategies that will further reduce these effects. Overall, Project-related effects on traditional land and resource use are being addressed in the ESA. An environmental education program will be developed and implemented to ensure that all personnel working on the construction of the Project are informed of the location of known TLU sites. All sensitive resources identified on the Environmental Alignments Sheets (Volume 6E) and environmental tables within the immediate vicinity or the right-of-way will be clearly marked before the start of clearing. Trans Mountain will: • provide Aboriginal communities with the anticipated construction schedule and proposed pipeline corridor maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities; • install signage notifying of construction activities in the area; and • work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members. In the event that additional TLU sites are identified during ongoing engagement with Aboriginal communities prior to construction for the Project, the sites will be assessed and appropriate mitigation measures will be determined. Access will be managed, where required, along the Project where new temporary and permanent access is created for the construction and operation of the pipeline. To mitigate environmental effects associated with increased access, which could further lead to increased concentrations of hunting and fishing activities at previously unattainable locations, increased predation of wildlife, disturb reclamation efforts on sensitive terrain, and other anthropogenic disturbances, Trans Mountain will manage access along portions of its right-of-way where new access is/was created by implementing one or more of the mitigation measures to manage access during the pre-construction, construction and post-construction phases. Mitigation measures are provided in the Traffic and Access Control Management Plan (Appendix C of Volume 6B). Further discussion is provided under traditional land and resource use in Section 7.2.2.	Volume 5B Section 7.2.2 Volume 6A Volume 6B Volume 6E

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Effect on traplines/trapline owner notifications prior to construction	Saddle Lake Cree Nation Enoch Cree Nation Samson Cree Nation Ermineskin Cree Nation Montana First Nation Louis Bull Tribe Nakcowinewak Nation of Canada Sunchild First Nation Aseniwuche Winewak Nation Simpcw First Nation Shx'ow'hamel First Nation	Trappers of affected registered fur management areas and traplines and guide-outfitters in relevant wildlife management units will be contacted prior to clearing and construction activities. Maps and schedule information will be provided to enable them to select alternate areas for their activities. Compensation will be provided, considering various forms, to affected trappers according to established industry and provincial protocols if reduced fur harvest and lost revenue is proven. Vandalism or theft of trapper equipment or trapped animals will be prohibited if they are observed on the construction right-of-way or the construction site. Further discussion is provided under human occupancy and resource use in Section 7.2.4. Mitigation measures are provided in the EPPs (Volumes 6B and 6C).	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report Volume 6B Volume 6C
Effects on access for areas of habitation, agriculture or culturally important activities	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Montana First Nation Louis Bull Tribe Alexis Nakota Sioux Nation Paul First Nation Nakcowinewak Nation of Canada Sunchild First Nation Simpcw First Nation Lower Nicola Indian Band Yale First Nation Shx'ow'hamel First Nation Popkum First Nation Chawathil First Nation Le'qa:mel First Nation Kwantlen First Nation	The Traffic and Access Control Management Plan (Appendix C of Volume 6B) addresses the management of pipeline construction traffic and access along the construction right-of-way and temporary access routes. This plan also addresses the activities during pre-construction, construction (pipe installation) and construction clean-up and reclamation phases of the Project and provides guidelines for vehicular use on the construction right-of-way and associated access roads, as well as blocking and/or controlling access to previously inaccessible portions of the right-of-way following construction and throughout the operation phase of the Project. The intent of the mitigation is to reduce disturbances caused by access, construction equipment and vehicle traffic, during and following pipeline construction. The objectives of the Traffic and Access Control Management Plan will be accomplished by minimizing the development of access routes, controlling public access along the construction right-of-way, selecting appropriate access routes that cause the least disturbance to high quality, sensitive wildlife habitat, managing traffic on these routes and determining appropriate construction reclamation. Trans Mountain will work with applicable resource managers, traditional land and resource users to define locations where access control is necessary, and what type(s) of access control will be implemented. Trans Mountain will: • provide Aboriginal communities with the anticipated construction schedule and proposed pipeline corridor maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities; • install signage notifying of construction activities in the area; and • work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members. Access will be managed, where required, along the Project where new temporary and permanent access is created for the construction and operation of the pipeline. To mitigate environmental effects associated with increased access, which could further lead to increased concentrations of hunting and fishing activities at previously unattainable locations, increased predation of wildlife, disturb reclamation efforts on sensitive terrain, and other anthropogenic disturbances, Trans Mountain will manage access along portions of its right-of-way where new access is/was created by implementing one or more of the mitigation measures to manage access during the pre-construction, construction and post-construction phases. Further discussion is provided under traditional land and resource use in Section 7.2.2. Mitigation measures are provided in the EPPs (Volumes 6B and 6C).	Volume 5B Section 7.2.2 Volume 6B Volume 6C

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Traffic and transportation	Enoch Cree Nation Paul First Nation Whispering Pines Clinton Indian Band Cowichan Nation Alliance Le'qa:mel First Nation	Speed limits that have been approved by Trans Mountain will be established on the construction right-of-way and access roads. Signs will be posted stating the applicable speed limits for construction traffic. An environmental education program will be developed and implemented. Environmental training will include the expectation that speed limits and signage, flagging and/or fences delineating the environmental features shall be respected at all times. Multi-passenger vehicles will be used for the transportation of crews to and from the job sites, to the extent feasible. Further discussion is provided under infrastructure and services in Section 7.2.5. Mitigation measures are provided in the Pipeline EPP (Volume 6B).	Volume 5B Section 7.2.5 Volume 6A Volume 6B
Increased need for waste management practices	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Ermineskin Cree Nation Montana First Nation Louis Bull Tribe Alexis Nakota Sioux Nation Paul First Nation Lower Nicola Indian Band Nakcowinewak Nation of Canada Sunchild First Nation Simpcw First Nation Yale First Nation Shx'ow'hamel First Nation Seabird Island Band Popkum First Nation	The Waste Management Standard outlines specific measures to be followed by all Trans Mountain employees and contractors involved with the construction of the Project. This plan is designed to ensure wastes generated by the Project are handled, stored and disposed of in an environmentally responsible manner, thereby maintaining ecological and cultural integrity. This Waste Management Standard will reduce the likelihood of an accidental release of potentially hazardous waste products into the environment during pipeline construction. The Waste Management Standard applies to all employees, contractors and consultants who conduct work on behalf of Trans Mountain during construction of the Project. All employees, contractors and consultants will abide by all federal, provincial and local requirements for the storage, handling, transport, disposal and spill reporting requirements of all waste materials that are potentially hazardous to the environment. Further discussion is provided under infrastructure and services in Section 7.2.5. Mitigation measures are provided in the EPPs (Volumes 6B, 6C and 6D).	Volume 5B Section 7.2.5 Volume 6B Volume 6C Volume 6D
Human safety and health	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Ermineskin Cree Nation Alexis Nakota Sioux Nation Paul First Nation Sunchild First Nation Nakcowinewak Nation of Canada Aseniwuche Winewak Nation Lheidli T'enneh Simpcw First Nation Lower Nicola Indian Band Whispering Pines Clinton Indian Band Yale First Nation Shx'ow'hamel First Nation Cheam First Nation Seabird Island Band Popkum First Nation Tzeachten First Nation	Pipeline safety is a common interest and a value shared by Trans Mountain. Safety is a top priority and at the core of who Trans Mountain is as a company. Dedicated staff work to maintain the integrity of the pipeline through maintenance, inspection and awareness programs. While no spill is acceptable to Trans Mountain, accidents can happen. Trans Mountain has a comprehensive response plan that includes working with local regulatory authorities to make sure the public and the environment are kept safe. Where the pipeline runs near schools, Trans Mountain is open to working with individual schools or districts to fully support their safety efforts and ensure their emergency response plans and Trans Mountain's are coordinated. Trans Mountain agrees that measures to protect sensitive environmental areas such as water bodies and riparian areas are critical. This is why Trans Mountain takes a multi-layered approach to pipeline safety, including taking measures such as strategically placed pipeline valves near waterways and drilled river crossings at some locations. Trans Mountain has comprehensive spill response plans in place for the Trans Mountain pipeline and facilities. These plans are constantly being updated to keep them current and are regularly practiced through deployment exercises. While the specific strategies used in response to a spill will vary depending on the circumstances, the primary objectives in all cases are to ensure safety and to minimize environmental damage. To ensure there are sufficient funds to remediate a spill, Trans Mountain is covered by insurance necessary to respond to all spills or releases from Trans Mountain's pipelines and facilities. Trans Mountain monitors the insurance program continuously and makes annual adjustments, as necessary, to ensure adequate coverage. Further discussion is provided under community health in Section 7.2.8. Mitigation measures are provided in the EPPs (Volumes 6B and 6C). Terrestrial spills are discussed in Volume 7.	Volume 5A Sections 5.0 and 7.0 Volume 5B Sections 5.3 and 7.2.8 Volume 5D Community Health Technical Report Screening Level Human Health Risk Assessment for Pipeline and Facilities Volume 6B Volume 6C Volume 7

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application
Noise pollution	Alexander First Nation Enoch Cree Nation Montana First Nation Alexis Nakota Sioux Nation Nakcowinewak Nation of Canada Sunchild First Nation Lheidli T'enneh Simpcw First Nation	Noise from construction of the Project has the potential to affect a variety of land users including users of parks and protected areas, Aboriginal traditional areas, residential areas and outdoor recreation areas. The potential effects on human receptors are not anticipated to extend beyond the Acoustic Environment local study area. Trans Mountain will ensure equipment is well-maintained during construction to minimize air emissions and unnecessary noise. Additionally, Trans Mountain will restrict the duration that vehicles and equipment are allowed to sit and idle to less than 1 hour unless air temperatures are less than 0°C. Trans Mountain recognizes that many regional changes have occurred since the pipeline was installed over 60 years ago including urban encroachment near some of its existing pump stations and terminals and is aware that noise during operations is of concern to nearby residents. Ambient sound surveys representative of sound levels at noise receptors and existing facilities were conducted and all noise level results were compared to Alberta Energy Regulator's *Directive 038 Noise Control* and the BC Oil and Gas Commission's *Noise Control Best Practices Guideline*. Standard mitigation plus noise-specific mitigation measures will be implemented. Further discussion is provided under acoustic environment in Section 7.2.6 of Volume 5A. Mitigation measures are provided in the Pipeline EPP (Volume 6B).	Volume 5A Sections 5.6 and 7.2.6 Volume 5B Section 5.4 and 7.2.4 Volume 5C Terrestrial Noise and Vibration Technical Report Volume 5D Socio-Economic Technical Report Volume 6B
Mature forest protection	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Ermineskin Cree Nation Montana First Nation Paul First Nation Sunchild First Nation Simpcw First Nation Lower Nicola Indian Band Yale First Nation Shx'ow'hamel First Nation Popkum First Nation	Discussions with BC Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) will be ongoing to discuss potential effects of the Project on Old Growth Management Areas. Mature forests are further discussed in managed forest areas under Section 7.2.4 HORU of Volume 5B. Mitigation measures are provided in the Pipeline and Facilities EPPs (Volumes 6B and 6C).	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Managed Forests Areas and Forest Health Technical Report Volume 6B Volume 6C
Salvageable timber to communities	Enoch Cree Nation Montana First Nation Louis Bull Tribe Paul First Nation Nakcowinewak Nation of Canada Sunchild First Nation Shx'ow'hamel First Nation	Trees, stumps, brush and other vegetation will be cleared from the construction right-of-way; temporary work sites; and permanent facilities that are not located on existing TMPL previously cleared easements. Timber harvesting and/or land clearing and debris disposal activities will be coordinated according to Provincial legislation or agreements. Trans Mountain will apply all mitigation measures pertaining to timber outlined in the Timber Salvage Management Plan of the Pipeline EPP (Volume 6B).	Volume 6B
Engagement or consultation process	Saddle Lake Cree Nation Enoch Cree Nation Alexander First Nation Samson Cree Nation Paul First Nation Sunchild First Nation Simpcw First Nation Lower Nicola Indian Band Yale First Nation Popkum First Nation	Since April 2012, Trans Mountain has engaged with Aboriginal communities that may be affected by the Project based on their assertion of traditional and cultural use of resources to maintain a traditional lifestyle. Trans Mountain respects the Aboriginal and treaty rights, unique culture, diversity, languages and traditions of Aboriginal people. Trans Mountain acknowledges the importance of teaching, the significance of culture and language and the considerable traditional knowledge that has been passed on for generations and as such is committed to continued listening, learning and working with Aboriginal people to ensure that knowledge and advice is considered and incorporated in the Project. The Aboriginal Engagement Program is based on mutual respect, timeliness, accountability and transparency in order to build positive and productive relationships for the long-term. Further discussion is provided in Volume 3B.	Volume 3B

TABLE 3.2-2 Cont'd

Summary of Interest or Concern	Aboriginal Community	Response Summary[1]	Where Issue is Addressed in the Application

Emergency response protocol	Enoch Cree Nation
	Samson Cree Nation
	Whispering Pines Clinton Indian Band
	Cowichan Tribes
	Yale First Nation
	Chawathil First Nation
	Scowlitz First Nation
	Tzeachten First Nation
	Matsqui First Nation
		• Pipeline safety is a common interest and a value shared by Trans Mountain. Trans Mountain has heard some specific questions about the pipeline and its safe operation near homes and schools and welcomes any opportunity to provide information and respond to questions.
		• Safety is a top priority and at the core of who Trans Mountain is as a company. Dedicated staff work to maintain the integrity of the pipeline through maintenance, inspection and awareness programs. While no spill is acceptable to Trans Mountain, accidents can happen.
		• Trans Mountain has a comprehensive response plan that includes working with local regulatory authorities to make sure the public and the environment are kept safe. Where the pipeline runs near schools, Trans Mountain is open to working with individual schools or districts to fully support their safety efforts and ensure their emergency response plans and Trans Mountain's are coordinated.
		• Trans Mountain will implement the following mitigation measures regarding emergency response:
		  • consult with emergency response agencies and municipal emergency planners regarding ERPs, as required, to ensure understanding of potential Project-related service needs;
		  • provide key Project contact numbers, proposed pipeline corridor maps, the construction schedule and emergency response program information to local and regional police services, fire departments and medical/health services;
		  • provide appropriate levels of security at camps and worksites. This will minimize the potential for external events to impact Project personnel, at the same time reducing diversion of emergency services from regional residents;
		  • to reduce response requirements related to Project worker/community integrations, develop a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions;
		  • to reduce response requirements related to Project worker/community integrations, adhere to a policy of no tolerance of use or being under the influence of illicit drugs or alcohol during work hours; and
		  • develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation.
		Further discussion is provided in Volume 4C and mitigation measures are provided in the Pipeline EPP (Volume 6B).
			Volume 4C
			Volume 5B
			Section 7.2.3
			Volume 6B

Note: 1 Detailed mitigation measures are outlined in the Project-specific EPPs (Volumes 6B, 6C and 6D).

3.3 Landowner Relations

The primary objectives of the landowner relations program were to introduce the Project to landowners and occupants and obtain approval for land access on a timely basis to support required engineering and environmental surveys. Over the long-term, the program objectives are obtaining landowner understanding, acceptance and land rights for survey, construction, restoration, and transition to operations. This approach also serves to preserve good relationships that currently exist and reinforce positive relations into operations.

Land stakeholder groups include private landowners, freehold and Crown occupants, and public landowners (federal, provincial, and municipal). Landowner issues include land rights, compensation, land-specific construction and restoration activities, as well as broader Project and policy issues. The program will attempt to engage all appropriate internal groups where necessary to address issues and concerns effectively.

Trans Mountain designed the program with the following objectives:

- introduce the Project to landowners in a manner that establishes a basis for a positive ongoing working relationship;
- support engineering and environment disciplines in determining Project routing and facility configuration by obtaining landowner survey consent;
- develop the Land Program Strategy to guide land rights acquisition;
- acquire necessary land rights to enable the Project to be constructed and placed into operation;
- obtain necessary third-party crossing approvals to enable the Project to be constructed safely;
- provide support to the regulatory applications and the regulatory process for the Project;
- support construction and restoration activities, including post-construction damage settlements; and
- transfer Project land information and landowner files to Trans Mountain Operations.

Trans Mountain recognizes the program must adapt to the needs of landowners and the Project, therefore, Trans Mountain will continuously review and assess the program to ensure that it is being conducted in the most effective and efficient manner.

3.3.1 Design of Program

Trans Mountain and its land agents began implementing the program in April 2012, and it continues to be an ongoing process. Internal processes within the program continue to evolve to better support the Project and in response to changes within engineering, environmental and operational functions. A detailed description of the program is provided in Volume 3C.

3.3.1.1 Landowner Notification

Trans Mountain identified a proposed pipeline corridor of generally 150 m width along the entire length of the Project. The corridor typically follows the TMPL system right-of-way, however, deviations have been identified as necessary. A land titles search to confirm the land and interest ownership was then initiated for lands within the proposed pipeline corridor. As the Project route is finalized, additional landowners and occupants may be identified; contact with newly identified landowners and occupants will be consistent with the format identified in Section 1.3.3 of Volume 3A.

Notification of Landowners

Trans Mountain and its land agents commenced the program in April 2012 and it continues to be an ongoing process. To ensure that Trans Mountain introduced the Project to landowners along the existing

system, an initial contact letter (Volume 3C) was sent to all 2,390 landowners. An additional letter was hand delivered to all urban residents along the TMPL system right-of-way in Edmonton, Alberta, and the BC Lower Mainland in August 2012 to inform the residents that Trans Mountain intended to pursue alternative routing in their communities.

Notification of Crown Occupants

A mail out was conducted with select Crown tenure holders with interests crossed by the proposed pipeline corridor who had not been contacted via other methods (*e.g.*, through the lands team or other disciplines on the assessment team). The mail out process was designed to provide an opportunity for the selected tenure holders (*e.g.*, agricultural tenure holders, commercial recreation tenure holders, guide-outfitters and registered trap line tenure holders) to identify key concerns related to Project activities and/or provide feedback on land/resource use patterns that may be affected.

3.3.1.2 Consultation and Survey Consent

The program uses a direct contact approach as it enables Trans Mountain's land agents to personally provide information to landowners and occupants about the Project and proposed studies. It also provides landowners and Crown occupants an opportunity to ask questions and identify concerns about the Project or the TMPL. These questions and concerns are passed on to the Project team. Trans Mountain's intention is to provide response to each landowner or occupant's concern or issue. The process has begun and will continue through all phases of landowner and occupant engagement.

Landowners and occupants located within the proposed pipeline corridor and likely to be directly affected by the Project were requested to provide consent for engineering and environmental study. Requests were usually made face-to-face and written or verbal consent was accepted.

Along this corridor, 1,325 landowners and 295 Crown rights holders in Alberta were contacted. In BC, 4,013 landowners and 615 Crown rights holders and pending land purchasers were contacted (Table 3.3-1).

TABLE 3.3-1

LANDOWNERS AND OCCUPANTS WITHIN THE PROPOSED PIPELINE CORRIDOR

Group	Alberta	BC	Total
Private Landowners	1,325	4,013	5,338
Crown Occupants and Pending Purchasers	295	615	910
Total	1,620	4,628	6,248

The approach provided an opportunity to collect information on aspects of the land which could be helpful in defining a route or potential effects of the Project on the socio-economic environment.

Communication with landowners and occupants is ongoing and questions or concerns will continue to be addressed throughout the life of the Project.

3.3.1.3 Corridor Survey Limitations

Landowners and Occupants

Some landowners and occupants refused to provide consent for surveys. Surveys were not completed on those respective land parcels. The occurrences of refusal are intermittently distributed throughout the length of the Project.

The reasons, when provided, varied substantially. Where opportunities existed, an agent revisited the landowner or occupant to verify their position or determine if circumstances had changed that would allow provision of consent.

Some landowners and occupants consented to survey but such surveys were to be restricted to the TMPL right-of-way only. Areas between the right-of-way and the proposed pipeline corridor boundaries were not accessible.

BC Provincial Parks

Application was made to BC Parks in December 2012 for an Education and Research Park Use Permit to conduct environmental studies within BC Parks. In June 2013, BC Parks requested the application be revised and re-submitted for only intrusive types of surveys (*e.g.*, ground disturbances and electro-fishing). With permission from BC Parks, certain non-intrusive studies have been conducted on some Park lands. The Education and Research Park Use permit application was received on November 15, 2013.

Indian Reserves

The TMPL crosses 15 Indian Reserves and the Aboriginal engagement team is involved in various stages of negotiation with each of the respective Aboriginal communities. Some Aboriginal communities have provided explicit consent for surveys, while others are anticipated to provide a decision on the matter in the near future.

Tk'emlúps Te Secwépemc

Tk'emlúps Te Secwépemc requested Trans Mountain to defer environmental field studies on traditional lands until Tk'emlúps Te Secwépemc was prepared to participate. The request affected studies within the corridor from the proposed Black Pines Pump Station in BC (reference kilometre [RK] 811.9) to Trans Mountain's Stump Pump Station (RK 862.7). Trans Mountain respected their request and postponed studies in June 2013 and part of July 2013. Further delay would result in lost study opportunities due to seasonal effects, therefore, with permission from Tk'emlúps Te Secwépemc, Trans Mountain resumed environmental studies on the traditional lands.

3.3.1.4 Land Acquisition

Section 5.4 of Volume 2 provides a detailed description of Land Acquisition.

3.3.1.5 Ongoing Relations

Trans Mountain will remain in contact with affected landowners and occupants throughout the Project life. Questions or concerns regarding the Project will be addressed as they arise. Once system operations commence, all landowner information will be transferred to Trans Mountain operations as the permanent record of land data.

3.3.2 Summary of Outcomes of the Public Consultation Program as it Relates to Socio-economic Elements

The data presented in this subsection was collected from April 2012, to July 31, 2013. Updates from the program will be filed with the NEB as updates when requested.

Landowner meetings comprised discussions about the Project in general as well as requests for consent for Project-specific surveys. The meetings also provided an opportunity for landowners to ask questions and identify concerns regarding the Project. Tables 3.3-2 to 3.3-5 provide information on the key topics relating to the socio-economic assessment and where these topics are addressed in the application.

3.3.2.1 Social and Cultural Well-Being

TABLE 3.3-2

INTERESTS OR CONCERNS RELATED TO SOCIAL AND CULTURAL WELL-BEING

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Town representatives have concerns about vandals	In areas where there may be a concern regarding the safety of the public, restricted areas are established. Trans Mountain will have a construction site safety and security plan in place and it will be communicated to the town representatives and adjacent residents. The influx of workers into communities and the potential effects on community way-of-life are discussed under social and cultural well-being in Sections 5.3 and 7.2.3 as well as under community health as it relates to public safety in Sections 5.8 and 7.2.8.	Volume 5B Sections 5.3, 5.8, 7.2.3 and 7.2.8 Volume 5D Socio-Economic Technical Report Community Health Technical Report
Concern about the effects of the Project on people's personal lives (*e.g.*, there has been a notable increase in loss of privacy, rules and regulations and a significant curtailing of what they are allowed to do on their own property)	Every effort is made to minimize effects on landowners. Through respectful dialogue, Trans Mountain's goal is to negotiate mutually-agreeable arrangements with each landowner who may be affected by the Project. In cases where Trans Mountain is unable to reach a mutually-agreeable arrangement, the NEB has a multi-step process that Trans Mountain will follow to address differences of opinions as part of the routing review and approval process. More information about the process from the NEB is available here: www.neb-one.gc.ca/clf-nsi/rthnb/pblcprtcptn/pplnrgltncnd/pplnrgltncnd_ndx-eng.html Pipeline Regulation in Canada: A Guide for Landowners and the Public. Community way-of-life (including as community perspectives of an oil pipeline) is discussed under social and cultural well-being in Sections 5.3 and 7.2.3 of Volume 5B.	Volume 5B Sections 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report
Disturbance to golf course	Trans Mountain is evaluating feasible route alternatives in order to reduce effects to golf courses and other recreational activities along the proposed pipeline corridor. Overall, Project-related effects on recreation use are being addressed in the ESA. This will include development of mitigation measures to reduce effects and optimize opportunities to enhance recreational use. Trans Mountain is evaluating ways to reduce the effects to golf courses potentially encountered along and close to the proposed pipeline corridor. Golf courses are considered a community asset which contribute to community way-of-life and are discussed under social and cultural well-being in Sections 5.3 and 7.2.3.	Volume 5B Sections 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report

TABLE 3.3-2 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Disturbance to school yards	Where practical, the alignment of the TMEP route will parallel the existing TMPL. Alternate routes for the proposed expanded pipeline may be necessary — especially in areas where land use has changed since the pipeline was built nearly 60 years ago. In communities where routing may deviate from the existing TMPL right-of-way, Trans Mountain will discuss and apply routing considerations and decision-making criteria in discussions with local stakeholders. Where practical, the route for the proposed expanded pipeline will remain along the existing TMPL right-of-way. Where land use has changed since the pipeline went into operation in 1953, there may be a need to route parts of the new line away from the existing TMPL right-of-way. In these cases, Trans Mountain will look at alternatives through comprehensive routing studies in combination with its consultation process. To minimize effects to the urban landscape and landowners, the proposed route of the new pipeline would follow existing linear infrastructure, such as municipal streets or highway, railway or utility corridors, or in some cases parklands. It is important to understand that while the pipeline may be near homes and schools, it does not run under any buildings. Living or being active near a pipeline does not pose a health risk. There are community trails, sporting events, community gardens and all kinds of businesses and agricultural activities safely co-existing near the TMPL. Trans Mountain will continue to engage and communicate with communities as new information becomes available. Trans Mountain will continue to contact landowners along the existing TMPL right-of-way, and when route alternatives are selected, Trans Mountain will work with landowners to identify mutually agreeable solutions to concerns. The landowner concerns regarding the route and potential effects of the Project to their land will be taken into consideration during detailed design and construction planning activities. Details will be communicated with the landowner. A discussion of routing principles and selection of the proposed pipeline corridor is provided in Section 4.0. Schools are considered community assets that contribute to community way-of-life and are discussed under social and cultural well-being in Sections 5.3 and 7.2.3.	Volume 5B Sections 4.0, 5.3 and 7.2.3 Volume 5D Socio-Economic Technical Report

3.3.2.2 Human Occupancy and Resource Use

TABLE 3.3-3

INTERESTS OR CONCERNS RELATED TO HUMAN OCCUPANCY AND RESOURCE USE

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Disturbance to agricultural land use (crops, grazing areas, livestock, farm facilities) Heat from pipelines affecting crops	Through respectful dialogue, Trans Mountain's goal is to negotiate mutually-agreeable arrangements with each landowner who may be affected by the Project. In cases where Trans Mountain is unable to reach a mutually-agreeable arrangement, the NEB has a multi-step process that Trans Mountain will follow to address differences of opinions as part of the routing review and approval process. More information about the process from the NEB is available here: www.neb-one.gc.ca/clf-nsi/rthnb/pblcprtcptn/pplnrgltncnd/pplnrgltncnd_ndx-eng.html. Pipeline Regulation in Canada: A Guide for Landowners and the Public. Trans Mountain is working with landowners to reduce the potential disturbance to agricultural lands and disruption of agricultural practices during construction. Representatives of Trans Mountain will address farming practices with landowners/tenants through the annual communication program. An Agricultural Management Plan has been developed to particularly reduce effects on agriculture, which includes measures related to weed management, re-seeding, soil compaction, livestock access, drainage and irrigation lines, management of crop disruption, and crop and productivity loss (Volume 6B). Handling of cattle will be planned with the landowner prior to construction. Agricultural land uses such as grazing pastures, field crops, organic and specialty crops (*e.g.*, blueberries, raspberries, nurseries) and livestock facilities are located along the proposed pipeline corridor. Trans Mountain is working with landowners to reduce the potential disturbance to agricultural lands and disruption of agricultural practices during construction. Appropriate mitigation (*e.g.*, soil handling, erosion control) and monitoring activities will be implemented during construction to maximize reclamation success. Additional special reclamation measures will be applied, as required, to return the disturbed areas to a stable and maintenance-free condition. As part of the proposed post-construction environmental monitoring (PCEM) program, Trans Mountain will monitor revegetation growth on the construction right-of-way and implement remedial measures where necessary (Volume 6A). Discussion of agricultural uses, including concerns related to soil temperature effects, is provided under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Agricultural Assessment Technical Report Volume 6A Volume 6B
Pipelines rising over time affecting deep tilling practices (agriculture)	Road levelling, landscaping and other changes to ground conditions after a pipeline has been installed (often decades after) can result in the depth of the ground cover changing over time. It is also recognized that changes to land uses may affect the existing and proposed pipelines. Trans Mountain will investigate depth of cover and future agricultural practices. If necessary, remediation plans will be developed. Discussion of agricultural uses is provided under HORU in Sections 5.4 and 7.2.4.	
Effects on organic farming	Mitigation that addresses equipment cleaning, the restriction of herbicides for weed management, disposal of construction materials and garbage and soil management considerations have been identified within the Agricultural Management Plan for construction on organic fields (Volume 6B). Additionally, the Pipeline EPP provides mitigation practices for crossing organic farms. Maintenance practices will also recognize sensitivity of organic farm operations. Discussion of agricultural uses, including concerns related to organic farms, is provided under HORU in Sections 5.4 and 7.2.4.	
Proximity to residences/residential areas; disturbance of built features on residential properties (*e.g.*, garages, sheds, driveways, fences, landscaping)	The primary design objective is to construct the Project within the existing pipeline right-of-way, and where this is not possible, minimize any new linear disturbance. It is Trans Mountain's intention to find a route for the proposed pipeline which minimizes effects to residences and communities. The landowner's concern will be considered during design and routing activities. Where privately-held land is needed for the proposed new route, land agents from Trans Mountain will discuss proposed locations of the pipeline with landowners. Trans Mountain's goal is to reach mutually-acceptable agreements with landowners to allow Trans Mountain to build and maintain the proposed new pipeline. Trans Mountain will attempt to contact the landowner to collect information about future development plans for consideration of routing. Discussion of residential use is provided under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report

TABLE 3.3-3 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Disturbance to planned future residential or other developments.	Trans Mountain will contact the landowner to specifically collect information about future development plans for consideration of routing. Trans Mountain will advise the landowner of processes established for the protection of the pipeline, the public, and the environment. Compensation and damages will be addressed at an appropriate time. Land agent advised this could become an issue for access if the second pipeline is constructed. It would not allow semis and trailers to load/unload, which would result in lost revenue to the owner. Discussion of residential use areas is provided under HORU in Section 7.2.4.	Volume 5B Section 7.2.4 Volume 5D Socio-Economic Technical Report
Effects on land/property values	Trans Mountain appreciates the concern about loss of property values and has been investigating potential effects upon properties for sale – both with and without easements. To date, Trans Mountain's investigation has not shown a measurable effect, however, this situation will continue to be monitored. Trans Mountain appreciates that most homes with the existing pipeline were built after the pipeline was in-place and the easement would have been disclosed to the buyer at that time. Looking ahead to the proposed new pipeline, under the *NEB Act*, companies are required to compensate landowners for any new easement and pay for any damages and inconvenience associated with the new pipeline. Included within the determination of compensation is any change in the value of the property before and after the pipeline was built. Through respectful dialogue, Trans Mountain's goal is to negotiate mutually-agreeable arrangements with each landowner who may be affected by the Project. In cases where Trans Mountain is unable to reach a mutually-agreeable arrangement, the NEB has a multi-step process that Trans Mountain will follow to address differences of opinions as part of the routing review and approval process. More information about the process from the NEB is available here: www.neb-one.gc.ca/clf-nsi/rthnb/pblcprtcptn/pplnrgltncnd/pplnrgltncnd_ndx-eng.html Pipeline Regulation in Canada: A Guide for Landowners and the Public. The effects of the Project on housing prices in general will not be worked through the assessment of employment and economy in Section 7.2.7. However, factors that may be of concern to residential property owners/occupants are considered in various parts of the ESA including noise (Section 7.2.6 Acoustic Environment of Volume 5A), air quality (Section 7.2.4 Air Emissions of Volume 5A), sensory/visual disturbance (Section 7.2.4 HORU) and community way-of-life (Section 7.2.3 Social and Cultural Well-Being).	Volume 2 Section 5.0: Land Relations, Rights and Acquisition Volume 5A Sections 7.2.4 and 7.2.6 Volume 5B Sections 7.2.3, 7.2.4 and 7.2.7
Loss of aggregate/gravel resources	It is Trans Mountain's intention to find a route for the proposed pipeline which minimizes effects to landowners and communities. Where privately-held land is needed for the proposed new route, land agents from Trans Mountain will discuss proposed locations of the pipeline with landowners. Trans Mountain's goal is to reach mutually-acceptable agreements with landowners to allow Trans Mountain to build and maintain the proposed new pipeline. The NEB has produced a guide for landowners and the public that provides details about the regulatory process governing pipeline projects. This information is available on the NEB website www.neb-one.gc.ca/clf-nsi/rthnb/pblcprtcptn/pplnrgltncnd/pplnrgltncnd_ndx-eng.html Pipeline Regulation in Canada: A Guide for Landowners and the Public. Final pipeline alignment will be determined and assessed in respect to proximity to gravel reserves. Compensation will be assessed and negotiated at an appropriate time. Aggregate resources are discussed as part of the other land and resource use indicator under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4 Volume 5D Socio-Economic Technical Report

TABLE 3.3-3 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Tree removal; visual effects of the pipeline right-of-way	Trees, stumps, brush, and other vegetation will be cleared from the construction right-of-way, temporary work sites, and permanent facilities that are not located on existing, previously cleared easements. Timber and brush disposal options will be subject to agreements with landowners and appropriate government authorities. As Trans Mountain develops detailed design and engineering work, the ditches will be designed to protect sensitive areas and minimize effects that are identified in Trans Mountain's routing and design process. In the event that tree removal negatively affects landowners, TMEP will work with landowners to resolve concerns in a manner that meets technical standards and protects the safety of workers and the public. Every effort will be made to minimize effects to landowners. Public awareness campaigns will be undertaken to notify local communities when, where, and for how long construction and/or disturbances may take place. Trans Mountain is committed to industry accepted best practices in reclamation, always striving for opportunities leading to advancement. As with all of its construction projects, Trans Mountain will reclaim any areas that are affected by the proposed Project. Trans Mountain is committed to full reclamation of the pipeline right-of-way and surrounding areas following construction. Following construction, Trans Mountain aims to return the right-of-way to preconstruction conditions, to the extent possible. This could include adding new footpaths, developing new habitats, improving water crossings, or bettering migration corridors. Reclamation efforts could include the planting of native plant and grass species, riparian and wetland areas, wildlife habitats, and any other areas disturbed during construction. Post-construction environmental monitoring and ongoing right-of-way maintenance will continue following construction. Aesthetic attributes are discussed under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4 and 7.2.4
Disturbance to land use and access	One of Trans Mountain's objectives is to use, or abut, the existing right-of-way where practicable. The landowner concerns regarding the route and potential effects of the Project to their land will be taken into consideration during detailed design and construction planning activities. Details will be communicated with the landowner. A key objective is to treat each landowner fairly and equitably. For those who may be directly affected by the Project, Trans Mountain will identify and address landowners' concerns and questions about the Project. Trans Mountain will then work with the landowners to reach jointly equitable solutions for the Project. Access will be discussed with the landowner following design and construction planning. Primary road and railway crossings will be bored to minimize interference with existing activities and usage. A discussion of land uses is provided under HORU in Sections 5.4 and 7.2.4 while transportation infrastructure such as roads and railways are discussed under infrastructure and services in Sections 5.5 and 7.2.5.	Volume 5B Sections 5.4, 5.5, 7.2.4, and 7.2.5 Volume 5D Socio-Economic Technical Report
Noise/sensory disturbance	Ambient sound surveys representative of sound levels at noise receptors and existing facilities will be conducted and all noise level results have been compared to Alberta Energy Regulator's *Directive 038 Noise Control* and the BC Oil and Gas Commission's *Noise Control Best Practices Guideline*. Standard mitigation plus noise-specific mitigation measures will be implemented. Trans Mountain is committed to industry accepted best practices in reclamation, always striving for opportunities leading to advancement. As with all of its construction projects, Trans Mountain will reclaim any areas that are affected by the proposed Project. Trans Mountain is committed to full reclamation of the pipeline right-of-way and surrounding areas following construction. Following construction, Trans Mountain aims to return the right-of-way to pre-construction conditions, to the extent possible. This could include adding new footpaths, developing new habitats, improving water crossings, or bettering migration corridors. Reclamation efforts could include the planting of native plant and grass species, riparian and wetland areas, wildlife habitats and any other areas disturbed during construction. Post-construction environmental monitoring and ongoing right-of-way maintenance will continue following construction. Factors that may be of concern to residential property owners/occupants are considered in various parts of the ESA including noise (Section 7.2.6 Acoustic Environment of Volume 5A), air quality (Section 7.2.4 Air Emissions of Volume 5A), sensory/visual disturbance (Section 7.2.4 HORU) and community way-of-life (Section 7.2.3 Social and Cultural Well-being).	Volume 5A Sections 7.2.4 and 7.2.6 Volume 5B Sections 7.2.3 and 7.2.4 Volume 5C Terrestrial Noise and Vibration Technical Report Volume 5D Socio-Economic Technical Report

TABLE 3.3-3 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Disruption to businesses and/or business access construction	It is Trans Mountain's intention to find a route for the proposed pipeline, which minimizes effects to residences and communities. Where privately-held land is needed for the proposed new route, land agents from Trans Mountain will discuss proposed locations of the pipeline with landowners. Trans Mountain's goal is to reach mutually-acceptable agreements with landowners to allow Trans Mountain to build and maintain the proposed new pipeline. The primary design objective is to construct the Project within the existing pipeline right-of-way, and where this is not possible, minimize any new linear disturbance. Trans Mountain works with landowners along its pipeline network. A key objective is to treat each landowner fairly and equitably. For those who may be directly affected by the Project, Trans Mountain will identify and address landowners' concerns and questions about the Project. These lands teams will then work with the landowners to reach jointly equitable solutions. The NEB has produced a guide for landowners and the public that provides details about the regulatory process governing pipeline projects. This information is available on the NEB website www.neb-one.gc.ca/clf-nsi/rthnb/pblcprtcptn/pplnrgltncnd/pplnrgltncnd_ndx-eng.html Pipeline Regulation in Canada: A Guide for Landowners and the Public. Discussion of factors that may affect nearby residents, including local business owners, is provided under HORU in Sections 5.4 and 7.2.4.	Volume 5B Sections 5.4, and7.2.4 Volume 5D Socio-Economic Technical Report
Groundwater wells/artisan springs/aquifers	Trans Mountain will assess water quality and/or quantity changes to nearby groundwater which may result in adverse effects for other stakeholder or environmental receptors. Trans Mountain will review existing geological, hydrogeological and other information to determine potential hydrogeological conditions along the pipeline right-of-way and proposed facilities; GIS mapping and assessment strategies will be applied. TMEP will develop site-specific hydrogeological investigation activities that may include field verified surveys, hydraulic response testing, monitoring requirements and water quality parameter surveys. Trans Mountain's goal is to reach mutually-acceptable agreements with landowners to allow Trans Mountain to build and maintain the proposed new pipeline. Groundwater, including wells, is discussed under water quality and quantity in Section 7.2.3 of Volume 5A as well as under HORU in Sections 5.4 and 7.2.4.	Volume 5A Section 7.2.3 Volume 5B Sections 5.4 and 7.2.4 Volume 5C Groundwater Technical Report

3.3.2.3 Infrastructure and Services

TABLE 3.3-4

INTERESTS OR CONCERNS RELATED TO INFRASTRUCTURE AND SERVICES

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Need built up road surface over pipeline(s) for heavy equipment access Will roads be bored under?	The primary design objective is to construct the Project within the existing pipeline right-of-way, and where this is not possible, minimize any new linear disturbance. Primary road and railway crossings will be bored to minimize interference with existing activities and usage. Mitigation measures related to boreholes and potential effects (*e.g.*, topsoil salvage and replacement, borehole dewatering) are located in the Pipeline EPP (Volume 6B). Damage to foreign utilities during construction and operation is discussed in accidents and malfunctions Section 7.9. Discussion of transportation infrastructure is provided under infrastructure and services in Sections 5.5 and 7.2.5.	Volume 5B Sections 5.5, 7.2.5 and 7.9 Volume 5D Socio-Economic Technical Report Volume 6B
Effects on the town's water pump and reservoir	Potential effects will be assessed and mitigated as required. Water, including for human use, is discussed under water quality and quantity in Section 7.2.3 of Volume 5A as well as under infrastructure and services in Sections 5.5 and 7.2.5.	Volume 5A Section 7.2.3 Volume 5B Sections 5.5 and 7.2.5

TABLE 3.3-4 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Crossing of water and sewer lines.	The landowner concerns regarding the route and potential effects of the Project to their land will be taken into consideration during detailed design and construction planning activities. Details will be communicated with the landowner and Trans Mountain will work with the landowners to reach jointly equitable solutions. Damage to foreign utilities during construction and operation is discussed in accidents and malfunctions Section 7.9. Mitigation measures relating to hydrovacing and ramping over foreign utility lines are located in the Pipeline EPP (Volume 6B). Discussion of potential effects to infrastructure and services is provided in Sections 5.5 and 7.2.5.	Volume 5B Sections 5.5, 7.2.5 and 7.9 Volume 6B

3.3.2.4 Community Health

TABLE 3.3-5

INTERESTS OR CONCERNS RELATED TO COMMUNITY HEALTH

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Concern about safety in the event of a spill or any other incident	Trans Mountain has in place a comprehensive emergency preparedness and response program in accordance with the KMC EHS Policy and Section 32 of the NEB Onshore Pipeline Regulations. In the event of a release, and in addition to prevention measures, steps would be taken to minimize the consequence of a release by quickly shutting down and isolating the damaged section of the pipeline or facility. Trans Mountain has developed comprehensive emergency response procedures that control centre and local operators must follow. These procedures, together with aerial and ground patrols, calls from the public to Trans Mountain's toll-free emergency number, and continuous Supervisory Control and Data Acquisition monitoring and leak detection systems combine to form the first line of defense in reducing the consequences of a spill. In addition to this, all Trans Mountain pump stations and terminals have automated leak detection and containment systems that are monitored continuously in the Control Centre. In the event of a facility leak, automatic emergency shutdown protection will immediately isolate the facility and trigger a call out of local personnel to investigate further. Trans Mountain works closely with local police and fire departments, regulatory authorities and Aboriginal communities in developing and maintaining comprehensive plans to ensure preparedness for any type of potential emergency. ERPs are constantly being updated to keep them current. If an incident were to occur, Trans Mountain can act quickly to protect employees and the public as well as mitigate any harm to the environment or property. In the event the potential exists for hydrocarbon vapours to reach unsafe concentrations in the community, the local police force will be advised to initiate evacuation. Teams prepare for these worst-case scenarios on a regular basis using the Trans Mountain ERP and the Incident Command System. The landowner concerns regarding conditions at the pump station, the route and effect on their land will be taken into consideration during detailed design activities. Any changes or effects will be communicated with the landowner and Trans Mountain will work with the landowners to reach jointly equitable solutions.	Volume 7

TABLE 3.3-5 Cont'd

Summary of Interest or Concern	Response Summary	Where Issue is Addressed in the Application
Concern about vandals and children playing in equipment after hours; community safety	Socio-economic studies have been conducted to assess existing conditions and types of land use in the Project area, as well as possible effects. Mitigation strategies and management plans are being developed through discussions with regulatory authorities, Aboriginal communities and stakeholders to help minimize the potential effects of the Project on biophysical and human environments. In areas where there may be a concern regarding the safety of the public, restricted areas are established. Trans Mountain will have a construction site safety and security plan in place and it will be communicated to the Town representatives and adjacent residents. The influx of workers into communities and the potential effects on community way-of-life are discussed under social and cultural well-being in Sections 5.3 and 7.2.3 as well as under community health as it relates to socio-economic health effects, public safety and health care service provision in Sections 5.8 and 7.2.8.	Volume 5B Sections 5.3, 5.8, 7.2.3 and 7.2.8

4.0 CORRIDOR AND FACILITY SITE SELECTION

The Project includes further looping of the existing 1,150 km TMPL system from Edmonton to Burnaby in operation since 1953. The 987 km of pipeline that will be looped as part of TMEP traverses a wide range of landforms from flat farmland to mountainous terrain. Land use varies from densely populated urban areas around Edmonton, Vancouver and elsewhere to sparsely populated rural agricultural and forested Crown lands. The pipeline segments to be constructed as part of the Project will also potentially cross over 500 rivers and streams, 8 provincial parks and 13 Indian Reserves (IRs).

An overview of the general routing objectives/criteria and proposed pipeline corridor is provided in Section 4.2 of Volume 2. A more detailed description of the pipeline corridor and selection process is provided in Section 2.8 of Volume 4A.

This section provides an overview of the selection process for the proposed pipeline corridor, including a discussion of how environmental, socio-economic, Aboriginal engagement, stakeholder consultation and other factors influenced pipeline corridor selection. While the proposed pipeline will generally require a construction right-of-way of 45 m, a 150 m corridor was selected to define the boundaries of the environmental resource surveys, landowner contacts and other survey needs.

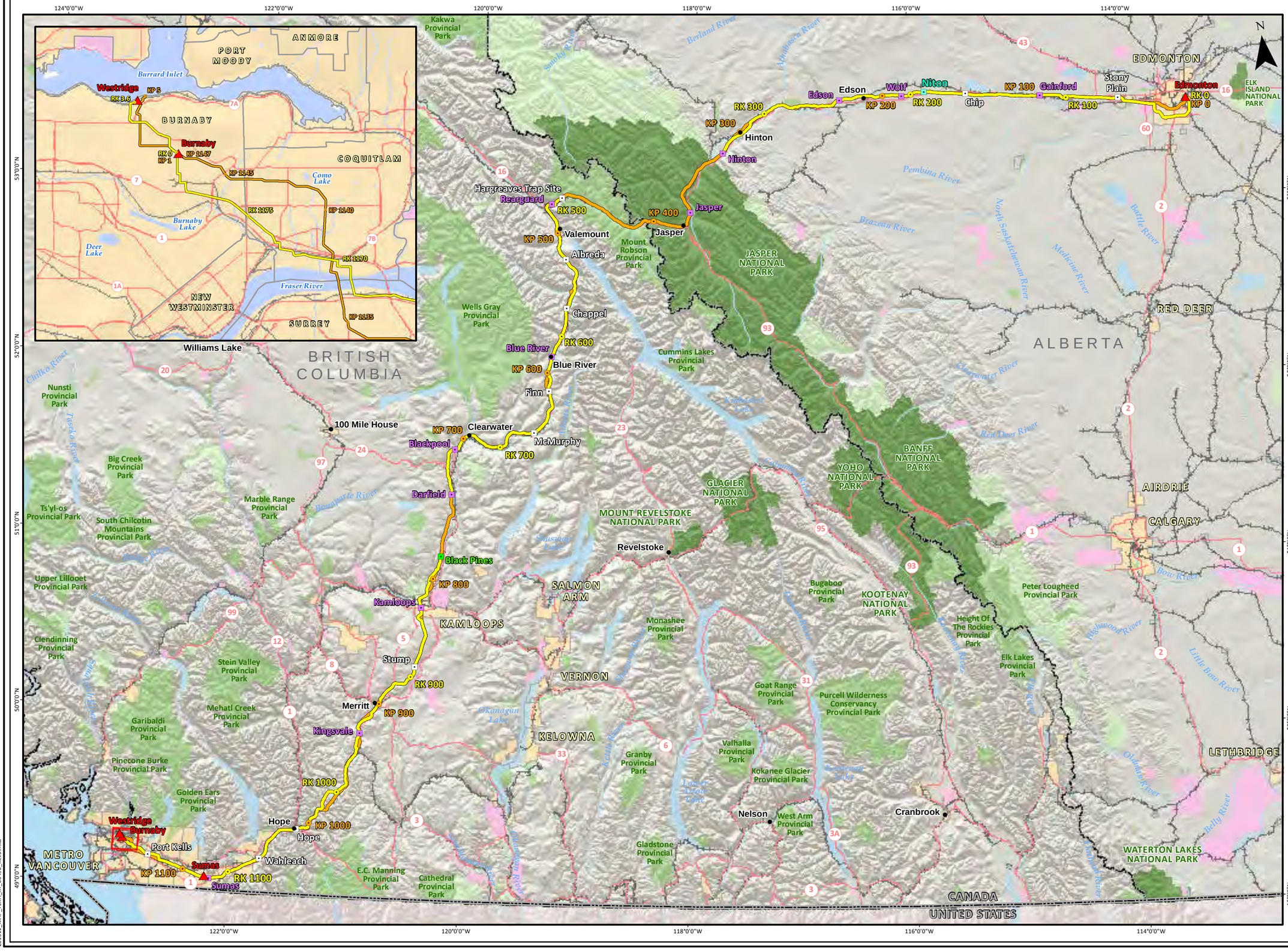
This section also describes the site selection for permanent facilities such as terminals, pump stations (including access roads and power lines) and mainline block valves, as well as the site selection process for temporary facilities used during construction, such as staging and stockpile sites, equipment storage sites, construction office sites, construction work camps, work areas for trenchless watercourse crossings, temporary access roads, borrow pits and log decks.

4.1 Overview of Corridor Selection Process

This subsection provides a summary of the TMEP corridor selection process. Throughout this subsection, the abbreviation “KP” refers to “Kilometre Posts”, approximately 1 km apart, along the existing TMPL easement or right-of-way (also known as Line 1 in Volumes 2 and 4), while the abbreviation “RK” refers to “Reference Kilometres”, approximately 1 km apart along the proposed pipeline corridor (also known as Line 2 in Volumes 2 and 4). The reader is also directed to view Figure 4.1-1 for general reference to KPs and RKs and the preliminary photomosaic Environmental Alignment Sheets at a scale of 1:15,000 in Alberta and 1:10,000 in BC that are provided in Volume 6E.

Early in the Project planning process, Trans Mountain decided to maximize usage of the existing TMPL 18 m wide right-of-way to the greatest extent practical to reduce environmental and socio-economic effects and facilitate efficient pipeline operations. The existing TMPL pipeline has been operating safely for more than 60 years and its location is well known to local TMPL operations crews, landowners, surface management agencies and local emergency responders. By constructing on or adjacent to the existing TMPL right-of-way, the number of new or additional landowners is reduced. Furthermore, landowners and surface management agencies are accustomed to the presence of a pipeline, and understand the types of land practices that maintain pipeline safety. The environmental and socio-economic effects can generally be reduced by constructing beside the existing TMPL right-of-way since it is possible to share temporary workspace that has been previously affected by construction, thereby minimizing the width of land and amount of vegetation to be disturbed. Similar benefits occur where the new pipeline is planned beside rights-of-way of other linear facilities, including other pipelines, power lines, highways, roads, railways, fiber optic transmission systems (FOTS) and other utilities. Finally, access to the right-of-way and power lines to the pump stations are already established, reducing the need to create additional disturbance for ancillary facilities.

Following detailed field surveys as described in Section 2.8 of Volume 4A, it was determined that, while it was possible to construct on or adjacent to the existing TMPL right-of-way for approximately two thirds of the TMEP distance (see note in Section 4.3), it was not possible in all cases due to engineering, constructability, geotechnical, environmental, socio-economic, Aboriginal interests or other reasons. At these locations, a number of potential alternative corridors were examined. Major alternative corridors that were considered but rejected are described in Section 4.2. Selected alternative corridors involving major deviations from the existing TMPL right-of-way worthy of a more detailed evaluation are also described in Section 4.2. The proposed pipeline corridor is summarized in Section 4.3.



TRANS MOUNTAIN

FIGURE 4.1-1

PROJECT OVERVIEW
ALBERTA AND BRITISH COLUMBIA

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: LCC Modified. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrastructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2009 ESRI

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Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER			PAGE
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4.2 Environmental, Socio-Economic and Associated Factors Considered in Pipeline Corridor Selection

Environmental, socio-economic, Aboriginal engagement, stakeholder consultation and other factors relating to pipeline corridor selection are discussed from east to west in the direction of pipeline flow. In general, the factors influencing selection of the proposed pipeline corridor are more complex in BC than Alberta. The bulk of the Rocky Mountains on the continental divide were crossed by the TMX Anchor Loop Project constructed in 2008, however, the proposed pipeline corridor must still cross several interior mountain ranges before entering the rich agricultural land and urban development in the Lower Mainland. A large portion of the urban development in the Lower Mainland, Kamloops and elsewhere has occurred after construction of TMPL in 1953. Likewise, the provincial parks potentially encountered by the Project have been established since TMPL was built.

4.2.1 Edmonton to Hinton Segment

This pipeline segment is characterized by dense urban development in the east, graduating to scattered country residential development, agricultural land and forests in the west.

Given that the TMPL Edmonton Terminal is on the east side of the City of Edmonton, it is difficult for a pipeline heading to the West Coast to avoid traversing the city. Trans Mountain examined three alternative corridors through Edmonton, each requiring a crossing of the North Saskatchewan River, the primary environmental feature in the area. The original TMPL 18 m right-of-way bypassed the then southern limits of the city, but 60 years of urban growth have caused the city boundaries to move many kilometres further south (see Plate 1 at the end of Section 4.2). Rather than run adjacent to hundreds of residential properties, Trans Mountain chose to take advantage of the Edmonton Transportation/Utility Corridor (TUC) established by the Province of Alberta in the 1970s. Accordingly, a major deviation from the existing TMPL right-of-way to the south takes place in the first 45 km of pipeline corridor. Final placement of TMEP within the TUC will be as directed by Alberta Infrastructure, the TUC administrator. Trans Mountain also examined the TUC around the north side of Edmonton but rejected that corridor when Alberta Infrastructure advised that a private land in-holding currently blocks the north TUC to future pipelines.

The proposed pipeline corridor rejoins the TMPL right-of-way west of Edmonton, following it through less developed areas of the City of Spruce Grove and the Town of Stony Plain before entering more rural landscapes and scattered country residential development in Parkland County. The existing TMPL right-of-way traverses Wabamun Lake Provincial Park for several kilometres. Wabamun Lake Provincial Park is located on the north shore of Wabamun Lake and was established as a provincial park in 1955 after construction of TMPL in 1953. The current proposed pipeline corridor passes north of the park; however, recent discussions with Alberta Tourism, Parks and Recreation indicate that it may be possible to follow TMPL through the park. During consultation, public stakeholders were open to routing the alternative corridor through the park, as it is in a utility corridor and adjacent to Highway 16. From an environmental and socio-economic perspective, crossing through the park parallel to the existing TMPL right-of-way is preferable because it is shorter, parallels an existing right-of-way, has fewer highway and road crossings and affects fewer private landowners.

Further west, the proposed pipeline corridor generally follows the TMPL right-of-way, crossing the Pembina River and McLeod River close to or beside the existing right-of-way towards the Town of Edson, which is bypassed immediately to the south. For the remainder of the length in Alberta, the proposed pipeline corridor generally follows the TMPL right-of-way with one main exception. Since the existing TMPL right-of-way passes through the middle of the Town of Hinton for 10.7 km, crossing adjacent to a number of residential and other private properties including a golf course, an improvement was made to follow a proposed new Highway 16 bypass that avoids the developed part of the town to the south. The proposed pipeline corridor then rejoins the TMPL right-of-way and eventually connects to the previously looped section of TMPL at the Hinton Pump Station.

4.2.2 Hargreaves to Darfield Segment

This pipeline segment is characterized by mountainous forested terrain alternating with dispersed rural residential and agricultural parcels in narrow mountain river valleys.

Commencing at Hargreaves Trap Site on the west side of Mount Robson Provincial Park and the western flank of the Rocky Mountains, the proposed pipeline corridor generally follows the TMPL right-of-way through the Fraser River valley except for a deviation to avoid Rearguard Falls Provincial Park and a crossing of the Fraser River west of the existing Rearguard Pump Station. Crossing the Fraser River east of Rearguard Pump Station is unavoidable, however, a dual crossing will be installed to avoid crossing the park and the Fraser River at a second location. The proposed pipeline corridor then rejoins the TMPL right-of-way, crossing over a height of land to enter the Rocky Mountain Trench. The Village of Valemount is bypassed to the west. Further south, the proposed pipeline corridor follows the existing TMPL right-of-way through successive narrow mountain valleys occupied by Camp Creek and the Albreda River, respectively.

As it continues to follow the existing TMPL right-of-way in a southerly direction, the proposed pipeline corridor enters the North Thompson River valley, which it generally follows for several hundred kilometres as far as the City of Kamloops. In the upper reaches of the valley, the TMPL right-of-way crosses the North Thompson River five times in less than 4 km. One crossing of the North Thompson River is unavoidable, however, an alternative corridor with reduced effects on watercourse crossings was sought by conducting field reconnaissance and gathering readily available resource information (see Figure 4.2-1 and Table 4.2-1). Following a study of four alternative corridors, the East Alternative is preferred since it: crosses the North Thompson River only once; crosses the least amount of Riparian Reserve Zone, Old Growth Management Area and critical moose winter range; is relatively short; has the fewest highway crossings; and avoids French's Hill, a known rapid earth slide hazard. For these reasons, the proposed pipeline corridor deviates from the TMPL right-of way to incorporate the East Alternative which parallels a nearby BC Hydro high voltage transmission line and forestry road for approximately 15 km.

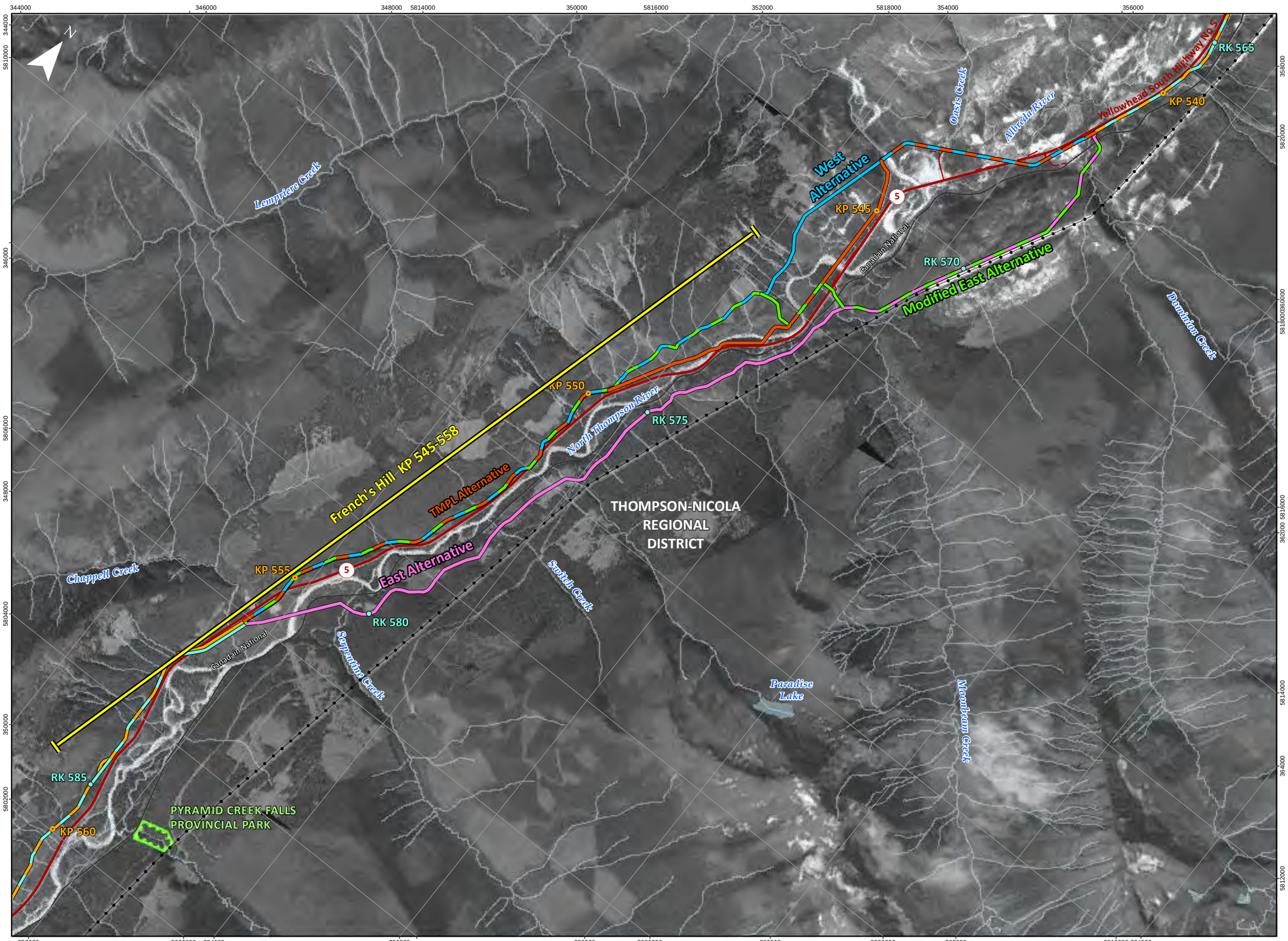
The proposed pipeline corridor continues to generally follow the existing TMPL right-of-way, descending the narrow, forested North Thompson River valley towards the Community of Blue River, entering the Interior Plateau. At Blue River, the proposed pipeline corridor is located immediately west of the community adjacent to the existing TMPL right-of-way and passes through the existing Blue River Pump Station. An alternative corridor from Blue River to the District of Clearwater was investigated. It would have involved: deviating from the North Thompson River valley; bypassing Blue River Pump Station; ascending 800 m up a steep hill; dropping into the upper reaches of the Raft River watershed; and then paralleling the Raft River to rejoin the TMPL right-of-way at Clearwater. Although 15% shorter, this alternative was rejected since it would encounter unacceptable pipe hydraulics and open up new corridor in habitat for a *Species at Risk Act* (*SARA*)-listed species – the Groundhog Mountain Caribou herd. South of Blue River, the proposed pipeline corridor continues to generally follow the existing TMPL right-of-way in the North Thompson River valley, except for an easterly deviation south of Froth Creek to avoid potential slope instability issues along Highway 5 at a place locally known as Messiter Hill. For the most part, the eastern deviation follows existing forestry roads, cut blocks and a BC Hydro high voltage transmission line. Further on, the proposed pipeline corridor rejoins the TMPL right-of-way as far south as Finn Creek Provincial Park.

Finn Creek Provincial Park is a Class A Park designated in 1996. Since it was uncertain whether BC Parks would permit a second pipeline in the park, Trans Mountain examined alternative corridors, both in the field and using readily available information sources (see Figure 4.2-2 and Table 4.2-2). Three alternatives were studied and evaluated from an environmental and socio-economic perspective. It was concluded that, assuming BC Parks approval, the TMPL Trenchless Alternative is preferred because it is short and involves a trenchless crossing of both Finn Creek and the northern tip of the park. If a trenchless crossing proves not feasible following further geotechnical field investigations, and assuming BC Parks approval, a conventional crossing of the park is preferred because it is the shortest alternative, parallels an existing right-of-way, avoids crossing an unnamed creek and does not involve clearing a new corridor to the east. BC Parks recently approved Trans Mountain's Stage 1 request to proceed to a Stage 2 application in the BC Parks boundary adjustment process.

Further south, the proposed pipeline corridor continues following the existing TMPL right-of-way through the widening North Thompson River valley, passing by the communities of Avola, Vavenby and the District of Clearwater before encountering two portions of the North Thompson River Provincial Park, a Class A Provincial Park designated in 1967. The northern portion of the park and the Clearwater River crossing is unavoidable whereas there is an alternative to avoid the southern portion of the park to the west. Two alternative corridors were studied and evaluated from an environmental and socio-economic

perspective (see Figure 4.2-3 and Table 4.2-3). It was concluded that, assuming BC Parks approval, the TMPL Alternative through the park is preferable because it is shorter, avoids highway crossings and encounters fewer private parcels. The current proposed pipeline corridor passes west of the park, although BC Parks recently approved Trans Mountain's Stage 1 request to proceed to a Stage 2 application in the BC Parks boundary adjustment process. The Stage 2 application would also incorporate the northern portion of the park described above.

Further south, the proposed pipeline corridor continues along the North Thompson River valley in the Interior Plateau, following the TMPL right-of-way as far south as Darfield Pump Station.



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TRANS MOUNTAIN

FIGURE 4.2-1

FIVE NORTH THOMPSON RIVER CROSSINGS ALTERNATIVE CORRIDORS

TRANS MOUNTAIN EXPANSION PROJECT

Five North Thompson River Crossings Alternative Corridors

- TMPL Alternative
- West Alternative
- Modified East Alternative
- East Alternative
- Reference Kilometre Post (RK)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Highway
- Paved Road
- Resource Road
- Transmission Line
- Railway
- Watercourse
- Park or Protected Area
- Waterbody

Projection: NAD 1983 UTM Zone 11N. Baseline TMPL Route Revision 0, provided by KMC May 2012. Proposed Corridor V6 provided by UPI, August 23, 2013; Transmission Lines: BC Hydro, 2011; Transportation: IHS Inc., 2007, BC FLNRO, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011; First Nation Lands: Government of Canada, 2013, BC FLNRO, 2005; Hydrology: BC FLNRO, 2008; Civic Facilities: DMTI Spatial Inc., 2013; Imagery: Provided by KMC, 2013, NASA Geospatial Interoperability Program 2005.

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MAP NUMBER		PAGE
201308_MAP_TERA_RT_00391_REV0_01_5THOMPSONS		SHEET 1 OF 1
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:50,000	PAGE SIZE: 11x17	DISCIPLINE: RT
DRAWN: SES	CHECKED: TGG	DESIGN: DM

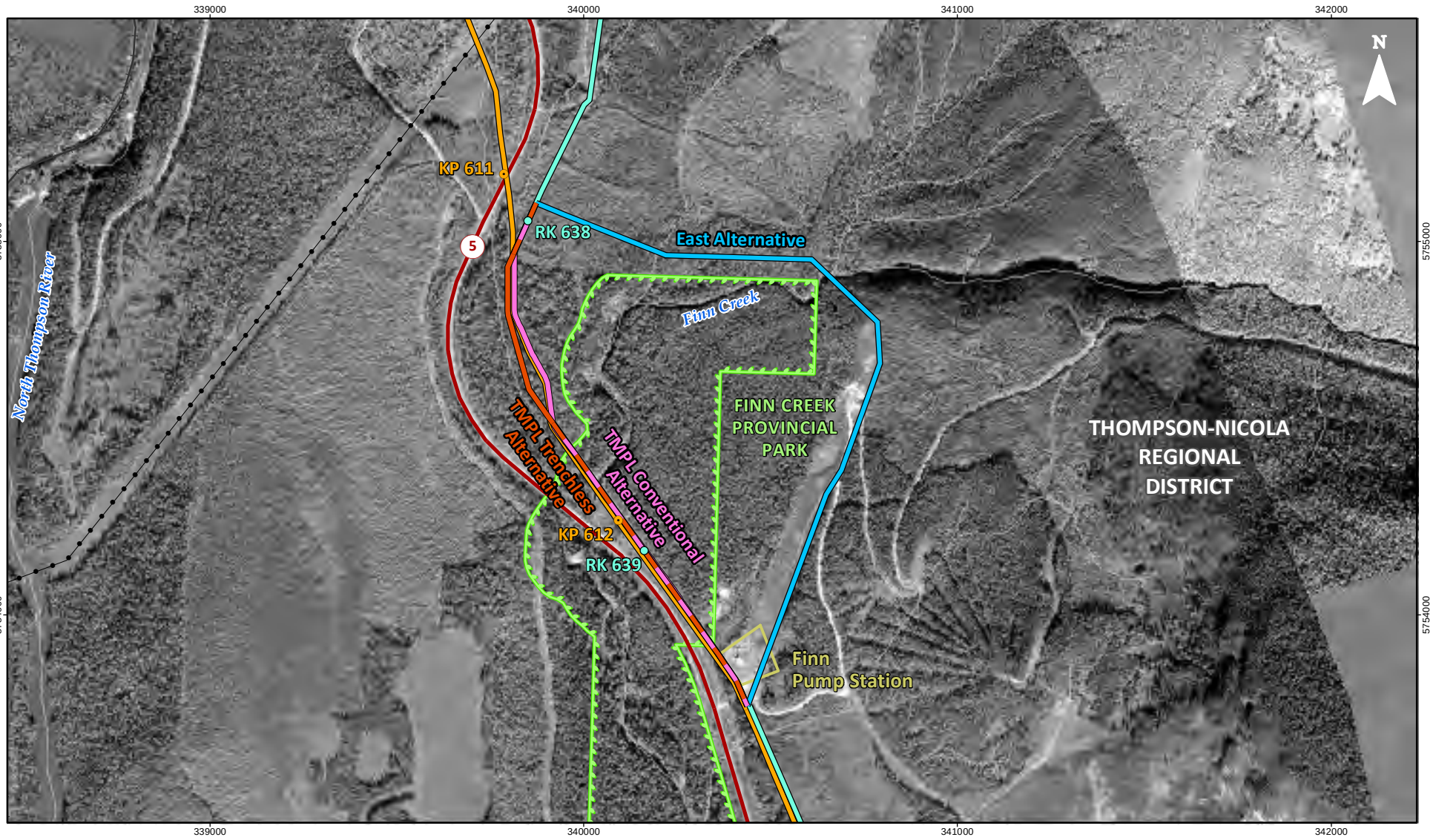
0 0.5 1 1.5 2 km

ALL LOCATIONS APPROXIMATE

TABLE 4.2-1

EVALUATION OF ALTERNATIVE CORRIDORS – FIVE NORTH THOMPSON RIVER CROSSINGS (KP 541.1 TO KP 555.9) (RK 567.1 TO RK 581.8)

Factors	TMPL Alternative	West Alternative	Modified East Alternative	East Alternative
LENGTHS				
Length of pipeline corridor (km)	14.9	14.7	15.5	14.7
Length following existing TMPL right-of-way (km)	14.9	9.7	7.4	0.2
Length following other linear features (other pipelines, power lines, highways, roads, FOTS, railways, etc.) (km)	0	2.6	5.9	10.8
Length of "new" corridor (km)	0	2.4	2.2	3.7
Total parallels (km)	14.9	12.3	13.3	11.0
CROSSINGS				
No. of highway crossings (No.)	4	4	4	0
No. of road (arterial, collector, local) crossings (No.)	0	0	0	0
No. of railway crossings (No.)	0	0	2	2
Crossings of named rivers (No.)	6 (5 x North Thompson River; Albreda River)	2 (North Thompson River; Albreda River)	1 (North Thompson River)	1 (North Thompson River)
Crossings of named creeks (No.)	3 (Dominion Creek; Oasis Creek; Moonbeam Creek)	2 (Dominion Creek; Oasis Creek)	2 (Dominion Creek; Moonbeam Creek)	4 (Dominion Creek; Switch Creek; Serpentine Creek; Moonbeam Creek)
Crossings of other watercourses (No.)	12	19	11	10
Total watercourses (No.)	21	23	14	15
GEOTECHNICAL				
Length crossing slopes > 50% on the fall line (km)	0	0	0	0
Length crossing slopes > 50% on sidehill (km)	1.0	1.5	1.6	2.4
Natural hazard potential (km)	High: 0.5 Medium: 1.7 Low: 12.7	High: 0.1 Medium: 2.0 Low: 12.6	High: 0.2 Medium: 1.7 Low: 13.6	High: 0.9 Medium: 2.0 Low: 11.8
Length of thin veneer of overburden or exposed bedrock (km)	1.7	3.2	3.4	2.6
HYDRAULIC ACCEPTABILITY	Yes	Yes	Yes	Yes
LAND				
Indian Reserve (km)(name)	0	0	0	0
Provincial Crown (km)	14.9	14.7	15.3	14.1
Private (km)	0	0	0.2	0.6
Unknown Parcels (km)	0	0	0	0
ENVIRONMENT				
Length within Riparian Reserve Zone (km)	2.8	0.5	0.5	0.2
Old Growth Management Area (legal) (km)	1.7	1.6	2.3	1.1
Old Growth Management Area (non-legal) (km)	0	0	0	0
Late winter or early winter habitat for mountain caribou (km) (Wells Gray or Groundhog)	8.6	9.0	9.0	8.7
Wetlands crossed (km), community forests crossed (km), woodlots crossed (km), designated Ungulate Winter Range (km), and Wildlife Habitat Areas (km) (species)	0	0	0	0
SOCIO-ECONOMIC				
Parks and protected areas (km)(name), Agricultural Land Reserve (km), and community watersheds (No.)	0	0	0	0
Land and Resource Management Plan (LRMP) area (km)(name)	14.9 (Kamloops LRMP)	14.7 (Kamloops LRMP)	15.5 (Kamloops LRMP)	14.7 (Kamloops LRMP)
LRMP Resource Management Zones crossed (km)(zone)	14.9 (Tk'emlúps te Secwepemc Traditional Territory) 14.9 (Visually Sensitive Areas) 11.1 (Critical Moose Winter Range)	14.7 (Tk'emlúps te Secwepemc Traditional Territory) 14.7 (Visually Sensitive Areas) 8.8 (Critical Moose Winter Range)	15.5 (Tk'emlúps te Secwepemc Traditional Territory) 11.4 (Visually Sensitive Areas) 6.0 (Critical Moose Winter Range)	9.9 (Tk'emlúps te Secwepemc Traditional Territory) 14.7 (Visually Sensitive Areas) 0.7 (Critical Moose Winter Range)
ABORIGINAL AND STAKEHOLDER ENGAGEMENT				
Aboriginal Support	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
Stakeholder Support	No notable feedback on this route option. Stakeholders are interested in reducing the number of river crossings.	Support for alternatives that reduce the number of river crossings without increasing environmental risk.	Support for alternatives that reduce the number of river crossings without increasing environmental risk.	Support for alternatives that reduce the number of river crossings without increasing environmental risk.
CONSTRUCTABILITY AND COST				
Constructability	5 North Thompson River crossings: 2 trenchless, 3 open cut; 1 Albreda River trenchless crossing.	New corridor along west side of valley; 1 North Thompson River crossing (open cut); 1 Albreda River crossing - trenchless crossing rejected due to slope instability issues.	Follows BC Hydro right-of-way; new corridor across to west side of valley; 1 North Thompson River crossing (trenchless).	Follows BC Hydro right-of-way, logging roads and new corridor along east side of valley; 1 North Thompson River crossing (trenchless).
Estimated Construction Cost ($ millions)	$55.8	$48.6	$51.1	$49.2



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KM
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ALL LOCATIONS APPROXIMATE

MAP NUMBER: 201308_MAP_TERA_RT_00391_REV0_02_FINNCREEK		PAGE: SHEET 1 OF 1
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:15,000	PAGE SIZE: 8.5 x 11	DISCIPLINE: RT
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Finn Creek Provincial Park Alternative Corridors

- TMPL Conventional Alternative
- TMPL Trenchless Alternative
- East Alternative
- Reference Kilometre Post (RK)
- Kilometre Post (KP)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Trans Mountain Pipeline (TMPL)
- Transmission Line
- Watercourse
- Highway
- Railway
- Finn Creek Provincial Park

Projection: NAD 1983 UTM Zone 11N. Baseline TMPL Route Revision 0, provided by KMC, May 2012. Proposed Corridor V6 provided by UPI, August 23, 2013; Transmission Lines: BC Hydro, 2011; Transportation: IHS Inc., 2007, BC FLNRO, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011, BC FLNRO, ; First Nation Lands: Government of Canada, 2013, BC FLNRO, 2005; Hydrology: BC FLNRO, 2008; Imagery: Provided by KMC, 2013, NASA Geospatial Interoperability Program 2005.

TRANS MOUNTAIN

FIGURE 4.2-2

FINN CREEK PROVINCIAL PARK ALTERNATIVE CORRIDORS

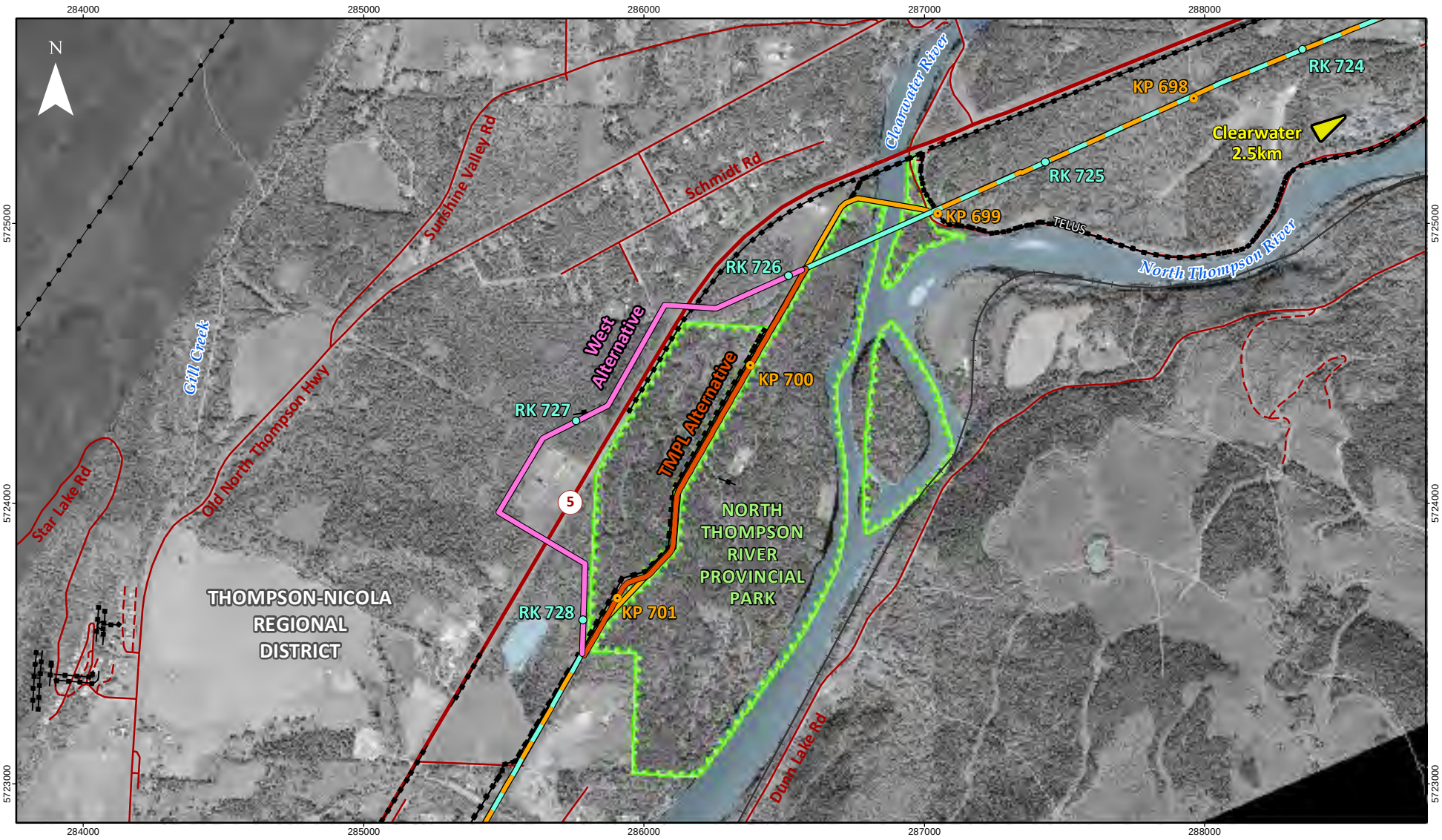
TRANS MOUNTAIN EXPANSION PROJECT

201308_MAP_TERA_RT_00391_Rev0_02_FinnCreek.mxd

TABLE 4.2-2

EVALUATION OF ALTERNATIVE CORRIDORS – FINN CREEK PROVINCIAL PARK (KP 611.2 TO KP 612.6) (RK 638.0 TO RK 639.5)

Factors	TMPL Alternative (Conventional)	TMPL Alternative (Trenchless)	East Alternative
LENGTHS			
Length of pipeline corridor (km)	1.5	1.6	2.1
Length following existing TMPL right-of-way (km)	1.4	1.6	0.1
Length following other linear features (other pipelines, power lines, highways, roads, FOTS, railways, etc.) (km)	0	0	1.3
Length of "new" corridor (km)	0.1	0	0.7
Total parallels (km)	1.4	1.6	1.4
CROSSINGS			
No. of highway crossings (No.)	0	0	0
No. of road (arterial, collector, local) crossings (No.)	0	0	0
No. of railway crossings (No.)	0	0	0
Crossings of named rivers (No.)	0	0	0
Crossings of named creeks (No.)	1 (Finn Creek)	1 (Finn Creek)	1 (Finn Creek)
Crossings of other watercourses (No.)	0	0	1
Total watercourses (No.)	1	1	2
GEOTECHNICAL			
Length crossing slopes > 50% on the fall line (km)	0	0	0
Length crossing slopes > 50% on sidehill (km)	0	0	0.1
Natural hazard potential (km)	High: 0.0 Medium: 0.0 Low: 1.5	High: 0.0 Medium: 0.0 Low: 1.5	High: 0.0 Medium: 0.0 Low: 2.1
Length of thin veneer of overburden or exposed bedrock (km)	0.0	0.0	0.0
HYDRAULIC ACCEPTABILITY	Yes	Yes	Yes
LAND			
Indian Reserve (km)(name)	0	0	0
Provincial Crown (km)	1.5	1.6	2.1
Private (km)	0	0	0
ENVIRONMENT			
Old Growth Management Area (legal) (km)	0	0	0.3
Old Growth Management Area (non-legal) (km)	0.1	0.1	0
Late winter or early winter habitat for mountain caribou (km) (Wells Gray or Groundhog)	0.8	0.8	0
Length within Riparian Reserve Zone (km), wetlands crossed (km), community forests crossed (km), woodlots crossed (km), designated Ungulate Winter Range (km), and Wildlife Habitat Areas (km) (species)	0	0	0
SOCIO-ECONOMIC			
Parks and protected areas (km)(name)	0.7 (Finn Creek Provincial Park) - would require boundary adjustment	0.7 (Finn Creek Provincial Park) - would require boundary adjustment	0
Agricultural Land Reserve (km)	0	0	0
Community watersheds (No.)	0	0	0
LRMP area (km) (name)	1.5 (Kamloops LRMP)	1.6 (Kamloops LRMP)	2.1 (Kamloops LRMP)
LRMP Resource Management Zones crossed (km)(name)	1.5 (Tk'emlúps te Secwepemc Traditional Territory) 1.5 (Visually Sensitive Areas)	1.6 (Tk'emlúps te Secwepemc Traditional Territory) 1.6 (Visually Sensitive Areas)	2.1 (Tk'emlúps te Secwepemc Traditional Territory) 2.1 (Visually Sensitive Areas)
ABORIGINAL AND STAKEHOLDER ENGAGEMENT			
Aboriginal Support	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
Stakeholder Support	General support for alternatives that avoid or reduce effects on provincial parks.	General support for alternatives that avoid or reduce effects on provincial parks.	General support for alternatives that avoid or reduce effects on provincial parks.
CONSTRUCTABILITY AND COST			
Constructability	Flow isolation crossing of Finn Creek and conventional trench construction through the balance of Finn Creek Provincial Park. Relatively flat terrain through the park south of the Creek.	Trenchless crossing of Finn Creek and Finn Creek Provincial Park.	Isolated crossing of Finn Creek and conventional trench construction bypassing Finn Creek Provincial Park to the east. Difficult terrain with extensive grade work on steep slopes in close proximity to BC Hydro line.
Estimated Construction Cost ($ millions)	$2.9	$6.8	$4.9



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KM
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ALL LOCATIONS APPROXIMATE

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DATE December 2013	TERA REF. 7894	REVISION 0
SCALE 1:20,000	PAGE SIZE 8.5 x 11	DISCIPLINE RT
DRAWN SES	CHECKED TGG	DESIGN DM

North Thompson River Provincial Park
Alternative Corridors

- TMPL Alternative
- West Alternative
- Reference Kilometre Post (RK)
- Kilometre Post (KP)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Trans Mountain Pipeline (TMPL)
- Highway
- Railway
- Paved Road
- Resource Road
- Transmission Line
- Fiber Optic Transmission System (FOTS)
- Watercourse
- North Thompson River Provincial Park

Projection: NAD 1983 UTM Zone 11N. Baseline TMPL Route Revision 0, provided by KMC, May 2012. Proposed Corridor V6 provided by UPI, August 23, 2013; Transmission Lines: BC Hydro, 2011; Transportation: IHS Inc., 2007, BC FLNRO, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011; First Nation Lands: Government of Canada, 2013, BC FLNRO, 2005; Hydrology: BC FLNRO, 2008; FOTS: ICIS, 2012; Imagery: Provided by MKC, 2013, NASA Geospatial Interoperability Program 2005.

TRANS MOUNTAIN

FIGURE 4.2-3

NORTH THOMPSON RIVER PROVINCIAL PARK ALTERNATIVE CORRIDORS

TRANS MOUNTAIN EXPANSION PROJECT

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TABLE 4.2-3

EVALUATION OF ALTERNATIVE CORRIDORS – NORTH THOMPSON RIVER PROVINCIAL PARK (KP 699.6 TO KP 701.2) (RK 725.9 TO RK 728.1)

Factors	TMPL Alternative	West Alternative
LENGTHS		
Length of pipeline corridor (km)	1.6	2.2
Length following existing TMPL right-of-way (km)	1.6	0.2
Length following other linear features (other pipelines, power lines, highways, roads, FOTS, railways, etc.) (km)	0	1.3
Length of "new" corridor (km)	0	0.7
Total parallels (km)	1.6	1.5
CROSSINGS		
No. of highway crossings (No.)	0	2
No. of road (arterial, collector, local) crossings (No.)	3	2
No. of railway crossings (No.)	0	0
Crossings of named rivers (No.)	0	0
Crossings of named creeks (No.)	0	0
Crossings of other watercourses (No.)	0	0
Total watercourses (No.)	0	0
GEOTECHNICAL		
Length crossing slopes > 50% on the fall line (km)	0	0
Length crossing slopes > 50% on side hill (km)	0	0
Natural hazard potential (km)	High: 0.0 Medium: 0.0 Low: 1.6	High: 0.0 Medium: 0.0 Low: 2.2
Length of thin veneer of overburden or exposed bedrock (km)	0.0	0.0
HYDRAULIC ACCEPTABILITY	Yes	Yes
LAND		
Indian Reserve (km) (name)	0	0
Provincial Crown (km)	1.4	0.4
Private (km)	0.2	1.6
Unknown Parcels (km)	0	0.2
No. of private parcels (No.)	1	6
ENVIRONMENT		
Old Growth Management Area (non-legal) (km)	0.2	0
Length within Riparian Reserve Zone (km), wetlands crossed (km), community forests crossed (km), woodlots crossed (km), Wildlife Habitat Areas (km) (species), designated Ungulate Winter Range (km), late winter or early winter habitat for mountain caribou (km) (Wells Gray or Groundhog) , and Old Growth Management Area (legal) (km)	0	0
SOCIO-ECONOMIC		
Parks and protected areas (km) (name)	1.4 (North Thompson River Provincial Park) - would require boundary adjustment.	0
Agricultural Land Reserve (km)	0	0
Community watersheds (No.)	0	0
Municipalities crossed	Clearwater	Clearwater
LRMP area (km) (name)	2.0 (Kamloops LRMP)	2.2 (Kamloops LRMP)
ABORIGINAL AND STAKEHOLDER ENGAGEMENT		
Aboriginal Support	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
Stakeholder Support	General support for alternatives that avoid provincial parks.	General support for alternatives that avoid provincial parks.
CONSTRUCTABILITY AND COST		
Constructability	TMPL Alternative is slightly hummocky requiring additional extra work space in park for grade cuts.	West Alternative crosses to the west side of Highway 5 to avoid North Thompson River Provincial Park and passes through terrain equivalent to the TMPL Alternative before crossing back to the east side of Highway 5 to rejoin the TMPL corridor.
Estimated Cost ($ millions)	$3.1	$4.2

4.2.3 Black Pines to Hope Segment

This pipeline segment is characterized by rolling grasslands in the vicinity of Kamloops and Merritt in the north, graduating to forested and mountainous terrain in the south.

From the location of the proposed Black Pines Pump Station (see Section 4.4) in the Interior Plateau, the proposed pipeline corridor follows the TMPL right-of-way on the west side of the lower North Thompson River valley, which now averages 2 km in width, becoming increasingly settled and agricultural. The community of Westsyde in the City of Kamloops has recently expanded along a broad terrace of the river, encroaching on the TMPL right-of-way (see Plate 2). Lac du Bois Grassland Protected Area is located immediately west of Westsyde. The protected area was first established in 1996 after TMPL was constructed and additional lands were added through a designated expansion in 2013. These additions overlap the existing TMPL right-of-way at two short locations north of Westsyde and at a longer location (1.5 km) in the Batchelor Hills area further south, which is unavoidable. During the consultation process, strong community support was expressed by some stakeholders for a corridor west of Westsyde through the protected area following a FOTS right-of-way (see Plate 3), while others raised concerns about effects of the Project on the protected area. Both alternative corridors were studied and evaluated from an environmental and socio-economic perspective (see Figure 4.2-4 and Table 4.2-4). It was concluded that, assuming BC Parks approval, the West Alternative is preferred because it crosses slightly fewer watercourses, considerably fewer private parcels and avoids the community of Westsyde. BC Parks recently approved Trans Mountain's Stage 1 request to proceed to a Stage 2 application in the BC Parks boundary adjustment process. The Stage 2 application would also incorporate the 2013 additional lands described above.

The proposed pipeline corridor then rejoins the TMPL right-of-way and crosses the Thompson River just east of the Kamloops Airport, ascending the south slope of the river valley to eventually connect to the Kamloops Pump Station on the south side of Highway 5.

The proposed pipeline corridor generally follows the existing TMPL right-of-way across a semi-forested upland plateau from Kamloops to Merritt, with three possible exceptions. The first is a jog to the west on the property of the proposed KGHM Ajax Mining Inc. copper and gold mine to avoid Jacko Lake and a narrow valley, where there is insufficient room to install a second pipeline. Further south, the existing TMPL right-of-way crosses the corners of two IRs north of Merritt (Zoht 5 and Zoht 4), where minor deviations avoiding the IRs are being considered in addition to following beside TMPL through the IRs.

The proposed pipeline corridor follows the existing TMPL right-of-way through the eastern limits of the City of Merritt in the Nicola River valley, cutting the northwest corner of the Joeyaska IR No. 2. A minor deviation avoiding the IR to the north and west is also being considered. Further south, the proposed pipeline corridor continues to follow the existing TMPL right-of-way up the Coldwater River valley, traversing Coldwater IR No. 1 for 7 km.

Based on correspondence from the Coldwater Indian Band, several alternative corridors east and west of the IR were studied and evaluated from an environmental and socio-economic perspective (see Figure 4.2-5 and Table 4.2-5). The currently proposed pipeline corridor is the East Corridor, although the Modified East Alternative is also under consideration. From an environmental and socio-economic perspective, and with the Coldwater Indian Band's approval, the preferred corridor would switch to the TMPL Modified Alternative Corridor as it: is the shortest; generally parallels an existing right-of-way; crosses the fewest watercourses; encounters the least amount of bedrock; and crosses the least amount of designated Ungulate Winter Range habitat.

Further south, the proposed pipeline corridor rejoins the existing TMPL right-of-way ascending the narrowing Coldwater River valley to just south of Kingsvale Pump Station. The terrain becomes increasingly mountainous as the proposed pipeline corridor extends further south through the Hozameen Range of the Cascade Mountains. From Kingsvale Pump Station, the proposed pipeline corridor deviates from the existing TMPL right-of-way several times to parallel the Spectra gas pipeline right-of-way which generally parallels the existing TMPL right-of-way in the Coldwater River valley area. These deviations are generally undertaken to take advantage of better terrain, to reduce the number of Coldwater River crossings or to minimize the length in the Riparian Reserve Zone.

In the upper reaches of the Coldwater River valley, the existing TMPL right-of-way is in close proximity to Coldwater River Provincial Park for 2 km, crosses the divide into the Coquihalla Summit Recreation Area and continues southwards through the Coquihalla Lakes area, over a 185 m "Jump Off" into the narrow gorge locally known as Coquihalla Canyon, eventually crossing the Coquihalla River 13 times in less than 20 km (see Plate 4). There is limited working room in Coquihalla Canyon for a second pipeline and constructability is a concern. An alternative corridor with reduced effects on water crossings was sought. After considerable field reconnaissance, a West Alternative Corridor was identified which follows a combination of a Spectra gas pipeline right-of-way, a FOTS right-of-way and the right-of-way of the relatively recently constructed Coquihalla Highway (Highway 5) through the Boston Bar Creek drainage west of Coquihalla Canyon. Both alternative corridors were studied and evaluated from an environmental and socio-economic perspective (see Figure 4.2-6 and Table 4.2-6). It was concluded that the West Alternative is preferred because it: entails 1 river crossing as opposed to 16; crosses considerably less terrain with high natural hazard potential; has considerably less length through the Riparian Reserve Zone, Old Growth Management Areas, and designated Ungulate Winter Range; avoids Coldwater River Provincial Park and crosses slightly less of the Coquihalla Summit Recreation Area. The two corridors rejoin where Boston Bar Creek flows into the Coquihalla River.

From this point to the District of Hope, the proposed pipeline corridor follows the narrow and steep Coquihalla River valley beside one of the existing rights-of-way occupied either by TMPL, Coquihalla Highway, Spectra or FOTS, depending upon the most constructible terrain and other factors. For example, the existing TMPL right-of-way traverses Coquihalla River Provincial Park for 3 km, whereas the proposed pipeline corridor avoids the park altogether. Once in the District of Hope, the proposed pipeline corridor generally follows the existing TMPL or the Spectra rights-of-way and, at the request of the Union Bar Indian Band, avoids the Kawkawa Lake IR No. 16. The proposed pipeline corridor continues west, crossing the Coquihalla River upstream of its confluence with the Fraser River and entering Hope Pump Station.

4.2.4 Hope to Burnaby Segment

West of the District of Hope, the proposed pipeline corridor generally follows the existing TMPL and Highway 1 (Trans-Canada Highway) rights-of-way in the narrow strip of land between the Fraser River and the Skagit Range of the Cascade Mountains. The remainder of the proposed pipeline corridor traverses the rich agricultural lands of the Lower Mainland of BC, which becomes increasingly urbanized from the Fraser Valley Regional District west to Metro Vancouver. Most of the agricultural lands are part of the provincial Agricultural Land Reserve. The proposed pipeline corridor generally follows the existing TMPL right-of-way unless otherwise specifically mentioned.

The proposed pipeline corridor continues west into the Lower Mainland, although minor deviations are being considered to avoid Ohamil IR No. 1, Peters IR No. 1A and Popkum IR No. 1. East of the City of Chilliwack, the proposed pipeline corridor crosses to the north side of the Trans-Canada Highway to parallel a BC Hydro power line in order to avoid a crossing of Bridal Veil Falls Provincial Park and Popkum IR No. 2. A small portion of Cheam Lake Wetland Regional Park is crossed for approximately 100 m, although in response to considerable opposition from the public and Fraser Valley Regional District, minor deviations are being considered in this area to avoid the park.

Further west, the proposed pipeline corridor passes through the City of Chilliwack, with minor deviations being considered to avoid crossing Grass IR No. 15 and Tzeachten IR No. 13. The Vedder River is the major watercourse crossed in the Chilliwack area. Further west, the proposed pipeline corridor enters the City of Abbotsford, crossing the Sumas River and surrounding agricultural Sumas Prairie before ascending the forested south flank of Sumas Mountain. The existing TMPL right-of-way provides for a branchline to access TMPL's Sumas Terminal. On the west side of Sumas Mountain, the proposed pipeline corridor crosses increasingly urbanized areas and a golf course in the vicinity of Clayburn. Towards the western end of the City of Abbotsford, the proposed pipeline corridor crosses the Matsqui Main IR No. 2, although a minor deviation is being considered to the south. The proposed pipeline corridor then enters the Township of Langley and continues along the existing TMPL right-of-way until the vicinity of the Salmon River valley south of Fort Langley. From this point onwards to the Fraser River crossing, urbanization in Langley and the City of Surrey has encroached considerably on the existing TMPL right-of-way in the past 60 years, making contiguous looping extremely difficult. For this reason an alternative pipeline corridor was sought. Trans Mountain chose to take advantage of the existing

Canadian National Railway Company (CN) right-of-way and new South Fraser Perimeter Road corridor on the south side of the Fraser River. Accordingly, the proposed pipeline corridor leaves the existing TMPL right-of-way near a golf course and heads north on new corridor a short distance across farmland in the Salmon River valley before reaching the CN right-of-way. Minor deviations in the Salmon River area are being considered to follow property lines, a second golf course and avoid a local natural area further north if possible before joining the CN right-of-way. From this point, the proposed pipeline corridor turns west, paralleling the CN right-of-way and later the South Fraser Perimeter Road right-of-way in a westerly direction through Langley and Surrey to the crossing location of the Fraser River near the Port Mann Bridge. The proposed pipeline corridor traverses the edge of the Surrey Bend Regional Park for about 3 km, although a minor deviation is being considered to reduce this length by taking advantage of surplus land released from the recently constructed South Fraser Perimeter Road project.

Two primary locations are being considered to cross the main stem of the Fraser River between the cities of Surrey and Coquitlam using horizontal directional drilling (HDD), a trenchless method of construction (see Plate 5). Currently, the proposed pipeline corridor is located approximately 500 m east of the existing TMPL pipeline, but an alternative location is being considered on the east side of the Port Mann Bridge. On the north side of the Fraser River, urbanization in the cities of Coquitlam and Burnaby has encroached considerably on the existing TMPL right-of-way in the past 60 years to make contiguous looping extremely difficult (see Plate 6). The proposed pipeline corridor follows the Lougheed Highway, although a deviation is being considered to traverse existing industrial lands and railway easements within the Brunette River Conservation Area. Both the proposed pipeline corridor and the deviation eventually connect to TMPL's Burnaby Terminal via other city streets.

4.2.5 Burnaby to Westridge Segment

From the Burnaby Terminal to the Westridge Marine Terminal on Burrard Inlet, urbanization in the City of Burnaby has encroached considerably on the existing TMPL right-of-way in the past 60 years to make contiguous looping with twin 762 mm (NPS 30) OD buried delivery lines extremely difficult. The proposed pipeline corridor follows alongside Burnaby Mountain Parkway, Hastings Street, and Cliff Avenue before turning east into TMPL's Westridge Marine Terminal. Other more direct alternatives involving partial or total trenchless (HDD or tunnel) methods of construction are also under consideration.

TRANS MOUNTAIN

FIGURE 4.2-4

LAC DU BOIS GRASSLANDS PROTECTED AREA ALTERNATIVE CORRIDORS

TRANS MOUNTAIN EXPANSION PROJECT

Lac Du Bois Grasslands Protected Area Alternate Corridors

- TMPL Alternative
- West Alternative
- Reference Kilometre Post (RK)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Highway
- Paved Road
- Resource Road
- Railway
- Fiber Optic Transmission System (FOTS)
- Transmission Line
- Other Existing Pipeline
- Populated Place
- Urban Area
- Park or Protected Area
- Waterbody
- Watercourse
- Indian Reserve

Projection: NAD 1983 UTM Zone 10N. Baseline TMPL Route Revision 0, provided by KMC, May 2012. Proposed Corridor V6 provided by UPI, August 23, 2013; Transmission Lines: BC Hydro, 2011; Transportation: IHS Inc., 2007, BC FLNRO, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011; First Nation Lands: Government of Canada, 2013, BC FLNRO, 2005; Hydrology: BC FLNRO, 2008; Civic Facilities: DMTI Spatial Inc. 2013; Spectra Pipelines and FOTS Lines: KMC, 2012; Imagery: Provided by KMC, 2013, NASA Geospatial Interoperability Program 2005.

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DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:50,000	PAGE SIZE: 11x17	DISCIPLINE: RT
DRAWN: TPH	CHECKED: TGG	DESIGN: DM

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ALL LOCATIONS APPROXIMATE

201308_MAP_TERA_RT_00391_Rev0_4_LacDuBoisPP.mxd

TABLE 4.2-4

EVALUATION OF ALTERNATIVE CORRIDORS – LAC DU BOIS GRASSLANDS PROTECTED AREA (KP 793.5 TO KP 809.4) (RK 820.5 TO RK 836.9)

Factors	TMPL Alternative	West Alternative
LENGTHS		
Length of pipeline corridor (km)	16.6	16.4
Length following existing TMPL right-of-way (km)	12.6	0.1
Length following other linear features (other pipelines, power lines, highways, roads, FOTS, railways, etc.) (km)	2.5	15.7
Length of "new" corridor (km)	1.5	0.6
Total parallels (km)	15.1	15.8
CROSSINGS		
No. of highway crossings (No.)	0	0
No. of road (arterial, collector, local) crossings (No.)	24	4
No. of main power line crossings (No.)	0	0
No. of distribution power line crossings (No.)	1	0
No. of railway crossings (No.)	0	0
Crossings of named rivers (No.)	0	0
Crossings of named creeks (No.)	3 (Dairy Creek; McQueen Creek; Lanes Creek)	3 (Dairy Creek; McQueen Creek; Lanes Creek)
Crossings of other watercourses (No.)	25	23
Total watercourses (No.)	28	26
GEOTECHNICAL		
Length crossing slopes > 50% on the fall line (km)	0	0
Length crossing slopes > 50% on sidehill (km)	0.2	0
Natural hazard potential (km)	High: 0.0 Medium: 1.7 Low: 14.8	High: 0.0 Medium: 0.0 Low: 16.4
Length of thin veneer of overburden or exposed bedrock (km)	0.6	3.2
Hydraulic Acceptability	Yes	Yes
LAND		
Indian Reserve (km) (name)	0	0
Provincial Crown (km)	2.0	13.7
Private (km)	14.5	1.8
Unknown Parcels (km)	0	0.9
No. of private parcels (No.)	72	4
ENVIRONMENT		
Length within Riparian Reserve Zone (km)	0.1	0
Woodlots crossed (km)	0.4	0
Wildlife Habitat Areas (km) (species), Old Growth Management Area (legal) (km), Old Growth Management Area (non-legal) (km), designated Ungulate Winter Range (km), wetlands crossed (km), and late winter or early winter habitat for mountain caribou (km) (Wells Gray or Groundhog)	0	0
SOCIO-ECONOMIC		
Parks and protected areas (km) (name)	0.2 (Lac Du Bois Grasslands Protected Area) - would require boundary adjustment	7.9 (Lac Du Bois Grasslands Protected Area) - would require boundary adjustment
Agricultural Land Reserve (km)	11.6	10.2
Community watersheds (No.)	0	0
Municipalities crossed	Kamloops	Kamloops
LRMP area (km) (name)	16.6 (Kamloops LRMP)	16.4 (Kamloops LRMP)
LRMP Resource Management Zones crossed (km)	Tk'emlúps te Secwepemc Traditional Territory (16.6) Visually Sensitive Areas (16.6) Settlement Resource Management Zone (3.7)	Tk'emlúps te Secwepemc Traditional Territory (16.4) Visually Sensitive Areas (11.7) Critical Deer Winter Range (7.2)
ABORIGINAL AND STAKEHOLDER ENGAGEMENT		
Aboriginal Support	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
Stakeholder Support	Westsyde residents have expressed strong support for avoiding Westsyde and traversing the Protected Area. If the West Alternative is not possible then this option is preferred by stakeholders.	Naturalists concerned about Protected Area and mitigation/compensation for environmental effects.
CONSTRUCTABILITY AND COST		
Constructability	TMPL parallel combined with complex in-street construction along Westsyde Road plus some residential backyard construction.	FOTS parallel along north west slope through Lac Du Bois Grassland Protected Area.
Estimated Construction Cost ($ millions)	$50.0	$30.6

TRANS MOUNTAIN

FIGURE 4.2-5

COLDWATER INDIAN RESERVE ALTERNATIVE CORRIDORS

TRANS MOUNTAIN EXPANSION PROJECT

Coldwater Indian Reserve Alternative Corridors

- TMPL Modified Alternative
- West Alternative
- East Alternative
- Modified East Alternative
- Reference Kilometre Post (RK)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Highway
- Paved Road
- Resource Road
- Railway
- Spectra Pipeline
- Fibre Optic Transmission System (FOTS)
- Transmission Line
- Park or Protected Area
- Waterbody
- Watercourse
- Indian Reserve

Projection: NAD 1983 UTM Zone 11N. Baseline TMPL Route Revision 0, provided by KMC, May 2012. Proposed Corridor V6 provided by UPI, August 23, 2013; Transmission Lines: BC Hydro, 2011; Transportation: IHS Inc., 2007, BC FLNRO, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011; First Nation Lands: Government of Canada, 2013, BC FLNRO, 2005; Hydrology: BC FLNRO, 2008; Civic Facilities: DMTI Spatial Inc. 2013; Spectra Pipelines and FOTS Lines: KMC, 2012; Imagery: Provided by KMC, 2013, NASA Geospatial Interoperability Program 2005.

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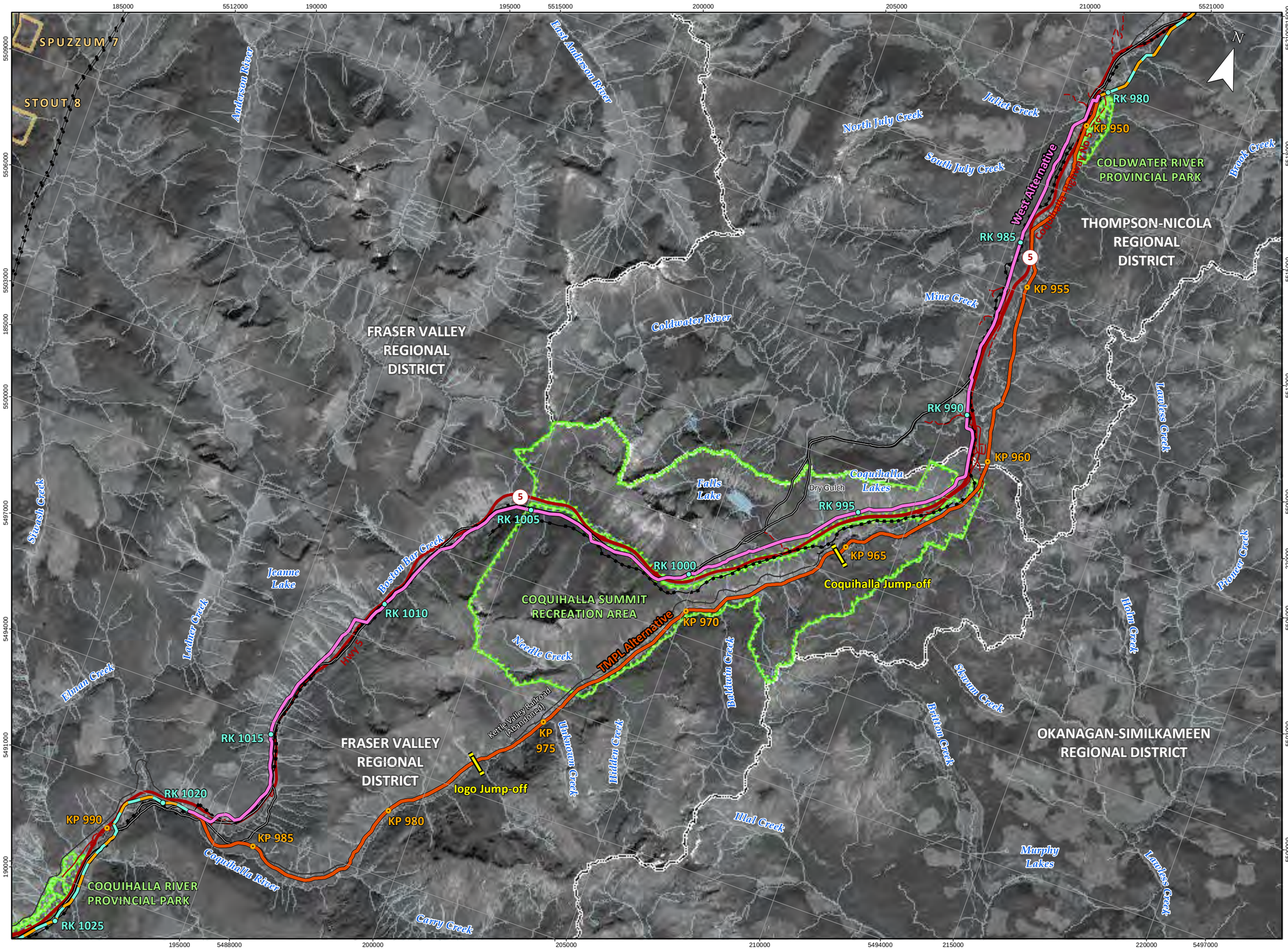
ALL LOCATIONS APPROXIMATE

201308_MAP_TERA_RT_00391_Rev0_05_ColdwaterIR.mxd

TABLE 4.2-5

EVALUATION OF ALTERNATIVE CORRIDORS - COLDWATER INDIAN RESERVE (KP 903.5 TO KP 919.5) (RK 933.1 TO RK 950.7)

Factors	TMPL Modified Alternative	West Alternative	East Alternative	Modified East Alternative
LENGTHS				
Length of pipeline corridor (km)	16.7	19.3	17.5	17.5
Length following existing TMPL right-of-way (km)	13.9	0.1	8.3	5.0
Length following other linear features (other pipelines, power lines, highways, roads, FOTS, railways, etc.) (km)	1.7	18.5	5.7	7.6
Length of "new" corridor (km)	1.1	0.7	3.5	4.9
Total parallels (km)	15.6	18.5	14.0	12.6
CROSSINGS				
No. of highway crossings (No.)	0	0	2	2
No. of road (arterial, collector, local) crossings (No.)	8	4	7	5
No. of railway crossings (No.)	0	0	0	0
Crossings of named rivers (No.)	0	2 (2 x Coldwater River)	0	0
Crossings of named creeks (No.)	5 (Stirling, Skugam, Kwinshatin, Castillion, Salem)	4 (Oluk, Salem, Lemoto x 2)	5 Stirling, Skugam, Kwinshatin, Castillion, Salem)	5 (Stirling, Skugam, Kwinshatin, Castillion, Salem)
Crossings of other watercourses (No.)	16	24	16	18
Total watercourses (No.)	21	30	21	23
GEOTECHNICAL				
Length crossing slopes > 50% on the fall line (km)	0	0	0	0
Length crossing slopes > 50% on sidehill (km)	0	0.2	0.3	0.5
Natural hazard potential (km)	High: 0 Medium: 1.4 Low: 15.3	High: 0 Medium: 2.2 Low: 17.1	High: 0 Medium: 0 Low: 17.5	High: 0 Medium: 0 Low: 17.5
Length of thin veneer of overburden or exposed bedrock (km)	0.3	4.5	3.3	4.1
HYDRAULIC ACCEPTABILITY	Yes	Yes	Yes	Yes
LAND				
Indian Reserve (km)(name)	7.0 (Coldwater IR 1)	0	0	0
Provincial Crown (km)	3.5	14.2	11.1	11.4
Private (km)	6.1	5.0	6.3	3.8
Unknown Parcels (km)	0.1	0.1	0.1	2.3
No. of private parcels (No.)	19	7	20	16
ENVIRONMENT				
Length within Coldwater River Riparian Reserve Zone (km)	0	0.6	0	0
Woodlots crossed (km)	0.2	0.7	0.2	0
Wildlife Habitat Areas for *SARA* listed species (km) (species)	0	1.6 (Williamson's Sapsucker)	0	0
Old Growth Management Area (non-legal) (km)	0.3	1.3	1.2	1.2
Designated Ungulate Winter Range (km)	3.6	13.4	11.2	13.7
Wetlands crossed (km), community forests crossed (km), and Old Growth Management Area (legal) (km)	0	0	0	0
SOCIO-ECONOMIC				
Parks and protected areas (km) (name)	0	0	0	0
Agricultural Land Reserve (km)	5.1	6.1	4.7	4.2
Community watersheds (No.)	2	0	2	2
LRMP area (km) (name)	0	0	0	0
ABORIGINAL AND STAKEHOLDER ENGAGEMENT				
Aboriginal Support	No	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
Stakeholder Support	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
CONSTRUCTABILITY AND COST				
Constructability	Crosses Coldwater IR 1; paralleling the existing TMPL right-of-way; skirts to the east of the more developed area.	Requires 2 Coldwater River trenchless crossings; includes Spectra right-of-way and FOTS parallel.	Skirts to east side of the Coldwater IR 1; includes 2 crossings of the Coquihalla Highway 5.	Skirts to the east side of Coldwater IR 1; includes 2 crossings of Coquihalla Highway 5.
Estimated Construction Cost ($ millions)	$31.3	$41.2	$33.2	$33.1



TRANS MOUNTAIN

FIGURE 4.2.6

COLDWATER RIVER PROVINCIAL PARK: COQUIHALLA VS. BOSTON BAR ALTERNATIVE CORRIDORS

TRANS MOUNTAIN EXPANSION PROJECT

Coldwater River Provincal Park: Coquihalla vs. Boston Bar Alternative Corridors

- TMPL Alternative
- West Alternative
- Reference Kilometre Post (RK)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Highway
- Paved Road
- Resource Road
- Railway
- Transmission Line
- Spectra Pipeline
- Fiber Optic Transmission System (FOTS)
- Park or Protected Area
- Waterbody
- Watercourse
- Indian Reserve
- Regional District Boundary

Projection: NAD 1983 UTM Zone 11N. Baseline TMPL Route Revision 0, provided by KMC, May 2012. Proposed Corridor V6 provided by UPI, August 23, 2013; Transmission Lines: BC Hydro, 2011; Transportation: IHS Inc., 2007, BC FLNRO, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011; First Nation Lands: Government of Canada, 2013, BC FLNRO, 2005; Hydrology: BC FLNRO, 2008; Civic Facilities: DMTI Spatial Inc. 2013; Spectra Pipelines and FOTS Lines: KMC, 2012; Imagery: Provided by KMC, 2013, NASA Geospatial Interoperability Program 2005.

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ALL LOCATIONS APPROXIMATE

201308_MAP_TERA_RT_00391_Rev0_06_Coq_BostonBar.mxd

TABLE 4.2-6

EVALUATION OF ALTERNATIVE CORRIDORS – COLDWATER RIVER PROVINCIAL PARK – COQUIHALLA VERSUS BOSTON BAR (KP 949.1 TO KP 987.3) (RK 980.3 TO RK 1019.2)

Factors	TMPL Alternative	West Alternative
LENGTHS		
Length of pipeline corridor (km)	37.9	39.0
Length following existing TMPL right-of-way (km)	37.9	0.6
Length following other linear features (other pipelines, power lines, highways, roads, FOTS, railways, etc.) (km)	0	36.9
Length of new corridor (km)	0	1.5
Total parallels (km)	37.9	37.5
CROSSINGS		
No. of highway crossings (No.)	0	4
No. of road (arterial, collector, local) crossings (No.)	16	7
No. of railway crossings (No.)	0	0
Crossings of named rivers (No.)	16 (13 x Coquihalla River; 3 x Coldwater River)	1 (Coldwater River)
Crossings of named creeks (No.)	7 (Baldwin Creek; Norley Creek; Juliet Creek; unnamed creek; Needle Creek; Hidden Creek; Boston Bar Creek)	4 (Mine Creek; Juliet Creek; Fallslake Creek; Boston Bar Creek)
Crossings of other watercourses (No.)	39	45
Total watercourses (No.)	62	50
GEOTECHNICAL		
Length crossing slopes > 50% on the fall line (km)	0.2	0
Length crossing slopes > 50% on sidehill (km)	4.4	2.5
Natural hazard potential (km)	High: 12.5 (includes Coquihalla and Iago jump-offs) Medium: 9.0 Low: 16.3	High: 1.1 (includes Dry Gulch) Medium: 5.5 Low: 32.4
Length of thin veneer of overburden or exposed bedrock (km)	7.3	13.0
HYDRAULIC ACCEPTABILITY	Yes	Yes
LAND		
Indian Reserve (km) (name)	0	0
Provincial Crown (km)	37.8	36.5
Private (km)	0.1	0.9
Unknown Parcels (km)	0	1.6
ENVIRONMENT		
Length within Riparian Reserve Zone (km)	13.5	0.5
Old Growth Management Area (legal) (km)	0	1.7
Old Growth Management Area (non-legal) (km)	2.8	0
Designated Ungulate Winter Range (km)	2.5	0
Late winter or early winter habitat for mountain caribou (km) (Wells Gray or Groundhog), wetlands crossed (km), community forests crossed (km), woodlots crossed (km), and Wildlife Habitat Areas (km) (species)	0	0
SOCIO-ECONOMIC		
Parks and protected areas (km)(name)	13.3 (Coquihalla Summit Recreation Area) - would require impact assessment	12.7 (Coquihalla Summit Recreation Area) – would require impact assessment
Agricultural Land Reserve (km), community watersheds (No.), and LRMP area (km)(name)	0	0
ABORIGINAL AND STAKEHOLDER ENGAGEMENT		
Aboriginal Support	No major comments received to date. Consultation ongoing.	No major comments received to date. Consultation ongoing.
Stakeholder Support	General support for alternatives that reduce slope and stability risk. General support for alternatives that avoid provincial parks.	General support for alternatives that reduce the slope and stability risk. General support for alternatives that avoid provincial parks.
CONSTRUCTABILITY AND COST		
Constructability	16 river crossings; Crosses Coquihalla and Iago jump-offs in Coquihalla Canyon.	1 river crossing; West Alternative generally follows the existing Spectra gas pipeline right-of-way and FOTS alongside the Coquihalla Highway. Crosses Dry Gulch.
Estimated Construction Cost ($ millions)	$141.2	$112.2

Plate 1 Existing TMPL right-of-way (shown in yellow) surrounded by urban development within the City of Edmonton.

Plate 2 Existing TMPL right-of-way (shown in yellow) encroached by urban development through the community of Westsyde.

Plate 3 Existing FOTS right-of-way within Lac Du Bois Grasslands Protected Area.

Plate 4 Existing TMPL right-of-way within Coquihalla Canyon in foreground and proposed corridor beside Coquihalla Highway and FOTS in mid-ground.

Plate 5 Overlooking the existing crossing of the Fraser River looking east with existing TMPL right-of-way (shown in yellow) in foreground, proposed pipeline corridor (shown in orange) in mid-ground and Port Mann Bridge in background.

Plate 6 Looking south along the existing TMPL right-of-way (shown in yellow) encroached by urban development in the City of Coquitlam, BC.

4.3 Proposed Pipeline Corridor

Every effort has been made to follow the existing TMPL right-of-way or other existing rights-of-way as much as possible. Of a total length of 990 km, the proposed pipeline corridor follows the existing TMPL right-of-way for 662 km (67%) and the rights-of-way of other linear facilities for 220 km (22%) for a total parallel length of 882 km (89%). The remaining 108 km (11%) are on new corridor. The proposed pipeline corridor is shown on all the mapping in the remainder of this document and the preliminary Environmental Alignment Sheets provided in Volume 6E.

Note that Volumes 5A and 5B utilize preliminary results of parallel calculations, whereas the other volumes in the NEB application utilize final numbers. As a result, there is a slight discrepancy. The final percentages of TMPL parallel, other parallel and new corridor are 73%, 17% and 10%, respectively.

For purposes of this application, it was necessary to identify a proposed pipeline corridor to focus environmental and other studies. The environmental and socio-economic assessment was conducted by overlaying the proposed pipeline corridor on the project environmental setting and making predictions about environmental effects based on available information, known mitigation practices and professional judgment. It is recognized that additional landowner, stakeholder, environmental, socio-economic, geotechnical, and other information will come forward that will lead to improvements in the location of the pipeline corridor. In addition, the pipeline routing specialists are continuing to refine the proposed 150 m corridor and narrow it down to a pipeline construction right-of-way. These improvements will adopt the routing criteria, strategies and guidelines described in Volume 4A, Section 2.8 without jeopardizing pipeline safety and security. Where corridor modifications occur, additional studies will be completed to confirm predictions and implement appropriate mitigation from the EPPs. No fundamental change in the overall conclusion of no significant adverse effects is anticipated. Additional information is provided in Section 9.0 of Volumes 5A and 5B.

4.4 Permanent Facility Site Selection

4.4.1 Introduction

The TMEP is a loop of the existing 1,150 km TMPL system from Edmonton to Burnaby that has been in operation since 1953. As well as the looping of the pipeline, several new or expanded facilities (*e.g.,* pump stations, storage tanks, etc.) are required to efficiently operate the pipeline system. An overview of the general facility site selection objectives/criteria and the proposed facility sites is provided in Section 4 of Volume 2. A detailed description of the facilities associated with the TMEP is provided in Sections 3.3, 3.4 and 3.5 of Volume 4A.

New and/or expanded permanent facilities are required for the successful operations of the pipeline component of the Project.

The permanent facilities associated with the Project include the following.

- Installing 23 new sending and receiving traps (16 on TMPL and TMEP), for in-line inspection tools at 9 existing sites and one new site.
- Adding 35 new pumping units at 12 locations (*i.e.,* 11 existing and 1 new pump station sites).
- Reactivating the existing Niton Pump Station that has been maintained in a deactivated state.
- Constructing 20 new tanks located at the terminals near Edmonton (5). Sumas (1) and Burnaby (14), preceded by demolition of two existing tanks near Edmonton (1) and Burnaby (1), for a net total of 18 tanks added to the system.
- Constructing one new dock complex, with a total of three Aframax-capable berths, as well as a utility dock (for tugs, boom deployment vessels, and emergency response vessels and equipment) at Westridge Marine Terminal, followed by the deactivation and demolition of the existing berth.

This subsection describes the site selection criteria and site selection process used by the Project team to choose the sites where permanent facility sites will be located.

4.4.2 Site Selection Criteria

Edmonton, Sumas and Burnaby Terminals

The Project includes the addition of storage tanks at the existing Edmonton Terminal, Sumas Terminal and Burnaby Terminal locations. Additional booster pumps and metering facilities are also proposed for the Edmonton and Burnaby facilities. Site selection for these new facilities is primarily focused on minimizing environmental and land use disturbance by utilizing existing facility locations. The proposed expansion of the existing terminal locations is based on the following site selection criteria.

- Maximize safety of personnel and the public during construction and operations.
- Reduce environmental effects and new disturbances.
- Limit effects on terrestrial vegetation and wildlife habitat.
- Accommodate facility expansion within existing property boundaries.
- Integrate the expansion works with existing operations.
- Ensure existing infrastructure (*e.g.,* access roads) are in place and suitable for Project needs.
- Minimize issues related to undesirable topography or terrain instability.
- Avoid culturally sensitive areas.
- Avoid conflicting land uses and encroachment upon residences/communities.
- Accommodate Aboriginal community, landowner, regulatory authorities and other stakeholder feedback, to the extent feasible.

All work associated with the Project to be conducted at Edmonton, Sumas and Burnaby terminals will be conducted within the footprint of the existing industrial sites on Trans Mountain-owned lands. No new land will be acquired for the expansion of existing facilities or the installation of new facilities at the terminal locations.

Westridge Marine Terminal

The Project includes an expansion of the existing tanker loading facilities at the Westridge Marine Terminal. Site selection is primarily focused on reducing environmental and land use disturbance by utilizing existing facility locations. Expansion of the existing dock facility is based on the following criteria.

- Maximize safety of personnel and the public during construction and operations.
- Provide the highest level of navigational safety, both for vessels berthing at Westridge Marine Terminal and for other vessels transiting the inlet or at one of the four anchorages nearby.
- Provide three Aframax capable berths, allowing capacity for vessels to wait for cargo or transit windows to reduce pressure.
- Allow the existing dock to remain in service during the construction of the new dock complex, and specifically until the new Berth 1 can be commissioned.
- Reduce the overall footprint and the effect to the community views.
- Eliminate the deep-water dredging and reduce the amount of dredging for the foreshore expansion.
- Minimal storm surge effect is expected at the existing dock site. Available public information suggests that the hazard from a tsunami is very low for the area.
- Reduce environmental effects and new disturbances.

- Reduce effects to terrestrial vegetation and wildlife habitat by using existing disturbed lands to the extent feasible.
- Avoid parks and recreational areas.
- Accommodate land-based component of facility expansion within existing property boundaries.
- Proximity of existing facilities to nearby existing infrastructure (*e.g.,* access road, electric power supply).
- Avoid culturally sensitive areas.
- Avoid conflicting land uses and encroachment upon residences/communities.
- Accommodate Aboriginal community, landowner, regulatory authorities and other stakeholder feedback to the extent feasible.

Pump Stations

Pump station sites are largely selected according to the hydraulic pressure requirements of the pipelines. Pump station location was determined following selection criteria designed to respond to construction, operational, environmental and land use constraints. Factors affecting the selection of pump station sites included the pipeline diameter, pipeline operating pressures, the hydraulic and elevation profile and the type of liquid being transported (high or low viscosity). New pump stations to be located on a previously undisturbed site (*i.e.,* Black Pines) were typically provided a siting range of +2 km downstream or -1 km upstream along the existing TMPL right-of-way, centred on the hydraulic optimum. Once the optimal hydraulic points were selected, the following site selection criteria were considered in the final placement of the pump stations.

- Locate the site on existing or former pump station sites or on lands owned by Trans Mountain. Where this was not possible, the following criteria were used.
    - Consult landowners to seek voluntary agreement to acquire the necessary lands with respect to surrounding land use and constraints.
    - Reduce disturbance by utilizing previously disturbed sites, where practical.
    - Locate site near existing infrastructure (*e.g.,* access roads, power lines), to the extent feasible.
    - Locate the site within less environmentally sensitive areas, to the extent feasible.
    - Avoid areas of terrain instability.
    - Avoid wetlands and riparian areas.
    - Avoid conflicting land uses and encroachment upon residences and communities, wherever practical.
    - Avoid known archaeological, heritage and traditional land use sites.
    - Accommodate Aboriginal community, landowner and regulatory authorities and other stakeholder feedback to the extent feasible.

Trans Mountain first identified lands that had been previously disturbed for other uses. In all instances, with the exception of Black Pines Pump Station, existing sites that have been previously used as pump stations or other company uses were selected for development of new pump stations by the Project.

Mainline Block Valves

Site selection criteria for mainline block valves will include:

- engineering and operations requirements;
- meet industry codes and standards, at a minimum;
- avoid wetlands and other sensitive environmental features;
- locate in vicinity of existing access roads and power supplies, if feasible;
- avoid steep slopes, unstable terrain and poorly drained areas; and
- avoid being immediately adjacent to major watercourses.

4.4.3 Terminal Site Selection

Edmonton Terminal

All new and upgraded facilities associated with the Edmonton Terminal will be constructed on Trans Mountain-owned lands on a previously disturbed, industrial area.

Sumas Terminal

The site for the new tank to be constructed at the Sumas Terminal is located to the north of the existing tanks on Trans Mountain-owned land. The land where the new facilities will be installed has been previously disturbed. There may be a small amount of clearing required along the north fenceline of the terminal site to make space available for an access road and to relocate an existing power line.

To make space available for the new tank, an existing containment berm will be dismantled and the area graded level to support the foundation for the new tank. A new containment berm will be constructed before the new tank is put into operation. The new containment berm will be comprised of the materials from the existing berm as well as the graded materials, provided these materials are acceptable for such a use (*i.e.,* non-porous).

A power line that is currently located on the north edge of the existing cleared area may be relocated to make space available for the new tank. Electrical facilities will not be upgraded as part of this development.

Burnaby Terminal

All lands required for the new and upgraded facilities associated with the Burnaby Terminal are owned by Trans Mountain. Some onsite riparian vegetation associated with several drainage channels that traverse the facility site will need to be cleared.

Westridge Marine Terminal

All new and upgraded facilities associated with the on-shore portion of the Westridge Marine Terminal will be located within the existing disturbed area on land that is owned by Trans Mountain. Additional reclaimed foreshore lands will be required to provide the space required for the new and upgraded facilities associated with the off-shore component of the Westridge Marine Terminal.

4.4.4 Pump Station Site Selection

Edmonton Pump Station

All new and upgraded facilities associated with the Edmonton Pump Station will be constructed on Trans Mountain-owned lands within a previously disturbed, industrial area.

Gainford Pump Station

All lands required for this new pump station are owned by Trans Mountain. Some of the lands are previously undisturbed by industrial developments and remain intact with a native tree cover. The new pump station will be located to the northwest of the existing pump station facilities. The size of the station

operating area associated with the Gainford Pump Station will be increased by approximately 0.6 ha on lands that are owned by Trans Mountain.

Niton Pump Station

The two deactivated pumping units associated with TMPL will be reactivated as part of TMEP. No new lands will be acquired for this aspect of the Project. All works planned for the Niton Pump Station will occur within the fenced site of the existing pump station on land that is owned by Trans Mountain. There will be no new facilities constructed at the Niton Pump Station associated with TMEP.

Wolf Pump Station

The expansion of the facilities at Wolf Pump Station will be to the west of the existing facilities on previously disturbed lands that are owned by Trans Mountain. A new pump building will be located adjacent to the existing pump building. The existing electrical infrastructure will be reused for TMEP operations. No new disturbance to previously undisturbed lands will be necessary at Wolf Pump Station.

Edson Pump Station

All land required for the planned upgrades and expansion of the Edson Pump Station is owned by Trans Mountain. All of the land required by the Project has been previously disturbed.

Hinton Pump Station

A new pump station will be built immediately adjacent to the existing Hinton Pump Station. Additional new lands will have to be acquired by Trans Mountain for the new pump station. The existing fence line will be expanded to the west by approximately 35 m, increasing the station operating area by approximately 0.3 ha.

Jasper Pump Station

All construction work to be conducted at the Jasper Pump Station will be located within the current fenced area of the existing pump station. There will be no new disturbance of previously undisturbed lands outside of the current fenced area associated with this work. Trans Mountain will not have to expand the lease they currently hold with Parks Canada.

Rearguard Pump Station

Additional new lands will have to be acquired by Trans Mountain for the development required at the Rearguard Pump Station. The existing fence line associated with this station will be expanded to the east by approximately 100 m, which will increase the station operating area by approximately 0.7 ha. The area that will be developed for this new pump station is relatively flat and has been previously disturbed.

Blue River Pump Station

All construction activities planned for the Blue River Pump Station will take place on previously disturbed lands that are owned by Trans Mountain. A new pump building will be located adjacent to the existing pump building. The existing electrical infrastructure will be reused for TMEP operations.

Blackpool Pump Station

All lands required for the planned expansion and upgrades associated with the Blackpool Pump Station are owned by Trans Mountain. All of the lands have been previously disturbed.

Darfield Pump Station

Trans Mountain will need to acquire a small amount of additional land (approximately 0.07 ha) located outside of the current fence line of the Darfield Pump Station to the north in order to accommodate the new scraper facilities to be installed at this site. The lands located to the north of the existing pump station are currently being used for agricultural purposes. Negotiations to acquire these lands by voluntary agreement are currently underway.

Black Pines Pump Station

The Black Pines Pump Station is the only new pump station location required for the Project that is not associated with a currently existing pump station. Pumping facilities for both TMPL and TMEP will be installed at Black Pines.

The general location for this pump station was selected based on the hydraulic optimum that considers the operating pressures and throughput of product in both TMPL and TMEP pipelines. The general location was identified along a 2 km length of the pipeline between KP 784 and KP 786 of the existing pipeline system. A field reconnaissance was conducted in December 2012 to further refine the location of the pump station to increase the distance from the nearest residences while keeping the station within the range of the identified hydraulic preference. The general terrain of the land was also considered during this reconnaissance to ensure the selected site was not located on steep slopes, in a wetland or close to waterbodies.

The preliminary site selected for the pump station is located at RK 811.8 (KP 784.6). This location is tree covered with mature coniferous trees (see Plate 7). The surface materials where the pump station would be located consist of a debris fan. Therefore, further geotechnical assessments will be required at this site to determine the optimum location for the station as well as to determine appropriate mitigation measures to protect the facilities from a potential debris flow during the operations phase of the Project. The current surface of the site is sloped, which would require grading to level the surface for construction and operations of the pump stations.

Plate 7 Aerial view of the proposed Black Pines Pump Station Site (May 27, 2013).

It is anticipated that an area of 150 m x 150 m will be required for the construction of the pump station and associated facilities (*e.g.,* sending/receiving traps). This area would generally be located to the west of the current Trans Mountain right-of-way, with the exception of the containment pond, which would be located east of the existing right-of-way. Final layout of the proposed pump station will be determined during detailed engineering design.

The lands that have been identified for this new pump station are currently privately owned. Trans Mountain will seek to acquire the lands needed for the construction and operation of the Black Pines Pump Station. Trans Mountain is currently negotiating with the landowners to acquire the land required for the Black Pines Pump Station.

Black Pines Power Line Route Selection Process

A search for existing power lines with a suitable voltage rating that is required for the Black Pines Pump Station was conducted after the preliminary site for the pump station was identified. A suitable existing power line was identified on the east side of Highway 5, which is to the east of the Black Pines Pump Station site (Figure 4.4-1).

A desktop assessment of existing surface encumbrances (*e.g.,* residences, farm buildings, etc.) and terrain and landscape features in the area surrounding the preliminary pump station site and the existing power line was conducted. Representatives of Trans Mountain and TERA conducted a field reconnaissance of the Black Pines area in December 2012 to verify the results of the desktop assessment.

A representative of Trans Mountain met with BC Hydro in February 2013 to discuss the potential to 'tap' into the existing power line at one of three potential locations along the line and to discuss high level routing considerations for the new power line. BC Hydro indicated that a 'tap' into this power line would be possible and that their preference would be to avoid routing the new power line across an island in the North Thompson River.

The preliminary power line route was selected to:

- reduce overall route length;
- reduce the number of bends in the line;
- avoid close proximity to residences; and
- avoid routing over an island in the North Thompson River.

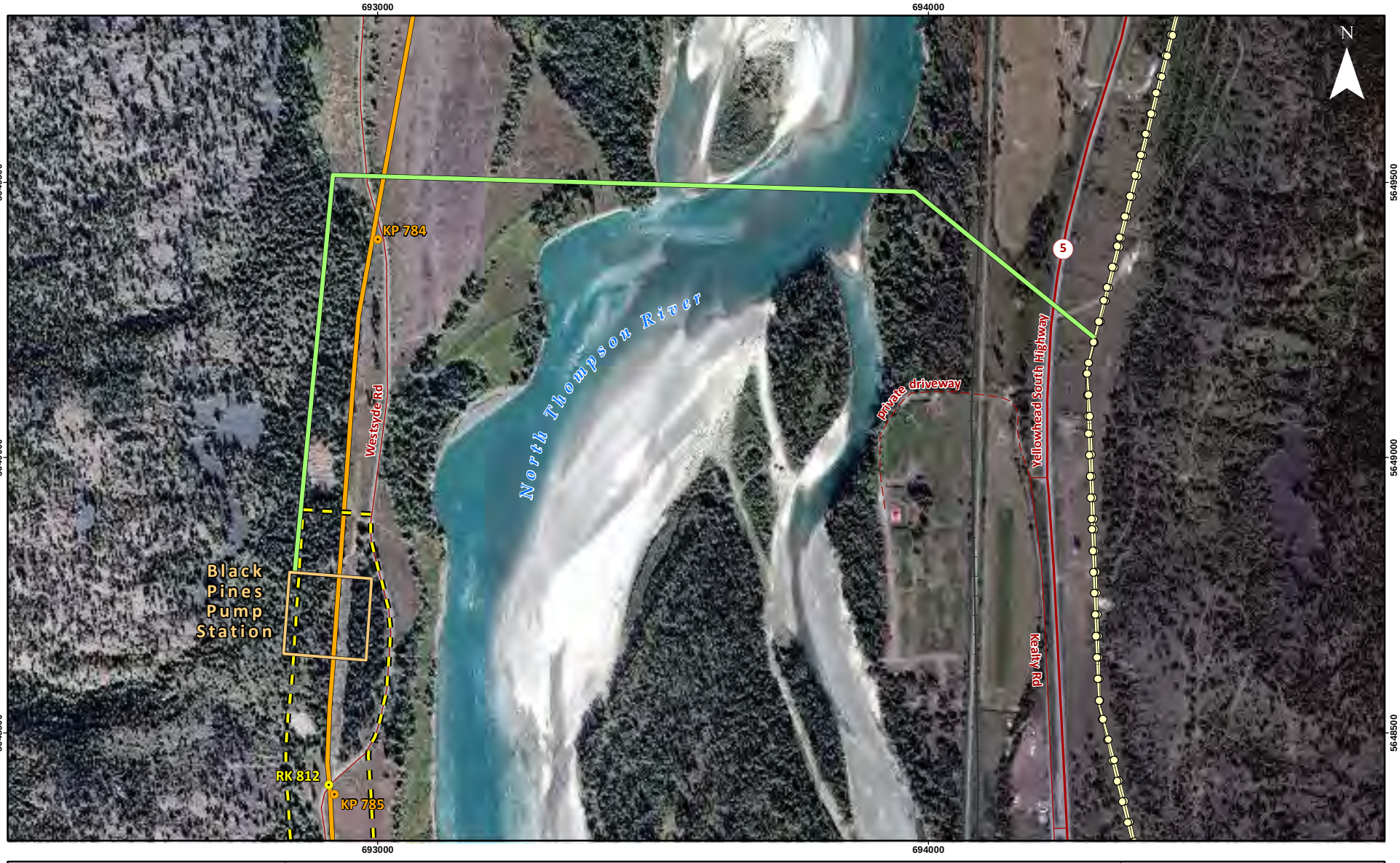
With these considerations in mind, a preliminary route option was selected to the north of the island identified as a routing constraint by BC Hydro. The route crosses the North Thompson River and then turns to the south on the west side of Westsyde Road where it intersects with the north boundary of the preliminary Black Pines Pump Station site.

A route option to the south of the island in the North Thompson River was not considered due to a higher density in residences on both the east and west sides of the North Thompson River.

A representative of Trans Mountain presented the preliminary 'tap' in location and route option to BC Hydro on May 13, 2013. BC Hydro endorsed both the route and the 'tap' location on May 31, 2013.

Access Road Route Selection Process

Depending on the final site selected for the pump station, a suitable location to construct the access road intersecting with Westsyde Road will be chosen. The terrain as well as the line-of-sight along Westsyde Road will be considered when selecting the access road required for the Black Pines Pump Station. Given the close proximity of the preferred site for the Black Pines Pump Station to Westsyde Road, the access road will be short (*i.e.,* less than 100 m).



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SCALE: 1:10,000

0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

MAP NUMBER: 201311_MAP_TERA_ESA_00493_REV0		PAGE: SHEET 1 OF 1
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:10,000	PAGE SIZE: 8.5 x 11	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Proposed Power Line
- Existing Power Line
- Proposed Pump Station
- Highway
- Road
- Resource Road
- Railway

Projection: NAD83 UTM Zone 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Colour Imagery Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community.

TRANS MOUNTAIN

FIGURE 4.4-1

PROPOSED BLACK PINES POWER LINE ROUTE

TRANS MOUNTAIN EXPANSION PROJECT

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Kamloops Pump Station

All new and upgraded facilities to be constructed at the Kamloops Pump Station associated with TMEP will be constructed on lands that are owned by Trans Mountain on previously disturbed, industrial land.

Kingsvale Pump Station

A new pump station and electrical substation will be constructed immediately adjacent to the existing Kingsvale Pump Station. The power line that currently feeds the existing pump station is undersized for the added load associated with the new pump station. Therefore, a new 138 kV power line, approximately 23.5 km in length, will also be required to provide electricity to this pump station.

The land required for the new pump station and electrical substation to be installed at Kingsvale is owned by Trans Mountain. Some new clearing and grading will be required to create a level working surface for the construction of the new facilities at Kingsvale Pump Station.

Kingsvale Power Line Route Selection Process

A search for existing power lines with suitable voltage rating as required for the Kingsvale Pump Station that are located in the vicinity of the Kingsvale Pump Station was conducted. A suitable power line exists on the east side of Highway 5A, which is to the east of the Kingsvale Pump Station site (Figure 4.4-2).

A desktop assessment of existing surface encumbrances (*e.g.,* residences, farm buildings, etc.) as well as terrain and landscape features in the area surrounding the study area between the Kingsvale Pump Station and the existing power line was conducted. Representatives of Trans Mountain and TERA conducted a field reconnaissance of the area in December 2012 to verify the results of the desktop assessment.

A representative of Trans Mountain met with BC Hydro in February 2013 to discuss the potential to 'tap' into the existing power line and to discuss high level routing considerations for the new power line. BC Hydro indicated that a 'tap' into this power line would be possible.

The preliminary power line route option was selected to:

- reduce overall route length;
- reduce the number of bends in the line;
- parallel existing linear features, to the extent practical; and
- avoid close proximity to residences.

With these considerations in mind, a preliminary route option was selected based on a desktop assessment of the area.

An aerial reconnaissance of the preliminary route option was conducted on May 27, 2013. Based on this reconnaissance several minor adjustments to the preliminary route alignment were made to avoid paralleling a drainage channel as well as steep sidehill terrain.

A representative of Trans Mountain presented the preliminary 'tap' in location and route options to BC Hydro on May 13, 2013. BC Hydro will have to approve the routing for the new power line since the selected route must meet their satisfaction from an operations perspective as well as future expansion considerations, if the selected route is located adjacent to the existing 500 kV transmission corridor. BC Hydro endorsed the selected route and the 'tap' location into the existing power line on May 31, 2013. However, BC Hydro has conducted an analysis to determine whether there will be an issue of induced current on the new power line required for the Kingsvale Pump Station. The result of the study indicated that there are no issues with the proposed route. The final route alignment for this power line will be selected during detailed design of the Project.

TRANS MOUNTAIN

FIGURE 4.4-2

PROPOSED KINGSVALE POWER LINE ROUTE

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Proposed Power Line
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Facility Boundary
- Highway
- Paved Road
- Existing Power Line
- Railway
- National Park / Provincial Park / Protected Area
- Indian Reserve / Métis Settlement

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community.

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Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER: 201311_MAP_TERA_ESA_00494_REV0		PAGE: SHEET 1 OF 1
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:75,000	PAGE SIZE: 11x17	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

0 500 1,000 1,500 2,000 2,500 m

ALL LOCATIONS APPROXIMATE

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The Proposed Power Line Route

The proposed power line route extends to the northwest along an existing access road from the 'tap' in location to the existing power line. From here, the proposed route continues to the west of Highway 5A before turning to the southwest. The proposed route then turns to the northwest and continues westward until it nears the existing 500 kV transmission corridor approximately 8 km east of the Kingsvale Pump Station. The proposed route then turns to the west and parallels the existing 500 kV transmission line corridor with an offset of 70 m south of the southernmost conductor on the existing transmission line. After crossing to the west of Highway 5, the proposed route turns to the north following the existing TMPL right-of-way before it enters the lands where the new substation will be constructed within the Kingsvale Pump Station site.

Pressure Control Station

A pressure control station may be required on both TMPL and TMEP. It is likely that this facility would be installed at the Hope Pump Station if it is determined during detailed design that it is required for operations.

Existing access and electrical facilities for the Hope Pump Station will be sufficient for the construction and operation of the pressure control station.

The lands required for the pressure control station are owned by Trans Mountain.

Sumas Pump Station

There will be a new pumping unit installed on the 609.6 mm OD (NPS 24) pipeline heading south from the Sumas Pump Station into Washington State (*i.e.,* the Puget Sound line).

The land required for the new pumping unit to be installed at the existing Sumas Pump Station is owned by Trans Mountain and has been previously disturbed by industrial activity.

4.4.5 Mainline Block Valves Site Selection

Once the approximate locations of mainline block valves have been identified, using the criteria listed above in Section 4.3.2, the sites will be subject to an environmental assessment. Detailed environmental surveys (*e.g.,* soils, vegetation and wildlife) will be conducted, where warranted, to determine any potential environmental issues associated with these sites.

The evaluation of mainline block valve locations will be conducted as far in advance of their intended use, as practical, in order to allow adequate time to identify and evaluate any alternate sites. In the event that specific mitigation is warranted for a specific site, the measures developed will be documented in the Environmental As-Built Report (see Volume 6A). General provisions will be included in the contract documents that commit contractors to site protection/restoration measures at sites identified, evaluated and used during the construction program. Mitigation measures to be used at mainline block valve sites will be as described in Section 7.0 of Volume 5A and Volume 6B (Pipeline EPP). All applicable approvals for the mainline block valves will be acquired prior to use of the site or area. The level of mitigation measures applied will ensure that any residual environmental effects are reduced to a level that is not significant.

4.5 Temporary Facility Site Selection

4.5.1 Introduction

New and/or expanded temporary facilities will be required during the construction of the Project. The temporary facilities associated with TMEP will include:

- staging and stockpile sites;
- equipment storage sites;
- construction office sites;

- construction work camps (likely one in Alberta and two in BC);
- trenchless crossing work areas;
- shoo-flies/temporary access roads;
- borrow pits; and
- log decks.

This subsection describes the site selection criteria and site selection process that will used by the Project team to select the sites where temporary facility sites will be located.

4.5.2 Temporary Facility Site Selection Criteria

The following site selection criteria will be used to evaluate and select temporary facility sites and workspace.

- Selection of an optimal location for construction needs.
- Locate the facility in the vicinity of similar existing facilities to reduce environmental and land use disturbances.
- Locate temporary facilities that require the use of utilities at sites already serviced by roads and utilities.
- Avoidance, to the extent practical, of areas of native vegetation by maximizing the use of previously cleared or broken lands, or lands currently under industrial land use.
- Preferential selection of grassed areas over bush or wooded areas when temporary workspace is necessary on lands supporting native vegetation.
- Avoidance, to the extent practical, of known locations that provide site-specific habitat for wildlife species of concern or apply special mitigation (refer to Section 7.0 of Volume 5A).
- Avoidance, to the extent practical, of known sites that support vascular plant species of concern or apply special mitigation (refer to Section 7.0 of Volume 5A).
- Avoidance, to the extent practical, of steep slopes, organic soils and poorly-drained areas.
- Avoidance, to the extent practical, of known areas with heritage resource sites or apply special mitigation (refer to Section 7.0 of Volume 5B).
- Avoidance of locations adjacent to a conflicting land use where potential noise, dust or visual concerns could not be readily mitigated.
- Avoidance of parks and protected areas.
- Abide by requests of Aboriginal communities, landowners and regulatory authorities, to the extent feasible.

4.5.3 Temporary Facility Site Selection

The need for and the respective general location of these sites are the responsibility of the pipeline or facilities construction contractor. However, all temporary workspace and temporary facility site locations will require the approval of the Inspector(s) or qualified designate.

Once the location of temporary workspace or a temporary facility for use during construction has been identified, the sites will be assessed and, where appropriate, approved by the Inspector(s) or qualified

designate. Detailed environmental surveys (*e.g.,* soils, vegetation and wildlife) will be conducted, where warranted, to determine any potential environmental issues.

The evaluation of potential temporary facility sites/workspace will be conducted as far in advance of its intended use, as practical, in order to allow an adequate time to chose and evaluate any alternate sites. In the event that specific mitigation is warranted for the site, the measures developed will be documented in the Environmental As-built Report (see Volume 6A). General provisions will be included in the contract documents that commit contractors to site protection/restoration measures at sites identified, evaluated and used during the construction program. Mitigation measures to be used at temporary facility sites and temporary work areas are described in Section 7.0 of Volume 5A and Volume 6B (Pipeline EPP). All applicable approvals for the temporary facility site or workspace will be acquired prior to use of the site or area. The level of mitigation applied will ensure that any residual environmental effects are reduced to a level that is not significant.

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5.0 SOCIO-ECONOMIC SETTING FOR THE PIPELINE

Prior to European contact, numerous Aboriginal communities settled both the plains and woodlands of Alberta. European settlement and influence began in the late 1700s with the advent of the fur trade. When the Hudson's Bay Company relinquished control of the land in 1870s, the region was opened for settlement, resulting in expansive colonization and transformation of the land for agricultural development, which became the dominant economic activity in Alberta until the discovery of oil in the Leduc field in 1947 (Government of Alberta 2012a).

Prior to European contact, BC's productive coastal region was likely one of the areas most densely inhabited by First Nations in North America. European settlement began along the south coastal regions in the late 1700s, expanding rapidly inland with the discovery of gold in the Fraser River and the Cariboo Region in the 1860s. Bustling cities, roads, railways and steamships were constructed to accommodate the influx of prospectors and merchants. By the mid-1900s, major transportation developments were undertaken to accommodate growing industries such as hydro-electric power, mining and forestry, and to connect regions and communities throughout BC (Province of BC 2012). Further information on past development of the Project area is provided in Section 8.1.

The following subsections present a summary of the socio-economic setting of the proposed pipeline corridor for the following elements from the NEB *Filing Manual* (2013a): heritage resources; traditional land and resource use (TLRU); social and cultural well-being; human occupancy and resource use (HORU); infrastructure and services; navigation and navigation safety; employment and economy; and community health. The socio-economic setting was compiled based on the following sources.

- Heritage resources, TLRU, socio-economic, community health and economic studies conducted for the Project.
- Existing published literature including topographic maps, aerial photography, scientific papers and reference books, as well as municipal, provincial and federal government maps, reports, interactive websites, guides, information letters, fact sheets and databases.
- Consultation and engagement with Aboriginal communities (including Aboriginal traditional knowledge [ATK] and traditional ecological knowledge [TEK]), landowners, regulatory authorities, stakeholders and the general public.

ATK is defined as knowledge that is held by, and unique to, Aboriginal peoples. TEK is a subset of ATK that is primarily concerned with the environment. ATK and TEK have been integrated into the setting in the following subsections where applicable from information gathered by the Aboriginal engagement team. The inclusion of ATK and TEK is essential in understanding the overall setting of the socio-economic environment.

Resource material was obtained by searching libraries, internet searches and documents from regulatory authorities. References used in the preparation of the socio-economic setting are cited in Section 5.11. Detailed methodology for the collection of information on existing conditions is provided in the applicable supporting studies in Volume 5D.

This section is divided into the setting for the new pipeline (Sections 5.1 through 5.8), proposed line facilities (Section 5.9) and the existing pipeline segments to be reactivated (Section 5.10). The potential Project-related effects and mitigation are presented in Section 7.0.

The settings for each element (a technical discipline or discrete component of the biophysical or human environment identified in the NEB *Filing Manual* [NEB 2013a]) are discussed by the socio-economic regions that have been designated for the purposes of this assessment, rather than by technical pipeline segments used by the biophysical elements in Volume 5A. While the pipeline segments are defined based on construction or other technical parameters and are logical for analysis for biophysical elements, the socio-economic regions are defined by political and administrative boundaries that are relevant to service delivery and governance for the communities and residents who might have direct or indirect interactions with the Project. The use of the socio-economic regions allows more precision in the estimates of potential socio-economic effects since they follow jurisdictional boundaries for service

delivery and governance and, therefore, align with available data. These regions also better align with a local "sense of place" and assist stakeholders in understanding how the socio-economic components of the assessment reflect local and regional interests. A breakdown of the six socio-economic regions of the Project, including their boundaries and the specific pipeline segments and facilities located in each region, is provided in Table 5.0-1.

TABLE 5.0-1

PIPELINE SEGMENTS AND ASSOCIATED FACILITIES WITHIN SOCIO-ECONOMIC REGIONS

Socio-Economic Region	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/Thompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Region Boundaries	Strathcona County to western boundary of Parkland County	Eastern boundary of Yellowhead County to eastern boundary of Jasper National Park	Eastern and western boundaries of Jasper National Park	Western boundary of Jasper National Park (Alberta/BC border) to halfway between Merritt and Hope	Halfway between Merritt and Hope to the western boundary of the FVRD	Boundaries of Metro Vancouver or the Greater Vancouver Regional District
Pipeline RK Range	RK 0.0 to RK 135.0	RK 135.0 to RK 339.4	No new pipeline (RK 339.4 to RK 489.6)	RK 489.6 to RK 991.1	RK 991.1 to RK 1137.4	RK 1137.4 to RK 1179.8 RK 0 to RK 3.6 (Burnaby Terminal to Westridge Marine Terminal)
New Pipeline Segment(s) in the Region	Edmonton to Hinton	Edmonton to Hinton	None	Hargreaves to Darfield; Black Pines to Hope	Black Pines to Hope; Hope to Burnaby	Hope to Burnaby; Burnaby to Westridge
Pipeline Reactivation Segments	None	Hinton to Hargreaves	Hinton to Hargreaves	Hinton to Hargreaves; Darfield to Black Pines	None	None
Pump Stations (bolded indicates Project activity)	Stony Plain **Gainford**	Chip **Niton** **Wolf** **Edson** **Hinton**	**Jasper**	**Rearguard** Albreda Chappel **Blue River** Finn McMurphy **Blackpool** **Darfield** **Black Pines (new site)** **Kamloops** Stump **Kingsvale**	Hope Waleach **Sumas**	Port Kells
Terminals (bolded indicates Project activity)	**Edmonton Terminal**	None	None	Kamloops Terminal	**Sumas Terminal**	**Burnaby Terminal** **Westridge Marine Terminal**

The settings pertaining to social and cultural well-being, infrastructure and services, employment and economy, and community health discuss existing conditions within the Socio-Economic Regional Study Area (RSA). The Socio-Economic RSA is shown in Figures 5.0-1 through 5.0-7 and considers communities close enough to the Project to potentially be a: source of labour; source of procured goods or services; location of community infrastructure/services influenced by the Project; accommodation or camp location for Project workers; or Project construction office location. This includes the counties and regional districts crossed by the proposed pipeline corridor (or certain regional sub-areas) and communities approximately 50 km from the proposed pipeline corridor that could participate in or be affected by the Project. It also includes Aboriginal communities whose reserves or traditional territory are crossed by the proposed pipeline corridor. Element-specific spatial boundaries are described in the subsections below for heritage resources, TLRU, HORU, and navigation and navigation safety.

TRANS MOUNTAIN

FIGURE 5.0.1

SOCIO-ECONOMIC STUDY AREA BOUNDARIES

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- Socio-economic Study Area Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Regional District Boundary
- Provincial Boundary
- International Boundary

Projection: Modified Lambert Conformal Conic. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009; World Shaded Relief: Copyright© 2013 Esri

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ALL LOCATIONS APPROXIMATE

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TRANS MOUNTAIN

FIGURE 5.0-2

SOCIO-ECONOMIC STUDY AREA BOUNDARIES – EDMONTON REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- Socio-economic RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- Transportation and Utility Corridor (TUC)
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary

Projection: NAD 1983 UTM 11N. Baseline TMPL: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, August 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrastructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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ALL LOCATIONS APPROXIMATE

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TRANS MOUNTAIN

FIGURE 5.0-3

SOCIO-ECONOMIC STUDY AREA BOUNDARIES – RURAL ALBERTA REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- Socio-economic RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- Provincial Boundary

Projection: NAD 1983 UTM 11N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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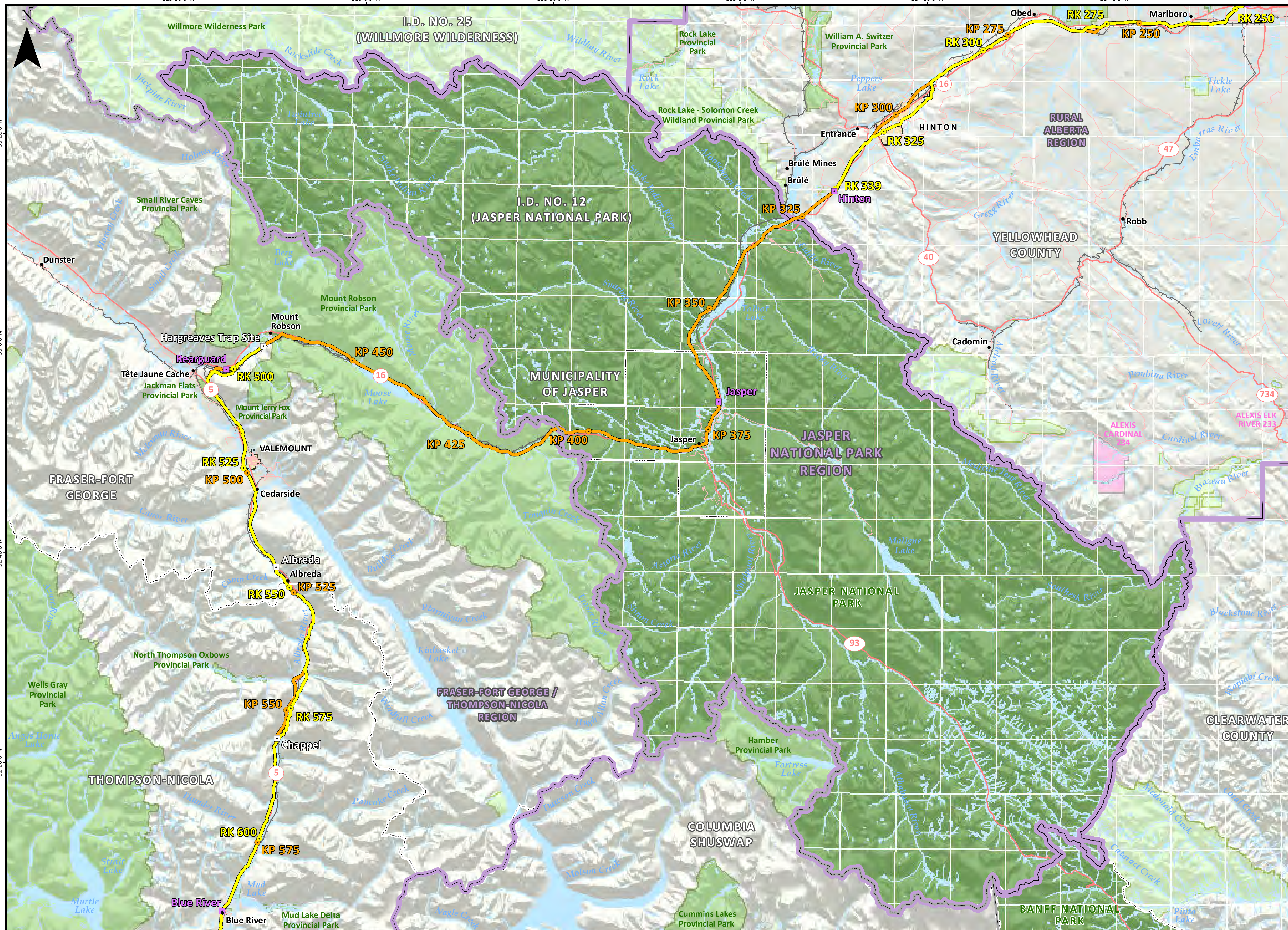

TRANS MOUNTAIN

FIGURE 5.0-4

SOCIO-ECONOMIC STUDY AREA BOUNDARIES – JASPER NATIONAL PARK REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Existing Pump Station
- Highway
- Railway
- Socio-economic RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- Provincial Boundary

Projection: NAD 1983 UTM 11N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, August 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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ALL LOCATIONS APPROXIMATE

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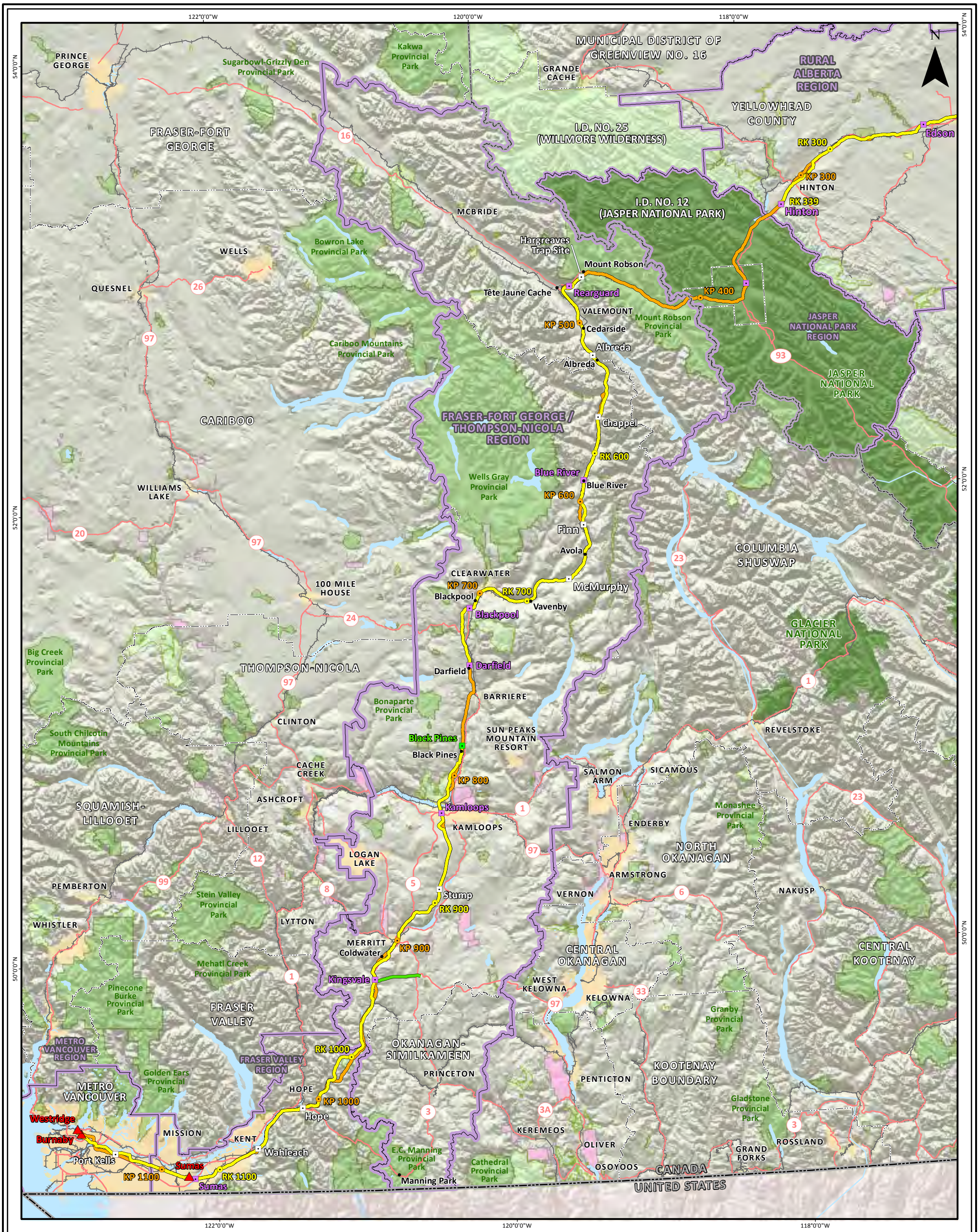

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- Town / Village / Hamlet
- Reference Kilometre Post (RK)
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Proposed Power Line
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Existing Pump Station
- Highway
- Railway
- Socio-economic RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Regional District Boundary
- Provincial Boundary
- International Boundary

Projection: NAD 1983 UTM 10N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009; World Shaded Relief: Copyright:© 2013 Esri

TRANS MOUNTAIN

FIGURE 5.0-5

SOCIO-ECONOMIC STUDY AREA BOUNDARIES – FRASER-FORT GEORGE / THOMPSON-NICOLA REGION

TRANS MOUNTAIN EXPANSION PROJECT

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0 20 40 60 80 Km

ALL LOCATIONS APPROXIMATE

TRANS MOUNTAIN

FIGURE 5.0-6

SOCIO-ECONOMIC STUDY AREA BOUNDARIES – FRASER VALLEY REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Existing Pump Station
- Highway
- Railway
- Socio-economic RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- International Boundary

Projection: NAD 1983 UTM 10N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009; World Shaded Relief: Copyright:© 2013 Esri

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ALL LOCATIONS APPROXIMATE

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TRANS MOUNTAIN

FIGURE 5.0-7

SOCIO-ECONOMIC STUDY AREA BOUNDARIES – METRO VANCOUVER REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Existing Pump Station
- Highway
- Railway
- Socio-economic RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- International Boundary

Projection: NAD 1983 UTM 10N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009; World Shaded Relief: Copyright:© 2013 Esri

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0 2 4 6 8 10 km

ALL LOCATIONS APPROXIMATE

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5.1 Heritage Resources

This subsection describes the known heritage resources (*i.e.*, archaeological sites, historic sites and palaeontological sensitive areas) along the proposed pipeline corridor and in the Heritage Resources RSA. Known archaeological, historical and palaeontological sites are confidential and, while they are presented on the Environmental Alignment Sheets in Volume 6E, their precise locations have not been identified. Rather, they will be identified on maps included in the Permit 13-018 Historical Resources Impact Assessment (HRIA) Report to be submitted at the completion of the study to Alberta Culture and in the Archaeological Impact Assessment (AIA) Report for Permit 2013-0165 to be submitted at the completion of the study to BC Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO), Archaeology Branch. The potential effects related to the construction of the proposed pipeline and associated facilities and mitigation pertaining to heritage resources are discussed in Section 7.2.1.

The setting pertaining to heritage resources is presented by the socio-economic regions that have been designated for the purposes of this assessment, rather than by technical pipeline segments used by biophysical disciplines (see Table 5.1-1).

The spatial boundary of the Heritage Resources RSA for the Project, as shown on Figures 5.1-1 to 5.1-4, consists of the broader landscape context extending beyond the Project Footprint, defined as an area of intersecting Borden Blocks (Borden and Duff 1952). A Borden Block measures 10 minutes of latitude by 10 minutes of longitude. For the Project, the Borden Blocks intersected by the proposed pipeline corridor measure approximately 12 km east-west by 18 km north-south.

5.1.1 Archaeological and Historic Sites Overview

Archaeological and historic sites are both areas that preserve some component of past human activity. Archaeological sites, unlike historical sites, are composed of artifacts associated with a prehistoric period that precedes written record. Historic sites are areas of human activity that were created after the appearance of writing and before the last 50 years. Modern sites are generally sites created later than 50 years before present.

Locations within the Footprint that are considered to have low archaeological potential are characterized by flat, featureless terrain, water saturated environments such as bogs and muskeg, moderately to steeply sloping terrain and previously disturbed lands (*e.g.*, roadways and industrial developments). Areas such as these are not targeted for pedestrian assessment but were assessed by desktop review as well as aerial photography.

Areas within the Project Footprint that are considered to have moderate to high archaeological potential, and targeted as a result, are characterized by at least one of the following features:

- areas of level, well-drained terrain adjacent to defined water sources (*e.g.*, rivers, lakes);
- the level tops and benches of well-defined, elevated landforms, such as knolls and eskers, in areas of otherwise level terrain;
- level terrain adjacent to distinct breaks-in-slope;
- micro-topographic relief, providing well-drained landforms adjacent to or within low-lying areas or muskeg; and
- locations of previously known archaeological or historic period sites.

TRANSMOUNTAIN

FIGURE 5.1-1

HERITAGE RESOURCE STUDY AREA BOUNDARIES - EDMONTON TO HINTON

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Heritage Resource Study Area Boundary
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary

Projection: NAD83 UTM Zone 11N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrastructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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MAP NUMBER 201310_MAP_TERA_HER_00443_REV0_01		PAGE SHEET 1 OF 4
DATE December 2013	TERA REF. 7894	REVISION 0
SCALE 1:1,000,000	PAGE SIZE 11x17	DISCIPLINE HER
DRAWN AJS	CHECKED TGG	DESIGN TGG

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ALL LOCATIONS APPROXIMATE

201310_MAP_TERA_HER_00443_Rev0_01.mxd

120°0'0"W

52°0'0"N

BRITISH COLUMBIA
ALBERTA
JASPER NATIONAL PARK
Mount Robson Provincial Park
Bowron Lake Provincial Park
Cariboo Mountains Provincial Park
Wells Gray Provincial Park
Schoolhouse Lake Provincial Park
Taweel Provincial Park
Upper Seymour River Provincial Park
Bonaparte Provincial Park
Anstey Hunakwa Provincial Park

Dunster
Mount Robson
Hargreaves Trap Site
Rearguard
Tête Jaune Cache
VALEMOUNT
Cedarside
Albreda
Albreda
Chappel
Blue River
Blue River
Finn
Avola
McMurphy
Clearwater
Vavenby
Birch Island
Blackpool
Blackpool
Darfield
Darfield
Simpcw
Little Fort
Barriere
Louis Creek
Criss Creek
Vidette
Seymour Arm
Eagle Creek
Mahood Falls
Canim Lake
Deka Lake
Roe Lake
Bridge Lake

KP 450
KP 400
RK 500
KP 500
RK 550
KP 550
RK 600
KP 600
RK 650
KP 650
RK 700
KP 700
RK 750
KP 750

16
5
23
24

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- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Heritage Resource Study Area Boundary
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary

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TRANS MOUNTAIN

FIGURE 5.1-2

HERITAGE RESOURCE STUDY AREA BOUNDARIES - HARGREAVES TO DARFIELD

TRANS MOUNTAIN EXPANSION PROJECT

MAP NUMBER: 201310_MAP_TERA_HER_00443_REV0_02		PAGE: SHEET 2 OF 4
DATE: December 2013	TERA REF.: 7894	REVISION: 0
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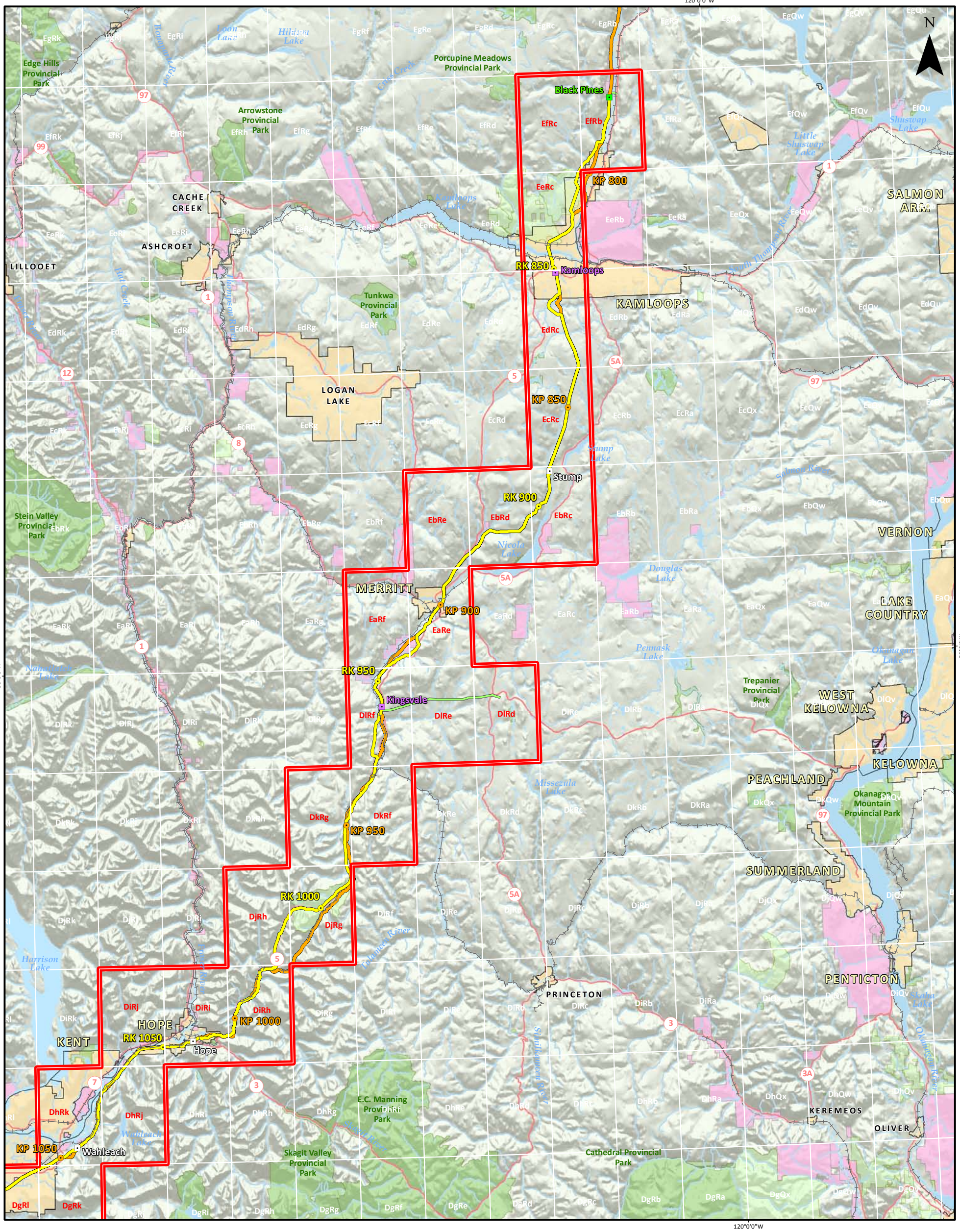
ALL LOCATIONS APPROXIMATE



tera ENVIRONMENTAL CONSULTANTS

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion Proposed Pipeline Corridor
- Proposed Power Line
- Heritage Resource Study Area Boundary
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary

Projection: NAD 1983 UTM 10N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrastructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

TRANS MOUNTAIN

FIGURE 5.1-3

HERITAGE RESOURCE STUDY AREA BOUNDARIES - BLACK PINES TO HOPE

TRANS MOUNTAIN EXPANSION PROJECT

MAP NUMBER: 201310_MAP_TERA_HER_00443_REV0_03		PAGE: SHEET 3 OF 4
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:700,000	PAGE SIZE: 11x17	DISCIPLINE: HER
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

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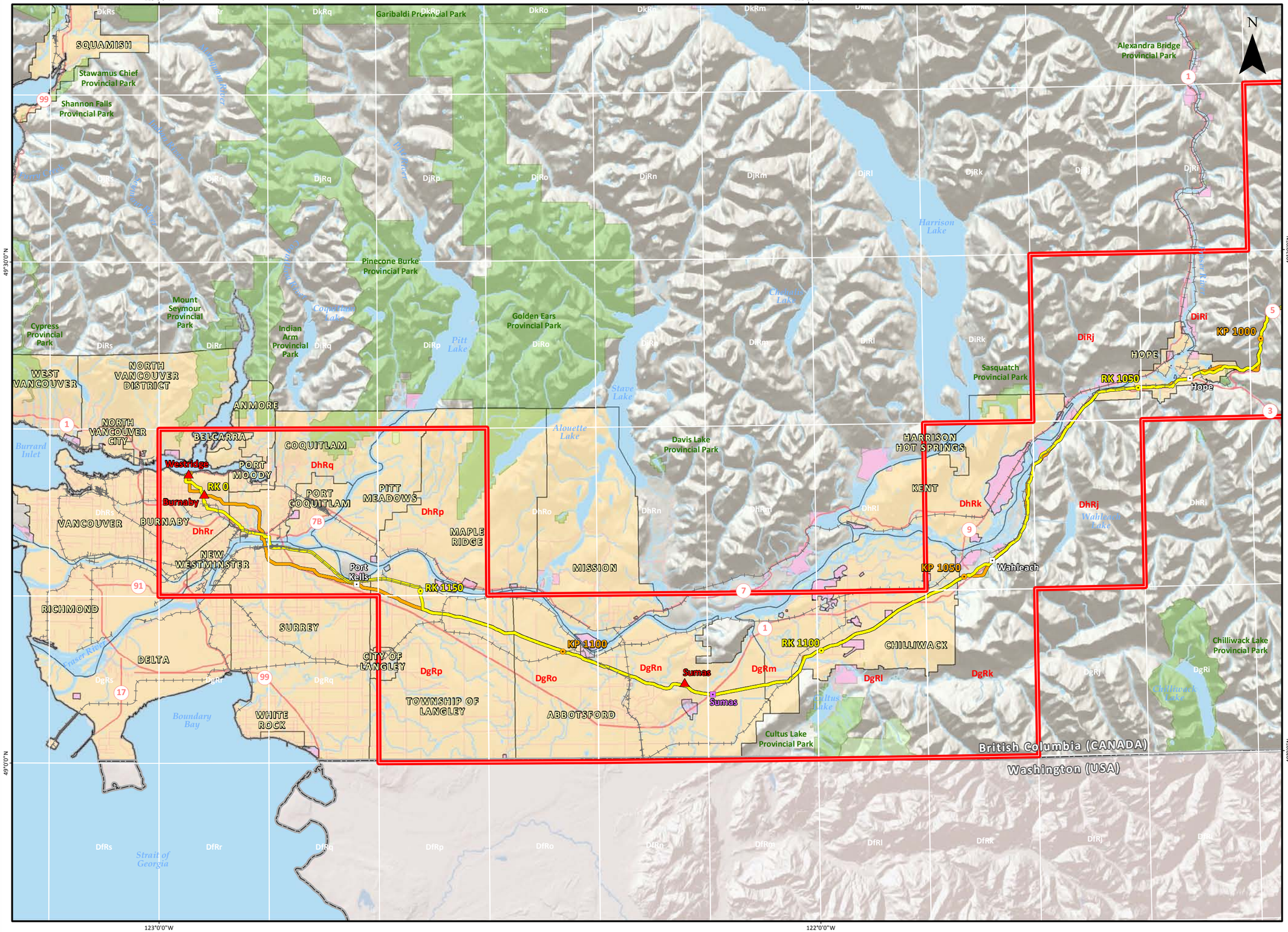
ALL LOCATIONS APPROXIMATE



TRANS MOUNTAIN

FIGURE 5.1-4

HERITAGE RESOURCE STUDY AREA BOUNDARIES - HOPE TO WESTRIDGE

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Existing Trans Mountain Pipeline
- Trans Mountain Expansion Proposed Pipeline Corridor
- Heritage Resource Study Area Boundary
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: NAD83 UTM Zone 10N. Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2013 Esri.

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MAP NUMBER 201310_MAP_TERA_HER_00443_REV0_04		PAGE SHEET 4 OF 4
DATE December 2013	TERA REF. 7894	REVISION 0
SCALE 1:400,000	PAGE SIZE 11x17	DISCIPLINE HER
DRAWN AJS	CHECKED TGG	DESIGN TGG

0 5 10 15 km

ALL LOCATIONS APPROXIMATE

201310_MAP_TERA_HER_00443_Rev0_04.mxd

5.1.1.1 Edmonton Region and Rural Alberta Region

The proposed pipeline corridor crosses five Natural Subregions in Alberta, including the Central Parkland, Dry Mixedwood, Central Mixedwood, Lower Foothills and Montane Natural Subregions (Natural Regions Committee 2006). Lands traversed by the proposed pipeline corridor in Alberta are agricultural, disturbed by plowing for cultivation, hay and tame pasture, areas of aspen woodlands and mixed aspen forest, treed pasture, and fringes of native vegetation around wetlands and the edges of certain watercourses, urban, industrial and parks. The proposed pipeline corridor traverses both the North Saskatchewan and Athabasca river basins. There are 202 proposed watercourse crossings along the proposed pipeline corridor in Alberta. The pipeline corridor crosses several major watercourses within these watersheds, including the North Saskatchewan, Pembina, McLeod and Lobstick rivers. Based on the fish and fish habitat assessment, 56 of the 202 proposed crossings were identified as fish-bearing (see Fisheries [Alberta] Technical Report of Volume 5C).

Most of the proposed pipeline corridor parallels the existing TMPL right-of-way, which has been previously investigated under HRIA and Historical Resources Overviews (HROs) in Alberta. The previous HRIA and HROs consisted of desktop reviews as well as pedestrian surveys for the length of the pipeline as means of mitigating the heritage resources along the development. During previous fieldwork for Trans Mountain, four sites were identified; however, they did not require mitigation since they were outside of the right-of-way.

Historical Resource Values (HRV) (numbered 0 to 5) are assigned by Alberta Culture based on the presence of previously known heritage resources or the topographic potential in that particular parcel of land to contain heritage resources (this is the same system for paleontological resources). Most of the lands crossed by the proposed pipeline corridor in Alberta have no HRV. However, several quarter-sections crossed by the proposed pipeline corridor have been assigned HRVs, including 4a and 5a (Alberta Culture 2013). Abundant historic structures (above ground structures dating prior to 50 years before present) (n=60 in an area of generally 175 m on either side of the centreline of the pipeline corridor) have been recorded in legal locations crossed by the proposed pipeline corridor in Alberta. Many of these previously recorded sites are located more than 100 m from the proposed pipeline corridor; however, a total of 48 archaeological sites have been previously recorded within 100 m of the proposed pipeline corridor, several of which have been identified as Precontact campsites. Most of these sites are represented by isolated finds or small scatters of artifacts found on the surface of cultivated fields with no intact subsurface components, and have accordingly been assigned HRVs of 0. The proposed pipeline corridor traverses 18 Borden Blocks, within which a total of 651 sites have been previously recorded. A listing of these blocks and the number of previously-identified archaeological sites contained within each block are provided in Table 5.1-1. A listing of the different site types encountered is provided in Table 5.1-2.

TABLE 5.1-1

BORDEN BLOCKS TRAVERSED BY THE PROPOSED PIPELINE CORRIDOR IN ALBERTA

Borden Block	Number of Previously Identified Archaeological Sites
FhQj	2
FhQk	15
FiPj	165
FiPk	91
FiQh	39
FiQi	24
FiQj	23
FiQk	33
FjPj	111
FjPk	54
FjPo	3
FjPp	50
FjQd	15

TABLE 5.1-1 Cont'd

Borden Block	Number of Previously Identified Archaeological Sites
FjQe	7
FjQf	5
FjQg	8
FjQh	0
FjQi	6
Total Number of Sites	651

TABLE 5.1-2

SITE TYPES WITHIN TRAVERSED BORDEN BLOCKS IN ALBERTA

Site Type	Number of Previously Recorded Sites
Burial/Ceremonial/Religious	6
Campsite	174
Collection	18
Historic Remains	57
Isolated Find	122
Killsite	7
Open or Reserved Number	31
Palaeoenvironmental	1
Palaeontological	2
Quarry	3
Scatter	202
Stone Feature	3
Workshop	25
Total Number of Sites	651

A Clearance Application for the Project was submitted to Alberta Culture for review. Alberta Culture issued a Schedule "A" requirements letter to Trans Mountain on November 22, 2012 (Historic Resources Management Branch File No. HRM 4780-12-0066) specifying that an HRIA must be conducted for the Project, including all standing historic structures and all areas of high historic resources potential within the Project Footprint. Qualified archaeologists commenced an HRIA in May 2013 under Archaeological Research Permit 13-018. The HRIA commenced with review of the background data to aid identification of potential historic structures and select target areas of high archaeological potential within the Project Footprint. The HRIA consisted of a ground reconnaissance within the target areas involving an intensive visual inspection and, where warranted, shovel testing.

To date, a total of 936 shovel tests have been excavated locations under Archaeological Research Permit 13-018. During this assessment, 68 new sites were identified; these comprise 54 historic sites and 14 previously unknown archaeological sites were identified within the proposed pipeline corridor.

Some additional ground reconnaissance and visual inspection is planned to begin under snow-free conditions and continue over summer and fall 2014 at selected locations where the HRIA was not completed prior to filing, due to land access constraints and the need for further investigations on chosen sites.

Further details on the methodology and results of the HRIA will be provided in the final report submitted to Alberta Culture for Permit 13-018.

Traditional Ecological Knowledge

TEK was collected in partnership between TERA and members of Saddle Lake Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Louis Bull Tribe, Alexis Nakota Sioux First Nation, Paul First Nation, Nakcowinewak Nation of Canada and Sunchild First Nation. During the archaeological field surveys, traditional methods of resource procurement were discussed, as well as modern methods currently employed. Seasonality of resource harvesting was also important information shared by the Aboriginal participants. Geographic locations were identified, as were areas that are not used and the reasons why. Potential mitigation measures to reduce any Project-related effects on a resource were also discussed during the archaeological field studies. Participants contributed to the discussion of potential Project-related effects on resources and participated in the discussion of potential mitigation measures to reduce potential Project-related effects.

The objectives, methods and engagement of potentially affected Aboriginal communities on the archaeological field surveys are described in Section 3.0.

During the field survey of the proposed pipeline corridor within the Edmonton Region and Rural Alberta Region, participants described characteristic features of Aboriginal burial sites; these sites are often traditionally marked with stone or wood but can also be void of any kind of marker (a Cree tradition) and can be identified by sunken land. Most people in Aboriginal communities know the locations of burial sites within their asserted traditional territories and graves are often located along the banks of rivers and streams and on high ridges. Some participants believe that people were buried with their belongings in the place where they died. The location of such sites can also depend upon the seasons, since summer camps were made along rivers and winter camps in forested areas. The dead were occasionally known to be placed in trees upon request, instead of buried in the ground so as not to be eaten by ants or other insects.

Medicine circles were described during field studies within the Edmonton Region and Rural Alberta Region. A medicine circle represents life and the interconnectedness of humanity and the natural world. The circle contains four colours that represent the four directions of earth, times of the day, the aging process and the four seasons. White represents north, night, Elder and old-man winter. Red represents south, afternoon, teenager and summer. Yellow represents east, morning; birth and spring. Blue represents west, evening, adult and autumn. Participants shared their belief about creation: in one version of the story, God created man and a woman from the soil. He did not create one man, but man and woman together as equals. God created the sun from fire and then put the fire from the sun into their hearts to create their souls. Aboriginal communities in these regions believe that when someone dies, their soul moves on while their body remains. Ceremonies, songs and feasts are often held to remember the ones who have died, and the souls are fed by these memorials by the living presenting tobacco and a feast. The Creator is said to like tobacco and wants tobacco to be presented to Elders at these ceremonies. It was shared that the first plant that was grown was tobacco and the Creator provided water to grow the plant.

In another version of the story, the Creator made man and woman from the soil and used the branches of an aspen tree to make their bones. The top two branches of the tree represent the first bones created. The first man and first woman then made five boys and five girls. Fingers represent each of those ten original children. The female children married the creatures of the sky, such as the thunderbird and eagle, and the males, the four-legged creatures. One of the boys was out walking in the woods and saw a girl he had never seen before; she was not of his family. From then on, he would sneak away to find her, telling his parents he was going hunting. After four days of this, the girl invited him to go meet her parents. He went with her to their home in a den-like cave. Her father and mother were sitting in the cave, along with two other children. Her father said it was good he had come, and gave him permission to marry his daughter. Then he told the boy to turn around clockwise, and when he did, he was facing two bears where the other two children had been sitting. The father told the boy not to run or be afraid, and when he turned around again, they were no longer bears, but had become children again. The girl's people were shape-shifters, and by marrying her, the boy connected his people to the spirit of animals. This story helps explain the innate connections Cree people have with wildlife, which traditionally included the ability for humans to change into animal shapes, based on their clan. It also explains the importance of arranged marriages, to support the fruit of life through uniting the two human elements of the Creator, man and

woman. In this story, women are connected with creatures of the sky and are, therefore, seen as being closer to heaven.

A large stone ring was identified by participants during the field studies and it was reported that this was where the tipi of a spiritual guide stayed to lead those on vision quests. The tipi was large and community members would sing to the spirits and offer berries to them. Community members would meet here at midnight and eat berries and then would not have food or water for four days. At another site, two smaller stone rings were identified as also being where vision quests were held and participants thought that the two stone rings could signify one for men and one for women.

During the field studies, participants held a pipe ceremony at the beginning of each field day. A participant led the ceremony starting with a smudge which was followed by a prayer and the passing of the pipe to all the men. Because the pipe made it around the entire circle without burning out it was said to be a sign of good luck. The participants believed that much TEK would be collected on this day because the ceremony was completed. A participant left a tobacco offering and said a prayer at the base of two old black poplar trees said to be grandfather trees due to their age. By offering tobacco, the participant prayed to leave all bad energy there and receive good energy instead and that those who say or use negative words on others will have it come back on them three fold.

Several campsites, cabins and habitation sites were identified within the Edmonton Region and Rural Alberta Region. These sites include historic ruins and sites that are currently in use. These sites can be identified by lean-to shelters, cabins, campsites, fire rings, fire wood, debris, traplines and berry picking sites. Campsites, historic and current, have been known to be used as trading places, berry picking areas, hunting and trapping sites and food caches. Historic campsites are no longer in use mainly because people do not travel by wagon or camp in groups to berry pick or trap any more. Often times the age of historic cabins can be indicated by the height of the trees surrounding the structure. Some cabins were built with axes and this can be seen by the notches in the logs. Campsites were often struck along trails and traditional trails were identified by participants who said that camping would often take place along travel routes (Cree and Blackfoot). Archaeological artifacts are often found along these trails.

Habitation sites can be identified on ridges, forested areas and near water. Participants reported that these features are ideal for habitation since ridges are ideal places for wigwams and tipis, and forested areas provide shelter and water for sustenance, and abundant wildlife. Aboriginal people in this region are said to live on the south side of trees in order to shelter themselves from the wind and the rain that comes from the north. Several historic and current cabins were identified by participants during the field surveys. Historic cabins are easily identified by decaying framework structures/lean-tos. Participants reported that these old structures may be currently used by homeless people for their shelter from the elements, abundant firewood and proximity to town. An in-ground, log cabin with a tarp overlay was identified at Hardisty Creek (at RK 319.8), and participants were unsure of who owned it; however, it was speculated that it belonged to a non-Aboriginal person since the door was chained. Participants noted that Aboriginal people generally do not lock their cabins.

Other heritage resources were identified by participants during the field study. Approximately 20 m north of RK 323.2, participants located an old wooden sled ski 1.5 m long and likely 50-60 years old, determined by the shape which is pointed at the front end and squared off on back end. The ski also had three, now rotten, wooden braces which would have attached to a sled. The end of the ski was tapered to slide along the snow easily. The ski was well preserved since it was found under a large spruce tree, protecting it from the elements. Approximately 50 m northeast of RK 323, participants identified four stone flakes and reported that this location would have made a great campsite since it is at a high elevation and there is an abundance of vegetation and trees for shelter. Approximately 50.1 m southwest of RK 61.6 and 12.5 m northeast of RK 63.5, participants identified small pieces of white quartz, stone fragments and lithic shatter. The participants reported that these stone fragments are used to fill ceremonial rattles or to make tools. The quartz pebbles are mixed with buckshot, and it is said the white quartz makes the rattle glow. The rattles are made by drying deer hide into a sphere by stuffing it with soil or charcoal. The handle is made from wood, and sometimes decorated. Rattles can be used for sweat lodges, sun dances and other rituals. Some rattles are multi-use, others are particular to a ceremony and some are exclusive to men or women. Today, people like to use a white rock such as quartz, so it lights up when rattled in the raw hide. Approximately 13.9 m south of RK 72.8, a sharp, shiny, triangular stone was found resting on plowed land surrounded by forest. Approximately 87 m south of RK 102.3, a rock used as a mortar and

pestle was identified. Pipestone and pipes were gathered from proposed watercourse crossings at RK 202.6 and at RK 202.7. Pipestones come in different colours but black is generally the colour of choice. Participants reported that pipe holders are chosen by the Elders, and there is protocol involved in the selection process. One must be asked to be pipe holder and must have traditional wisdom.

Participants identified culturally modified trees (CMTs) during the field studies. Trees are modified for a variety of reasons and are typically used to mark trails. The markings or blazes can be made by axe, knife or by peeling the bark of the tree's trunk in strips. Often when the blazes are higher up the trunk, this means that they were made in the winter months, since the snow line would obscure the lower trunk. The lower markings would be made during the warmer months. A culturally modified poplar tree, approximately 5 to 10 years old, was identified along a ridge line overlooking a shallow valley. Participants said the markings were made by hand and the tree may have been used as a "marker", but were unable to confirm.

5.1.1.2 Fraser-Fort George/Thompson-Nicola Region, Fraser Valley Region and Metro Vancouver Region

The proposed pipeline corridor crosses nine Biogeoclimatic (BGC) Zones in BC, including the Interior Cedar-Hemlock, Sub-Boreal Spruce, Interior Douglas Fir, Ponderosa Pine, Bunchgrass, Montane Spruce, Engelmann Spruce-Sub-Alpine Fir, Coastal Western Hemlock and Mountain Hemlock BGC Zones (Demarchi 1996). Lands traversed by the proposed pipeline corridor in BC are agricultural, disturbed by plowing for cultivation, hay and tame pasture, areas of forest, native vegetation, urban, industrial and parks. There are 800 watercourse crossings along the route of the proposed pipeline corridor in BC (see Fisheries [British Columbia] Technical Report of Volume 5C). The proposed pipeline corridor crosses several major watercourses, including the Fraser, Canoe, North Thompson, Clearwater, Thompson, Nicola, Coldwater, Fraser and Chilliwack rivers. Based on the fish and fish habitat assessment, 171 of the 800 proposed crossings were identified as fish-bearing.

Most of the proposed pipeline corridor parallels the existing TMPL right-of-way, which was not investigated previously under any AIA in BC. Many previously recorded sites are located more than 100 m from the proposed pipeline corridor (generally 175 m on either side of the centreline of the proposed pipeline corridor); however, a total of 41 archaeological sites have been previously recorded within 100 m of the proposed pipeline corridor. Most of these sites are represented by artifact scatters with several Precontact cultural depressions, habitation sites, and historic burials and cemeteries. A file search for previously recorded sites indicated that the proposed pipeline corridor crosses 38 Borden Blocks containing archaeological sites. These blocks contain 206 previously recorded sites. The number of sites and Borden Blocks by Ecoprovince are presented in Table 5.1-3. A listing of the different site types encountered is provided in Table 5.1-4.

TABLE 5.1-3

BORDEN BLOCKS WITH SITES WITHIN THE PROPOSED PIPELINE CORRIDOR IN BC

Ecoprovince	Number of Borden Blocks with Sites	Total Number of Sites in Borden Blocks
Georgia Depression	9	43
Southern Coastal Mountains	4	59
Southern Montane Cordillera	17	83
Columbia Montane Cordillera	8	21
Total	38	206

TABLE 5.1-4

SITE TYPES WITHIN TRAVERSED BORDEN BLOCKS IN BC

Site Type	Number of Previously Recorded Sites
Pre-Contact	
Ceremonial/Religious	8
Cultural Depression	57
Habitation Site	5
Artifact Scatter	88
Fishing Feature	3
Post-Contact	
Ceremonial/Religious	3
Cultural Depression	1
Habitation Site	1
Structure	17
Transportation	6
Other	3
Multi-Component	
Cultural Depression	1
Habitation Site	6
Scatter	3
Traditional	
Culturally Modified Tree (CMT)	4
Total Number of Sites	206

An Application for Permit for the Project, submitted to BC MFLNRO, Archaeology Branch, was accepted July 3, 2013. Qualified archaeologists commenced an AIA in July 2013 under Archaeological Research Permit 2013-0165. The AIA commenced with review of the background data to aid identification of potential historic structures (above ground structures dating prior to 50 years before present) and select target areas of high archaeological potential within the Project Footprint. The AIA consisted of a ground reconnaissance within the target areas involving an intensive visual inspection and, where warranted, shovel testing.

To date, a total of 368 shovel tests have been excavated under Archaeological Research Permit 2013-0165. During this assessment, 10 previously unknown archaeological sites and 1 historic site were identified within the proposed pipeline corridor. Each of these sites has been recorded, mapped and had subsurface testing conducted to date.

Some additional ground reconnaissance and visual inspection is planned to begin under snow-free conditions and continue over summer and fall 2014 at selected locations where the AIA was not completed prior to filing, due to land access constraints and the need for further investigations on chosen sites.

Further details on the methodology and results of the AIA will be provided in the final report submitted to BC Archaeology Branch for Permit 2013-0165.

Traditional Ecological Knowledge

TEK was collected in partnership between TERA and members of Lower Nicola Indian Band, the Nicola Tribal Association and Chawathil First Nation. Nooaitch Indian Band, Nicomen Indian and Shackan Indian Band have delegated authority of the Nicola Tribal Association to act on behalf of their respective communities for Project engagement activities. During the archaeological field surveys, traditional methods of resource procurement were discussed, as well as modern methods currently employed. Seasonality of resource harvesting was also important information shared by the Aboriginal participants. Geographic locations were identified, as were areas that are not used and the reasons why. Potential mitigation measures to reduce any Project-related effects on a resource were also discussed during the biophysical field studies. Participants contributed to the discussion of potential Project-related effects on

resources and participated in the discussion of potential mitigation measures to reduce potential Project-related effects.

The objectives, methods and engagement of potentially affected Aboriginal communities on the archaeological field surveys are described in Section 3.0.

During the field survey of the proposed pipeline corridor within the Fraser-Fort George/Thompson-Nicola Region, Fraser Valley Region and Metro Vancouver Region, participants identified a graveyard site 50 m southeast of RK 918.2, estimated to be over 100 years old. A bone of undetermined origin was discovered in the ground outside the fencing of the graveyard. Participants suggested that the gravesite could be one section of a larger site, also indicating that land adjacent to the watercourse at this site was ideal for campgrounds and trails because of the flat topography.

Basalt, chert, lithic and chalcedony rock are found around Lake Penask, approximately 45 km east of RK 870. Traditionally, Aboriginal peoples would use this type of rock to fashion tools including knives, scrapers, and arrowheads. The ridges surrounding the Nicola River are known to have archeological lithic scatters on them. A potential broken tip of an arrowhead was discovered on a sloped area, west of Highway 53, approximately 308.2 m northwest of RK 924.7. Participants suggested that it likely belonged to a hunter; however, it is unlikely that this area was a camp due to the slope and the lack of other archaeological finds in proximity. The approximate age of the artifact is unknown. Rocks with holes were identified 531.9 m southeast of RK 928.6. These rocks were described as having cultural importance since similar rocks are found in ancient stories that predate western contact. The stories are of transformers (a human turning to stone). Participants suggested that the hillsides throughout this region have a lot of these “two-hole,” or hollow rocks.

Several CMTs were identified by participants during the field studies explaining that trees are modified for a variety of reasons. Markings may be used to indicate water access or wildlife activity while others are personal markers and navigational signs. CMTs were also created when the cambium layer or bark of the tree was harvested for consumption, or for making goods. The CMTs in these regions are most commonly cedar. Long strip-like indentations in a tree can indicate a CMT. The bark of tall, straight trees is harvested for basket weaving. Baskets were also traditionally made by weaving together cedar roots. The baskets would later be used for plant harvesting. Participants also described using the bark for clothing, shingles, regalia, hats, vests and floor mats. Regalia are sometimes used in longhouse ceremonies.

Pithouses traditionally used as winter shelters located in the valley northwest of the City of Merritt, BC along the Nicola River were discussed during the field studies. The walls and roof of a pithouse were made of fir and pine trees. Participant observed an old homestead potentially dating from the 1920’s approximately 211 m northwest of RK 918.1. Approximately 22 pit houses were identified along the proposed pipeline corridor from RK 1058.2 to RK 2058.7. The houses were always located near a water source, and often there would be many pit houses in the same area. Pit houses are dug down to about 1 m to 3 m for insulation, and wood and branches are used for the roof. Occasionally, mud would be used on the roof to fill holes. Pit houses would have enough space to sleep, cook and have a fire. At one end of the house, there is a hole for a ladder and for smoke from fires to escape. Some communities would use pit houses all year. The size of a pit house varies by family, but is generally approximately 9 m in diameter. Participants suggested that most communities probably stopped using pit houses as settlers moved in and showed them how to make other types of houses in the late 1800s or early 1900s. Participants also discussed the use of pit houses as protection places based on stories shared by Elders. Pit houses were used in summer, forming waterside villages. When enemies approached, village people would retreat to other pit houses near the mountains. Pit houses were also used for funerary purposes, in particular during the spread of smallpox. In some areas, instead of burying or burning the dead, smallpox victims would have been left in the pit houses and the entire pit house would be covered to avoid coming in contact with the bodies.

Participants reported that totem poles are used in their communities and are culturally important. Totem poles are made to honour people, gods, spirits and animals, and to mark special times. The construction of a totem pole is an inclusive community event. Surrounding communities are invited to the raising ceremony to pay respect and witness the event. The object on top of the totem pole is the most important and is usually a bald eagle. The use of totem planks by previous generations was also discussed. Totem planks would be placed in front of homes to indicate what the resident was known for. People from other

villages who came to trade could then easily identify who could provide specific goods or services. Totem planks are no longer common practice.

5.1.2 Potential Palaeontological Areas

The study of palaeontology seeks information about several aspects of past organisms; for example, their identity, origin, environment and evolution. There are two types of palaeontological resources, body fossils and trace fossils. Body fossils are the remnants of an organism, such as a skeleton or leaf imprint, that is embedded and preserved within the earth's crust. Trace fossils on the other hand consist of tracks, burrows, coprolites and marks left by feeding which reflect the organisms' behaviors. Organisms that are discovered during palaeontological work include single-celled organisms, plants, fungi and both invertebrate and vertebrate animals.

5.1.2.1 Edmonton Region and Rural Alberta Region

The proposed pipeline corridor crosses 25 quarter sections with lands listed as having HRV values of 5 for palaeontological resources in the current *Listing of Historical Resources* (Alberta Culture 2013). Alberta Culture issued a Schedule "A" requirements letter to Trans Mountain on November 22, 2012 (Historic Resources Management Branch File No. HRM 4780-12-0066) specifying that an HRIA in the form of a palaeontological monitoring program during construction must be conducted for the Project if a trenched pipeline crossing will be implemented at water crossings.

5.1.2.2 Fraser-Fort George/Thompson-Nicola Region, Fraser Valley Region and Metro Vancouver Region

BC does not have an equivalent listing of lands with potential palaeontological resources. There is no provincial legislation providing protection for palaeontological sites in BC. The proposed pipeline corridor crosses lands that that have high potential for encountering palaeontological sites, including Valemount through the Monashee Mountains, the North Thompson River Valley to Kamloops, Kamloops to Hope and Hope to Vancouver.

5.2 Traditional Land and Resource Use

This subsection provides an overview of existing conditions pertaining to traditional land and resource use (TLRU). Two indicators were selected to represent potential effects of the Project on TLRU; these are 'subsistence activities and sites', and 'cultural sites'. Potential effect pathways and measurement endpoints for TLRU are described in detail in the Traditional Land and Resource Use Technical Report of Volume 5D, as well as rationale for selection of indicators. As part of the traditional land use (TLU) for the Project, each participating Aboriginal community was asked to identify potential subsistence activities and sites including hunting, trapping, fishing, plant gathering, trails/travelways, habitation sites and cultural sites including gathering places and sacred areas.

Subsistence activities and sites represent the extensive land and water bases on which activities take place, a broad view of where and how people move in the landscape, how they use it and where they inhabit it. Travelways on the landscape are used to access subsistence resources and neighbouring communities. Hunting, trapping, fishing and plant gathering are activities pursued by Aboriginal peoples for both subsistence and traditional purposes and represent the intrinsic link to the biophysical environment. Cultural sites represent people's long-term connection to the land, water and cultural continuity and include the ability to participate in and continue practices and activities conducted by past generations, and the ability to pass on the collective knowledge and use of the environment according to tradition. Gathering areas and sacred areas are collective terms used to incorporate all types of sites unrelated to the acquisition of environmental resources.

Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about, and seek feedback on, the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. Of the 85 Aboriginal communities engaged on the Project with Trans Mountain, the following 62 communities have been identified as having an interest in the Project or having interests potentially affected by the Project:

Saddle Lake Cree Nation;

Enoch Cree Nation;

Alexander First Nation;

Samson Cree Nation;

Métis Nation of Alberta (Region 4);

O'Chiese First Nation;

Ermineskin Cree Nation;

Montana First Nation;

Louis Bull Tribe;

Alexis Nakota Sioux Nation;

Foothills Ojibway Society;

Paul First Nation;

Nakcowinewak Nation of Canada;

Sunchild First Nation;

Aseniwuche Winewak Nation;

Lheidli T'enneh;

Simpcw First Nation;

Lhtako Dene Nation;

Canim Lake Band;

Whispering Pines (Clinton Indian Band);

Métis Nation British Columbia;

Tk'emlúps te Secwépemc;

Skeetchestn Indian Band;

Penticton Indian Band;

Upper Nicola Indian Band;

Lower Similkameen Indian Band;

Upper Similkameen Indian Band;

Lower Nicola Indian Band;

Coldwater Indian Band;

Shackan Indian Band;

Nicomen Indian Band;

Nooaitch Indian Band;

Yale First Nation;

Union Bar First Nation;

Chawathil First Nation;

Shxw'ōwhámel First Nation;

Cheam First Nation;

Sumas First Nation;

Peters Band;

Seabird Island Band;

Popkum First Nation;

Scowlitz First Nation;

Skowkale First Nation;

Yakweakwioose First Nation;

Aitchelitz First Nation;

Skwah First Nation;

Kwaw-kwaw-apilt First Nation;

Soowahlie First Nation;

Shxwha:y Village;

Tzeachten First Nation;

Squiala First Nation;

Leq'á:mel First Nation;

Semiahmoo First Nation;

Matsqui First Nation;

Kwantlen First Nation;

Katzie First Nation;

Kwikwetlem First Nation;

Qayqayt First Nation;

Squamish Nation;

Tsleil-Waututh Nation;

Musqueam Indian Band; and

Tsawwassen First Nation.

This setting discusses traditional land and resource use within the TLRU RSA, which is defined by the RSA boundaries of water quality and quantity, fish and fish habitat, air emissions, acoustic environment, wetland loss or alteration, vegetation, and wildlife and wildlife habitat, which are described in Section 7.0 of Volume 5A as well as heritage resources which is described in Section 5.1. The spatial boundaries of the TLRU RSA are shown on Figure 5.2-1. Existing conditions of traditional land and resource use encountered within or in proximity to the TLRU RSA were determined through a review of: publicly available harvest data, Aboriginal traditional knowledge and Traditional Land Use (TLU)/Traditional Use Study (TUS) reports; the results of engagement with Aboriginal community representatives; and TLU studies conducted with potentially affected Aboriginal communities for the Project. The traditional land and resource use setting information in this subsection is presented by Aboriginal community from east to west along the proposed pipeline corridor and according to proposed pipeline segment to align with assessment of environmental elements (Volume 5A). Corresponding Project components (proposed pipeline segments) and socio-economic study regions are provided in Table 5.2-1. The geographic relationship of the potentially affected Aboriginal communities is described in detail in the Traditional Land and Resource Use Technical Report of Volume 5D and detailed community profile and socio-economic study region information is provided in the Socio-Economic Technical Report of Volume 5D.

Traditional Land Use Studies

TERA was commissioned to assist in the collection of traditional land and resource use information with potentially affected Aboriginal communities that focused on the current use of Crown lands and waters for traditional activities potentially disturbed by pipeline and facility construction and clean-up activities, including associated physical works and activities. Trans Mountain acknowledges the unique relationship that has evolved between the Aboriginal peoples and their surrounding physical environment. This physical environment includes the lands, waters, resources and events that have shaped and sustained the local Aboriginal peoples, their culture and their communities. In this volume, Trans Mountain will refer to this relationship as "traditional land use" or “traditional land and resource use”, and both shall be interpreted broadly, respectful of the Aboriginal worldview, not limited to lands, but inclusive of all aspects of the terrestrial and marine environments.

TRANSMOUNTAIN

FIGURE 5.2-1

TRADITIONAL LAND AND RESOUCE USE REGIONAL STUDY AREA

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Proposed Power Line
- Terminal
- Pump Station (Pump Addition, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- Traditional Land and Resource Use Regional Study Area
- Marine Traditional Land and Resource Use Regional Study Area
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: NAD83 UTM Zone 11N. Routing: Baseline TMPL & Facilities: provided by KMC 2012; Proposed Pipeline Corridor V6: provided by UPI Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013; AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Service Layer Credits: Copyright © 2013 Esri.

tera ENVIRONMENTAL CONSULTANTS

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER 201310_MAP_TERA_TLU_00441_REV0		PAGE SHEET 1 OF 1
DATE December 2013	TERA REF. 7894	REVISION 0
SCALE 1:2,750,000	PAGE SIZE 11x17	DISCIPLINE TLU
DRAWN AJS	CHECKED HS	DESIGN TGG

0 25 50 75 100 km

ALL LOCATIONS APPROXIMATE

201310_MAP_TERA_TLU_00441_Rev0.mxd

Following Project initiation, TERA on behalf of Trans Mountain, facilitated the TLU studies conducted by interested Aboriginal communities for the Project (Table 5.2-1). The Project scope, timetable and location were discussed. Project information packages, which included a Project description, facts on the nature, timing, scope and location of the Project and relevant contact information for communication with Trans Mountain and TERA, were sent to each community and meetings were subsequently scheduled. Communities were also provided with copies of the proposed TLU study methods and a draft outline of TERA's TLU study work plan. Participation in the TLU studies, either as TERA-facilitated or community directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies.

TABLE 5.2-1

TIME TABLE OF TRADITIONAL LAND AND RESOURCE USE STUDIES FOR EACH PARTICIPATING COMMUNITY

Community	Proposed Pipeline Segment(s)	Socio-Economic Study Region(s)	Map Review	Interviews	Overflight	Ground Reconnaissance	Results Review/ Mitigation Meetings
Saddle Lake Cree Nation	Edmonton to Hinton	Rural Alberta Region	Interest in a TLU study to be determined by Saddle Lake Cree Nation.				
Enoch Cree Nation	Edmonton to Hinton	Edmonton Region	June 7, 2013	August 29 to 30, 2013	September 7, 2013	September 18 to 26, 2013	To be determined
Alexander First Nation	Edmonton to Hinton	Edmonton Region	October 4, 2012	October 18 and 19, 2012	October 30, 2012	October 30 to November 1, 2012	To be determined
Samson Cree Nation	Edmonton to Hinton	Edmonton Region	September 20, 2012	September 20, 2012	March 22 to 23, 2013	November 6 to 9, 2012; September 25 to October 2, 2013	December 4, 2013
Métis Nation of Alberta (Region 4)	Edmonton to Hinton	Edmonton Region	Independent, third-party engagement report (underway).				
O'Chiese First Nation	Edmonton to Hinton	Rural Alberta Region	Independent, third-party TLU study. Final report received on September 20, 2013.				
Ermineskin Cree Nation	Edmonton to Hinton	Edmonton Region	September 4, 2012	September 4, 2012	September 5 to 7, 2012	September 5 to 7, 2012	October 31, 2013
Montana First Nation	Edmonton to Hinton	Edmonton Region	August 7 to 8, 2013	August 7 to 8, 2013	N/A	To be determined	To be determined
Louis Bull Tribe	Edmonton to Hinton	Edmonton Region	Interest in a TLU study to be determined by Louis Bull Tribe.				
Alexis Nakota Sioux Nation	Edmonton to Hinton	Edmonton Region	October 26, 2012	May 16 to 17, 2013	November 5, 2012	November 6 to 10, 2012	To be determined
Foothills Ojibway Society	Edmonton to Hinton	Rural Alberta Region	Declined TLU study participation; identified preliminary interests on June 5, 2013.				
Paul First Nation	Edmonton to Hinton	Edmonton Region	November 14, 2012	November 14, 2012	December 3, 2012	December 3, 2012	November 8, 2013
Nakcowinewak Nation of Canada	Edmonton to Hinton	Edmonton Region	September 19 to 20, 2013	September 19 to 20, 2013	N/A	September 21 to 26, 2013	November 25, 2013
Sunchild First Nation	Edmonton to Hinton	Rural Alberta Region	Independent, third-party TLU study (underway).				
Aseniwuche Winewak Nation	Edmonton to Hinton	Jasper National Park Region	Independent, third-party TLU study. Final report received on November 18, 2013.				
Lheidli T'enneh	Hargreaves to Darfield	Fraser-Fort George/Thompson-Nicola Region	Independent, third-party TLU study. Interim report received on November 20, 2013.				
Simpcw First Nation	Hargreaves to Darfield	Fraser-Fort George/Thompson-Nicola Region	Independent, third-party TLU study (underway).				
Lhtako Dene Nation	Hargreaves to Darfield	Fraser-Fort George/Thompson-Nicola Region	TERA-facilitated TLU study work plan development underway.				
Canim Lake Band	Hargreaves to Darfield	Fraser-Fort George/Thompson-Nicola Region	May 1, 2013	October 9, 2013	October 9, 2013	October 10, 2013	November 5, 2013
Whispering Pines (Clinton Indian Band)	Hargreaves to Darfield	Fraser-Fort George/Thompson-Nicola Region	July 16, 2013	Interest in conducting additional phases of a TLU study for the Project will be determined by Whispering Pines First Nation (Clinton Indian Band).			
Métis Nation British Columbia	Hargreaves to Darfield Black Pines to Hope Hope to Burnaby Burnaby to Westridge	Metro Vancouver Region	Independent, third-party engagement report (underway).				

TABLE 5.2-1 Cont'd

Community	Proposed Pipeline Segment(s)	Socio-Economic Study Region(s)	Map Review	Interviews	Overflight	Ground Reconnaissance	Results Review/ Mitigation Meetings
Tk'emlúps te Secwépemc	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Interest in a TLU study to be determined by Tk'emlúps te Secwépemc.				
Skeetchestn Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Interest in a TLU study to be determined by Skeetchestn Indian Band.				
Penticton Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Interest in a TLU study to be determined by Penticton Indian Band.				
Upper Nicola Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Interest in a TLU study to be determined by Upper Nicola Indian Band.				
Lower Similkameen Indian Band	Black Pines to Hope	Fraser Valley Region	Interest in a TLU study to be determined by Lower Similkameen Indian Band.				
Upper Similkameen Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Interest in a TLU study to be determined by Upper Similkameen Indian Band.				
Lower Nicola Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Independent, third-party TLU study (underway). Interim summary of findings received on November 26, 2013.				
Coldwater Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Interest in a TLU study to be determined by Coldwater Indian Band.				
Shackan Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Joint third-party TLU study with Nicomen Indian Band and Nooaitch Indian Band led by Nicola Tribal Association (underway).				
Nicomen Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Joint third-party TLU study with Shackan Indian Band and Nooaitch Indian Band led by Nicola Tribal Association (underway).				
Nooaitch Indian Band	Black Pines to Hope	Fraser-Fort George/Thompson-Nicola Region	Joint third-party TLU study with Nicomen Indian Band and Shackan Indian Band led by Nicola Tribal Association (underway).				
Yale First Nation	Black Pines to Hope	Fraser Valley Region	Independent, third-party TLU study (underway).				
Union Bar First Nations	Hope to Burnaby	Fraser Valley Region	Interest in a TLU study to be determined by Union Bar First Nations.				
Chawathil First Nation	Hope to Burnaby	Fraser Valley Region	Independent, third-party TLU study.				
Shxw'ōwhámel First Nation	Hope to Burnaby	Fraser Valley Region	May 28, 2013	Independent, third-party TLU study.			
Cheam First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party Integrated Cultural Assessment (ICA) with Sumas First Nation, Aitchelitz First Nation, Kwaw Kwaw Apilt First Nation, Shxwha:y Village, Skowkale First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Yakweakwioose First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Sumas First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Cheam First Nation, Aitchelitz First Nation, Kwaw Kwaw Apilt First Nation, Shxwha:y Village, Skowkale First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Yakweakwioose First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Peters Band	Hope to Burnaby Burnaby to Westridge	Fraser Valley Region	Interest in a TLU study to be determined by Peters Band.				

TABLE 5.2-1 Cont'd

Community	Proposed Pipeline Segment(s)	Socio-Economic Study Region(s)	Map Review	Interviews	Overflight	Ground Reconnaissance	Results Review/ Mitigation Meetings
Seabird Island Band	Hope to Burnaby	Fraser Valley Region	Interest in a TLU study to be determined by Seabird Island Band.				
Popkum First Nation	Hope to Burnaby	Fraser Valley Region	April 24, 2013	April 24, 2013	N/A	November 13 to 14, 2013	To be determined
Scowlitz First Nation	Hope to Burnaby	Fraser Valley Region	May 16, 2013	To be determined			
Skowkale First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Aitchelitz First Nation, Kwaw Kwaw Apilt First Nation, Shxwha:y Village, Cheam First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Yakweakwioose First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Yakweakwioose First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Aitchelitz First Nation, Kwaw Kwaw Apilt First Nation, Shxwha:y Village, Cheam First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Aitchelitz First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Kwaw Kwaw Apilt First Nation, Shxwha:y Village, Cheam First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Skwah First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Kwaw Kwaw Apilt First Nation, Shxwha:y Village, Cheam First Nation, Aitchelitz First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Kwaw-kwaw-apilt First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Skwah First Nation, Shxwha:y Village, Cheam First Nation, Aitchelitz First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Soowahlie First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Skwah First Nation, Shxwha:y Village, Cheam First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Squiala First Nation, Tzeachten First Nation and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited (underway).				
Shxwha:y Village	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Skwah First Nation, Soowahlie First Nation, Cheam First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Squiala First Nation, Tzeachten First Nation and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Tzeachten First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Skwah First Nation, Soowahlie First Nation, Cheam First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Squiala First Nation, Shxwha:y Village and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Squiala First Nation	Hope to Burnaby	Fraser Valley Region	Joint third-party ICA with Sumas First Nation, Yakweakwioose First Nation, Skwah First Nation, Soowahlie First Nation, Cheam First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Tzeachten First Nation, Shxwha:y Village and Skowkale First Nation led by Ts'elxweyeqw Tribe Management Limited. Draft indicator report received on November 15, 2013.				
Leq'á:melFirst Nation	Hope to Burnaby	Fraser Valley Region	April 23, 2013	April 23, 2013	September 11, 2013	September 11 to 13, 2013	November 8, 2013
Semiahmoo First Nation	Burnaby to Westridge	Metro Vancouver Region	Independent, third-party TLU/TMRU study (underway).				
Matsqui First Nation	Hope to Burnaby	Fraser Valley Region	Interest in a TLU study to be determined by Matsqui First Nation.				
Kwantlen First Nation	Hope to Burnaby	Fraser Valley Region	Interest in a TLU study to be determined by Kwantlen First Nation.				
Katzie First Nation	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Katzie First Nation.				
Kwikwetlem First Nation	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Kwikwetlem First Nation.				
Qayqayt First Nation	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Qayqayt First Nation.				
Squamish Nation	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Squamish Nation.				

TABLE 5.2-1 Cont'd

Community	Proposed Pipeline Segment(s)	Socio-Economic Study Region(s)	Map Review	Interviews	Overflight	Ground Reconnaissance	Results Review/ Mitigation Meetings
Tsleil-Waututh Nation	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Tsleil-Waututh Nation.				
Musqueam Indian Band	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Musqueam Indian Band.				
Tsawwassen First Nation	Burnaby to Westridge	Metro Vancouver Region	Interest in a TLU study to be determined by Tsawwassen First Nation.				

Trans Mountain provided funding to assist Aboriginal communities that elected to conduct their own community directed TLU studies. These communities often engaged other consultants to provide technical support and assistance with their TLU studies for the Project (Table 5.2-1).

The TERA-facilitated TLU studies were conducted in a phased approach consisting of map reviews/interviews, field reconnaissance and follow-up reporting (Table 5.2-1). Interpreters were made available at the request of the community. Each phase of a TERA-facilitated TLU study is described in further detail in the Traditional Land and Resource Use Technical Report of Volume 5D.

A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B and Appendix A of Volume 3B.

The progress of each participating community's TLU study at the time of application filing is described in Table 5.2-1. Ongoing TLU study work is scheduled to occur with participating Aboriginal communities for the Project prior to construction. Information gathered during ongoing TLU studies will be incorporated into Project planning, including the Environmental Protection Plans (EPPs) (Volume 6B to 6D) and the Environmental Alignment Sheets (Volume 6E), as appropriate. The results of these ongoing engagement efforts will be provided to the NEB. Further details regarding supplemental studies are provided in Section 9.0 of Volume 5B.

5.2.1 Existing Conditions

Existing (baseline) conditions represent the current use of lands and resources by Aboriginal peoples for traditional purposes prior to construction of the Project and provide a reference point against which future conditions are compared to assess Project-specific and cumulative effects. Existing conditions of traditional land and resource use encountered by the Project were determined through a review of publicly available harvest data, ATK and TLU reports, the results of engagement with Aboriginal community representatives, the collection of TEK during biophysical field study participation and TLU studies conducted with potentially affected Aboriginal communities.

The potential Project-related effects and mitigation pertaining to traditional land and resource use and on TLU sites arising from construction and operation of the Project are discussed in Section 7.2.2. Refer to the Traditional Land and Resource Use Technical Report of Volume 5D for additional details on the existing conditions of traditional land and resource use.

Literature/Desktop Review

The results of the literature/desktop review provided below represent the publicly available regional and local traditional land and resource use information for Aboriginal communities most likely to be affected by the Project (as identified in Section 5.2). This information is presented by Aboriginal communities from east to west in relation to the Project. The geographic relationship of the potentially affected Aboriginal communities is described in Table 5.2-1. Corresponding socio-economic study regions are also listed in Table 5.2-1. Where available approximate distances and directions of specific geographic areas from the proposed pipeline corridor were determined by TERA based on the information provided in publicly available reference material.

The results of this literature/desktop review were verified and augmented through field data collection and TLU studies by potentially affected communities.

Detailed community profile and socio-economic study region information is provided in the Socio-Economic Technical Report (Volume 5D). Further details regarding existing (baseline) conditions can be found in the Traditional Land and Resource Use Technical Report of Volume 5D.

Traditional Land Use Studies

Engagement with potentially affected Aboriginal communities is ongoing. Trans Mountain continues to engage potentially affected Aboriginal communities and will continue to facilitate TLU studies with interested communities (Table 5.2-1). The results of these ongoing engagement efforts will be provided to the NEB. The results to date of TLU studies for the Project, as well as the preliminary interests identified

by participating Aboriginal communities that may be affected by the Project, are provided in the subsections below.

5.2.2 Edmonton to Hinton Segment

The Edmonton to Hinton Segment crosses the traditional territories of 15 Aboriginal communities that have been identified as having an interest in the Project or having interests potentially affected by the Project (see Table 5.2-1).

Desktop traditional land and resource use information relative to the TLRU RSA was available for 8 of the 15 communities during the compilation of this ESA and is included in the subsections below.

The results of TLU studies conducted to date have identified TLU sites potentially affected by the proposed Edmonton to Hinton Segment and associated Project components requiring mitigation (see Table 5.2-2).

TABLE 5.2-2

TRADITIONAL LAND USE SITES IDENTIFIED BY PARTICIPATING ABORIGINAL COMMUNITIES FOR THE PROPOSED EDMONTON TO HINTON SEGMENT

Approximate Distance and Direction from Project	Site Description
Enoch Cree Nation	
At RK 91	Enoch Cree Nation Gravesite 1
40 m south of RK 133.6	Sacred site
At RK 135	Youth gatherings at Pembina River
At RK 271	Berry picking site at Medicine Lodge
Alexander First Nation	
50 m north of RK 129.2	Sweat lodge and ceremonial site
At RK 135	South of Evansburg – hunting site for moose and rabbit
At RK 135.6	Travelway on Pembina River
At RK 135.6	Pembina River crossing – locale for net or rod fishing
13 m north of RK 135.6	Pembina River - trapping
At RK 160	South of Chip Lake – fungus gathering
At RK 175	Elders and community members hunt moose and grouse
70 m south of RK 178.6	Foundation of log cabin
24 m north of RK 205.4	Well-used elk trail about 50 m long, 2 m wide as well as habitat (elk antler rub on nearby trees) – elk hunting in general region
10 m south of RK 205.8	Blue diamond willow
10 m north of RK 221.8	Hunting along nearby Wolf Creek
47 m north of RK 223.6	Berry picking site
8 m south of RK 223.7	Blue diamond willow tree
At RK 223.8	Quad trail
42 m southeast of RK 320.6	Prayer tree with coloured fabric tied to it
Samson Cree Nation	
Crossed at RK 33.5	Fishing along North Saskatchewan River
From RK 76.8 to RK 86.8	Wagon trail from Hobbema to Lac Ste. Anne
At RK 100.8	Quad trail
30 m southeast of RK 118.5	Plant gathering site
At RK 118.7	Plant gathering site
At RK 118.8	Plant gathering site
22 m south of RK 118.8	Sacred tree ribbon site
At RK 132.9	Plant gathering site
40 m south of RK 133.6	Sacred site
At RK 135.6	Fishing along Pembina River
At RK 135.6	Pembina River - travelway
Crosses at RK 135.6	Medicinal plant gathering along Pembina River
At RK 135.9	Plant gathering site

TABLE 5.2-2 Cont'd

Approximate Distance and Direction from Project	Site Description
At RK 141.3	Plant gathering site
At RK 141. 7	Plant gathering site
2 m south of RK 141.7	Potential burial site
At RK 141.9	Plant gathering site
At RK 142.4	Plant gathering site
At RK 151.4	Ceremonial sundance site
50 m south of RK 151.5	Sacred site with birch tress
At RK 154.7	Camp site
5 m north of RK 174.1	Plant gathering site
At RK 174.2	Sacred King tree
At RK 175.9	Plant gathering site
At RK 176	Plant gathering site
10 m south of RK 176.1	Plant gathering site
1 m south of RK 176.2	Plant gathering site
20 m south of RK 179.1	Plant gathering site
At RK 220.4	Plant gathering site
At RK 224.3	Fishing along McLeod River
At RK 243. 8	Plant gathering site
At RK 244	Plant gathering site
At RK 244.2	Plant gathering site
42 m southeast of RK 320.6	Prayer tree with coloured fabric tied to it
30 m southeast of RK 325 to RK 416	Hunting region
At RK 332.4	Gravesites/fasting/vision quests on Willmore trail
At RK 332.4	Willmore trail from Jasper to Grand Cache
Crosses at RK 333.5	Plant gathering North Saskatchewan River
At RK 334	Horse riding trail
12 m southeast of RK 336.4	Game trail
13 m northwest of RK 338.8	Possible grave site
At RK 339	Old trading trail that is now Highway 16
O'Chiese First Nation	
At RK 27.9	Trail from Rocky Mountain House to Edmonton
At RK 120.2	Trail from Rimbey to Whitecourt
At RK 172	Trail from O'Chiese IR 203 to Nojack to Mayerthorpe
At RK 173	Trail from O'Chiese IR 203 to Whitecourt
At RK 307	Plant species of importance identified
At RK 320	Two plant species of importance identified
At RK 322.6	Trail from O'Chiese IR 203 to Hinton
At RK 322.6	Campsite and cabin near Hinton
Ermineskin Cree Nation	
Crosses at RK 22.8	Trail near Highway 2
Crosses at RK 33.5	Travelway on North Saskatchewan River
Crosses RK 135.6	Travelway on Pembina River
Crosses at RK 135.6	Medicinal plant gathering along Pembina River
Alexis Nakota Sioux Nation	
65 m south of RK 118.8	Campsite and potential sweat lodge
Crosses at RK 220.3	Wolf Creek - fishing
Crosses at RK 224	Trails near McLeod River
At RK 224.1	Game trail from McLeod River to Whitecourt
Crosses at RK 224.3	Wood and mint gathering near McLeod River
At RK 333.4	Horse riding trail and quad trails
At RK 334	Ceremonial site, prayer flags tied to poplar trees bordering existing right-of-way
Paul First Nation	
Crosses at RK 135	Plant harvesting site along Pembina River
20 m north of RK 171	Important medicinal plant harvesting area
From RK 196.6 to RK 206.6	Medicinal plant harvesting site near Peers south of McLeod Valley

TABLE 5.2-2 Cont'd

Approximate Distance and Direction from Project	Site Description
From RK 238.4 to 248.8	Hunting site
20 m north of RK 287.7	Sacred spring
At RK 319.7	Hunting south of Hinton (north of Luscar)
Nakcowinewak Nation Of Canada	
Crossed at RK 173.5	Range Road 114 was once a wagon trail
At RK 257.5	Grave site
At RK 305	Medicinal plant gathering
35 m north of RK 320	Plant gathering site along hydro line
42 m southeast of RK 320.6	Prayer tree with coloured fabric tied to it
At RK 322.8	Trapper's stand
At RK 322.8	Hunting with game trails
At RK 334	Ceremonial site, prayer flags tied to poplar trees bordering existing right-of-way
At RK 339	Highway 16 was once a wagon trail
At RK 339	Camping on both sides of Highway 16
At RK 339	Both sides of Highway 16 used to gather medicinal plants
At RK 339	Ceremonial site where moose hides were prepared and on both sides of Highway 16
Aseniwuche Winewak Nation	
At RK 286.2	Medicinal plant gathering Obed Lake
At RK 321	Hunting in Hinton area
At RK 321	Medicinal and plant gathering near Hinton
At RK 326	Medicinal plant gathering near Hinton
At RK 332	Medicinal plant gathering
At RK 494.5	Plant gathering near the Hargreaves Trap Site
At RK 496.8	Fishing on Fraser River
At RK 499	Medicinal plant gathering near the Rearguard Station
At RK 500	Plant gathering near the Rearguard Pump Station
At RK 505.7	Plant gathering near the Rearguard Pump Station

Further details regarding the results of TLU studies and the preliminary interests received to date can be found in the Traditional Land and Resource Use Technical Report of Volume 5D. A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B.

5.2.2.1 Saddle Lake Cree Nation

Trans Mountain has shared Project information and invited Saddle Lake Cree Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Saddle Lake Cree Nation and to support Saddle Lake Cree Nation participation in Project activities. Interest in a TLU study will be determined by Saddle Lake Cree Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Saddle Lake Cree Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.2.2 Enoch Cree Nation

Enoch Cree Nation elected to conduct a TERA-facilitated TLU study for the Project. The TLU study included a map review, community and Elder interviews, overflight and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Enoch Cree Nation crossed by the proposed pipeline corridor. Enoch Cree Nation also provided their 'Phase One Preliminary Interests of the Project' to Trans Mountain on May 15, 2013.

The map review, interviews and ground reconnaissance revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-2).

Background Data

Extensive historic trail networks exist along the North Saskatchewan River, crossed by the proposed pipeline corridor at RK 33.5 and along the Battle and Red Deer rivers (Northern Gateway Pipelines Ltd. Partnership [NGPLP] 2010). Traditional gathering places are located along the west side of the North Saskatchewan River as well as at the confluence of the Sturgeon and North Saskatchewan rivers, located approximately 28 km northeast of RK 0. Trout are fished throughout the Enoch Cree Nation asserted traditional territory, while large whitefish are harvested at Pigeon Lake, located approximately 47 km southwest of RK 29.6.

Berries and plants harvested by Enoch Cree Nation community members include wild onion, dandelion leaves, rose hips, blueberries, high-bush and low-bush cranberries, chokecherries, pin cherries, Saskatoon berries, raspberries, currants, strawberries, wild gooseberries, bear berries and beaked hazelnuts (NGPLP 2010). Harvesting certain types of fungus for ceremonial and medicinal purposes is an important cultural practice, accompanied with the practice of making an offering. Important areas for harvesting are located in undisturbed lands near the towns of Hinton and Grande Cache. Hinton and Grande Cache are located approximately 2.1 km northwest of RK 319.5 and 105 km northwest of RK 339, respectively. Several species of traditionally important plants that are now considered rare or extinct throughout the Enoch Cree Nation asserted traditional territory include wild rhubarb, Seneca root and wild onion. Strawberries, raspberries and currants are also in decline, a trend community members attribute to increased farming in the region (NGPLP 2010).

Moose, elk, deer, rabbit and duck are currently hunted (NGPLP 2010). Traditionally, rabbit, duck, gopher, muskrat and porcupine were dietary staples. Hunters continue to distribute meat throughout the community. Important hunting areas include: Tomahawk, located approximately 20 km south of RK 119; Peers, located approximately 5 km north of RK 198.1; lands near Edson, located approximately 1.8 km south of RK 232.2; and lands near Hinton, located approximately 2.1 km northwest of RK 319.5. Hunting locations depend on the target species and time of year. Animals that were traditionally hunted are not considered to be of the same quality or abundance as was found in the past. Deer affected by chronic wasting disease and moose infested with ticks are often perceived to be connected to air pollutants, toxic waste management and the oil and gas industry (NGPLP 2010).

Trapping was once a common traditional activity, which occurs less frequently today (NGPLP 2010). An old trapline remains at Riviere Qui Barre, located approximately 29 km north of RK 54. Muskrat tails are considered a delicacy, however, muskrat and porcupine are rarely eaten now and gophers are thought to be contaminated with pesticides (NGPLP 2010).

5.2.2.3 Alexander First Nation

Alexander First Nation elected to conduct a TERA-facilitated TLU study for the Project. TERA assisted during the map review, community and Elder interviews, overflight and ground reconnaissance phases of the community led TLU study that focused on Crown lands within the asserted traditional territory of Alexander First Nation crossed by the proposed pipeline corridor.

The map review, interviews and ground reconnaissance revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-2).

Background Data

Extensive historic trail networks exist between Alexander First Nation reserves and Lac La Nonne located approximately 39.5 km north of RK 85.5 and Fort Assiniboine located approximately 83.8 km north of RK 118.5 (NGPLP 2010).

Known settlements include Egg Lake (Manawan Lake) and a campsite at Riviere Qui Barre, located approximately 42.7 km north of RK 50 and 29 km north of RK 54, respectively. An historic settlement and burials at Deadman Lake near Edmonton are located approximately 33 km north of RK 66. Plant gathering occurs at Egg Lake; at Alexander IR 134; and at Blue Ridge, located approximately 59 km north of RK 159. Harvest from these areas includes low-bush cranberries, Saskatoon berries, strawberries, chokecherries, pin cherries, gooseberries, blueberries, high-bush cranberries, wild onion and beaked hazelnuts. Raspberries and Saskatoon berries have been dwindling due to forest fires and conditions that

are too wet or dry. There are concerns about effects of development on spiritually important and medicinal plants and potential contamination of traditional foods, medicine and agricultural food crops resulting from pesticide and herbicide use (NGPLP 2010).

Hunting areas are located at Deadman Lake, located approximately 33 km north of RK 66, where moose, deer, elk, wolves, lynx, muskrats, beaver, mink, ducks, spruce grouse and pheasant, geese, black ducks and bald eagles can be found (NGPLP 2010).

Fishing areas are located at: Riviere Qui Barre, located approximately 29 km north of RK 54; the Sturgeon River, located approximately 15.7 km north of RK 87; Lac Ste. Anne, located approximately 13.3 km north of RK 95; the Smoky River, the southern end of which is located approximately 51.5 km north of RK 490.5; and the Athabasca River, located approximately 1 km northeast of the proposed pipeline corridor at RK 309 (Alexander First Nation 2013). Whitefish and pickerel are fished for in Wabamun Lake, located approximately 1 km south from RK 96 to RK 117 and Lac Ste. Anne, located approximately 11.5 km north of RK 95 (NGPLP 2010).

5.2.2.4 Samson Cree Nation

Samson Cree Nation elected to conduct a TERA-facilitated TLU study for the Project. The TLU study included a map review, community and Elder interviews, overflight and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Samson Cree Nation crossed by the proposed pipeline corridor. Samson Cree Nation also provided their 'Preliminary Aboriginal & Socio-Economic Interests' to Trans Mountain on May 31, 2013.

The map review, interviews and ground reconnaissance revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-2).

Background Data

Samson Cree Nation members continue the practice of trading medicines with neighbouring communities (Neufeld 2012). Medicinal plants may include Labrador tea, muskeg leaves, juniper, mint, sweet grass and bark. Sweet grass is frequently used in ceremonies. Berry plants are also harvested and include blueberries, high-bush cranberries, moose berries, raspberries, Saskatoon berries, gooseberries and chokecherries. Wildlife harvested includes moose, elk, deer, beaver, muskrat, bush chickens or grouse and rabbit. Geese, ducks and prairie chickens are also hunted. Whitefish, perch, pickerel, pike and walleye are fished from lakes and rivers throughout the Samson Cree Nation asserted traditional territory. Sweat lodge ceremonies and fasting activities are held at Lac Ste. Anne, located approximately 11.5 km north of RK 95. Members also travel to Lac Ste. Anne in July for an annual pilgrimage and sundance ceremony. Sacred areas also exist along lands from St. Albert to Morinville, located approximately 15 km north of RK 42 to 32 km north of RK 41.

5.2.2.5 Métis Nation of Alberta (Region 4)

Trans Mountain and Métis Nation of Alberta (Region 4) have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Métis Nation of Alberta (Region 4) is currently conducting an independent, community led engagement report for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Métis Nation of Alberta (Region 4) will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.2.6 O'Chiese First Nation

O'Chiese First Nation elected to conduct a third-party TLU study for the Project. A third-party consultant, Calliou Group, conducted community interviews and completed two field visits that focused on Crown lands within the asserted traditional territory of O'Chiese First Nation. Representatives from TERA were also in attendance for portions of the field visits.

The map review, interviews and ground reconnaissance revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-2).

Background Data

An O'Chiese First Nation winter campsite and hunting and trapping areas are located near Baptiste River, approximately 105 km south of RK 139.5 (Lifeways of Canada Ltd. [Lifeways] 2012). In 1997, O'Chiese members raised concerns publicly that development projects would interfere with several burial sites and ceremonial sites in the Grave Flats region, south of Hinton and located approximately 73 km south of RK 262.5 (MacKinnon 1997).

5.2.2.7 Ermineskin Cree Nation

Ermineskin Cree Nation elected to conduct a TERA-facilitated TLU study for the Project. The TLU study included a map review, community and Elder interviews, overflight and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Ermineskin Cree Nation crossed by the proposed pipeline corridor. Ermineskin Cree Nation also provided their 'Summary to the proposed approach to the environmental and socio-economic assessment for the Trans Mountain pipeline ULC Trans Mountain Expansion Project' to Trans Mountain in June 2013.

The map review, interviews and ground reconnaissance revealed TLU sites requiring mitigation (see Table 5.2-2).

5.2.2.8 Montana First Nation

Montana First Nation elected to conduct a TERA-facilitated TLU study for the Project. The TLU study included a map review meeting and community interviews that focused on Crown lands within the asserted traditional territory of Montana First Nation crossed by the proposed pipeline corridor.

The map review and interviews did not reveal any TLU sites requiring mitigation.

Background Data

Montana First Nation hunts elk and big horn sheep, and fishes rainbow trout and mountain trout west of Montana IR 139, which encompasses lands and waters from Rocky Mountain House to Jasper National Park (MacPherson and Tyerman 2011), and spans an area south of the proposed pipeline corridor from RK 131 to RK 269.

5.2.2.9 Louis Bull Tribe

Trans Mountain has shared Project information and invited Louis Bull Tribe to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Louis Bull Tribe and to support Louis Bull Tribe participation in Project activities. Interest in a TLU study will be determined by Louis Bull Tribe.

Issues of concern, traditional use sites or features identified through ongoing engagement with Louis Bull Tribe will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.2.10 Alexis Nakota Sioux Nation

Alexis Nakota Sioux Nation elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review, community and Elder interviews, overflight and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Alexis Nakota Sioux Nation crossed by the proposed pipeline corridor.

The map review, interviews and ground reconnaissance revealed TLU sites requiring mitigation (see Table 5.2-2).

Background Data

Berries and plants harvested by Alexis Nakota Sioux Nation community members include alder, aspen, blueberries, dock, raspberries, rat root, red willow and sage (wort). Plants harvested close to Lac Ste. Anne, located approximately 11.5 km north of RK 95, include blueberries, raspberries, strawberries, Saskatoon berries, chokecherries, cranberries, mushrooms, wild rice and hazelnuts (Alexis Nakota Sioux Nation 2013).

Animals traditionally hunted by Alexis Nakota Sioux Nation include buffalo, grizzly bear, black bear, moose, elk, deer, beaver, rabbit, wolverine, fox, duck, geese, fish, squirrel, caribou, wolf, mink, fisher, lynx, eagle, common loon, bighorn sheep and coyote. Lac Ste. Anne, located approximately 11.5 km north of RK 95, is a hunting, trapping and fishing area. Moose, elk and deer were hunted and muskrat, rabbit and beaver were trapped (Alexis Nakota Sioux Nation 2013). A registered trapline is located between Lodgepole and Cynthia located approximately 54 km south of RK 155.5 (In Land and Life 2013). Lac Ste. Anne, traditionally known as Wakamne, is the site of an annual pilgrimage and spiritual gathering (Alexis Nakota Sioux Nation 2007).

5.2.2.11 Foothills Ojibway Society

Trans Mountain and Foothills Ojibway Society have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Foothills Ojibway Society declined participation in a TLU study electing instead to share their preliminary interests in the Project with Trans Mountain. Foothills Ojibway Society provided their 'Preliminary letter of interests' to Trans Mountain on June 5, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Foothills Ojibway Society will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.2.12 Paul First Nation

Paul First Nation elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review meeting and community interviews that focused on Crown lands within the asserted traditional territory of Paul First Nation crossed by the proposed pipeline corridor. Paul First Nation also provided their 'Preliminary Aboriginal Interests with Respect to the Trans Mountain Expansion Project' to Trans Mountain on May 28, 2013.

The map review, interviews and ground reconnaissance revealed TLU sites requiring mitigation (see Table 5.2-2).

Background Data

Numerous trails and travel routes connect Paul First Nation's asserted traditional territory with other First Nation communities. A former Paul First Nation trapline and cabin was located near Chickadee Creek, approximately 64 km north of RK 199.5 (NGPLP 2010). The Pembina River, crossed by the proposed pipeline corridor at RK 135.0, and McLeod River, crossed by the proposed pipeline corridor at RK 223.9, are fishing sites for northern pike and fresh water whitefish. Traditional fishing sites include: Lac Ste. Anne, approximately 11.5 km north of RK 95; Buck Lake, located approximately 55 km southwest of RK 27.6; and Wabamun Lake, located approximately 1 km south from RK 96 to RK 117 (NGPLP 2010). Burial sites are located at Blue Ridge, located approximately 59 km north of RK 159, and at Chip Lake, located approximately 2 km north of RK 164.3 (NGPLP 2010). Meat staples include moose, deer, elk, buffalo, partridge and rabbit. Bear and wolf are used for ceremonial purposes. Traditional medicinal plants include blueberries, Saskatoon berries, raspberries, strawberries, willow, spruce and birch (NGPLP 2010, Lifeways 2012).

Paul First Nation community members no longer feel it is safe to drink local waters due to declining water quality and fear consuming traditional foods harvested locally because of potential contamination from development. Issues identified include removal of sacred medicines and forests, effects on the balance of nature and effect on the land. Concerns regarding spills are exacerbated by Paul First Nation members'

experience with the Canadian National Railway Company (CN) spill at Wabamun Lake. Paul First Nation considers Wabamun Lake to be polluted from this spill and fish populations have declined. Community well-being and health are understood by community members to be declining. Wabamun Lake no longer freezes over in winter and ducks no longer migrate south. The community views itself as being responsible for safeguarding the environment and using sustainable practices (NGPLP 2010, Lifeways 2012).

5.2.2.13 Nakcowinewak Nation of Canada

Nakcowinewak Nation of Canada elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review meeting and community interviews that focused on Crown lands within the asserted traditional territory of Nakcowinewak Nation of Canada crossed by the proposed pipeline corridor. Nakcowinewak Nation of Canada also provided their 'Nakcowinewak Aboriginal Interests: Aboriginal Engagement Trans Mountain Expansion Project' to Trans Mountain on June 3, 2013.

The map review, interviews and ground reconnaissance revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-2).

Background Data

Traditional plant gathering sites identified by Nakcowinewak Nation of Canada include: the Hinton area, located approximately 2.4 km southeast of RK 318; the Athabasca River Valley, located approximately 14.6 km southwest of RK 339.4; Devona Flats, located approximately 22.5 km southwest of RK 339.4; the Miette River, located approximately 59.5 km southwest of RK 339.4; and near Robson Ranch, located approximately 2.9 km south of RK 490 (TERA 2005). Traditional fishing sites include the Miette River, located approximately 52.9 km southwest of RK 339.4, and the Fraser River located approximately 93 km southwest of RK 339.4 (TERA 2005b). Sacred sites include a site near Robson Ranch, approximately 2.9 km south of RK 490, and the Moberly Flats, located approximately 35.9 km southwest of RK 339.4 (TERA 2005). Traditional habitation sites are located at Benchlands between Devona and Jasper, approximately 22.5 km southwest of RK 339.4, and at Snaring Warden Station, located approximately 34.4 km southwest of RK 339.4 (TERA 2005).

5.2.2.14 Sunchild First Nation

Trans Mountain and Sunchild First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Sunchild First Nation elected to conduct an independent, community led TLU study for the Project. Sunchild First Nation also provided their preliminary 'Sunchild First Nation Interests on the Trans Mountain Pipeline Expansion Project' to Trans Mountain on November 28, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Sunchild First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.2.15 Aseniwuche Winewak Nation

Aseniwuche Winewak Nation elected to conduct a third-party TLU study for the Project. A third-party consultant, Aseniwuche Environmental Corporation, conducted a map review, community interviews and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Aseniwuche Winewak Nation. Representatives from TERA were also in attendance during the ground reconnaissance.

The map review, interviews and ground reconnaissance did not reveal any TLU sites within the proposed pipeline corridor requiring mitigation.

Background Data

The Pinto Creek region, located approximately 44 km northwest of RK 320, contains an important Aseniwuche Winewak Nation trail, the Pinto Creek Cabin and a burial site (NGPLP 2010). Plants that are commonly harvested and consumed by community members include poplar tree cambium, wild onion,

Labrador tea, mint, high-bush and low-bush cranberries, blueberries, huckleberries, Saskatoon berries, northern gooseberries, wild red currant, loganberries, common and alpine bearberries, wild raspberries and soapberries (NGPLP 2010). Important animals harvested include black bear, moose, elk, white-tail deer, mule deer, grouse, beaver, muskrat, rabbit, porcupine and mountain sheep.

Traditional plant gathering sites identified by Aseniwuche Winewak Nation include: Devona Flats to Moberly Flats, located approximately 22.5 km southwest of RK 339.4; Miette River Valley, located approximately 52.9 km southwest of RK 339.4; Yellowhead Lake, located approximately 70.3 km southwest of RK 339.4; and near Decoigne Road, located approximately 60.8 km southwest of RK 339.4 (TERA 2005). Traditional hunting sites include: east of Pocahontas, located approximately 14.6 km southwest of RK 339.4; Devona Flats to Moberly Flats, located approximately 22.5 km southwest of RK 339.4; east of Windy Point, located approximately 31.8 km southwest of RK 339.4; Overlander Lodge, located approximately 36.5 km southwest of RK 339.4; Miette River Wetlands, located approximately 52.9 km southwest of RK 339.4; and Oxbow portions along the Fraser River, located approximately 93 km southwest of RK 339.4 (TERA 2005). Traditional fishing sites include: the Miette River, located approximately 52.9 km southwest of RK 339; Yellowhead Lake, located approximately 70.3 km southwest of RK 339.4; and the Fraser River, located approximately 93 km southwest of RK 339.4 (TERA 2005).

A traditional gathering site is located at the Miette Hot Springs, approximately 16.3 km south of RK 339.4 (TERA 2005). A sacred site is located near Decoigne Road, approximately 60.8 km southwest of RK 339.4 (TERA 2005). Traditional habitation sites include: Vine Creek, located approximately 31.9 km southwest of RK 339.4; east of Windy Point, approximately 31.8 km southwest of RK 339; Moberly Flats, located approximately 35.9 km southwest of RK 339.4; Snaring Warden Station, located approximately 34.4 km southwest of RK 339.4; Palisades Centre, located approximately 41 km southwest of RK 339.4; near Decoigne Road, approximately 60.8 km southwest of RK 339.4; and Yellowhead Lake, located approximately 70.3 km southwest of RK 339.4 (TERA 2005). A traditional trail is located in Grande Cache via Sheep Creek Valley and is approximately 113 km northwest of RK 339 (TERA 2005).

5.2.3 Hargreaves to Darfield Segment

The Hargreaves to Darfield Segment crosses the traditional territories of six Aboriginal communities that have been identified as having an interest in the Project or having interests potentially affected by the Project (see Table 5.2-1).

Desktop traditional land and resource use information relative to the TLRU RSA was available for four of the six communities during the compilation of this ESA and is included in the subsections below.

The results of TLU studies conducted to date have identified TLU sites potentially affected by the proposed Hargreaves to Darfield Segment and associated Project components requiring mitigation (see Table 5.2-3).

TABLE 5.2-3

TRADITIONAL LAND USE SITES IDENTIFIED BY PARTICIPATING ABORIGINAL COMMUNITIES FOR THE PROPOSED HARGREAVES TO DARFIELD SEGMENT

Approximate Distance and Direction from Project	Site Description
Camin Lake Band	
At RK 607.4	Hunting near Blue River
Crosses at RK 717.35	Fishing on Raft River
Crosses at RK 748.8	Trail from the Canim Lake IR 1 to Boulder on the North Thompson River
Whispering Pines First Nation (Clinton Indian Band)	
At RK 820	Berry picking site.

Further details regarding the results of TLU studies and the preliminary interests received to date can be found in the Traditional Land and Resource Use Technical Report of Volume 5D. A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B.

5.2.3.1 Lheidli T'enneh

Lheidli T'enneh elected to conduct a third-party TLU study for the Project. A third-party consultant, Chignecto Consulting Group conducted a map review, community interviews and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Lheidli T'enneh.

The findings of the TLU study have not been reviewed or approved by Lheidli T'enneh Chief and Council or community. The interim report is considered draft and any changes resulting from review with the Lheidli T'enneh community will be incorporated into the final report.

To date, the map review, interviews and ground reconnaissance did not reveal any TLU sites within the proposed pipeline corridor requiring mitigation.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Lheidli T'enneh will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Plant species traditionally harvested by Lheidli T'enneh include grasses, ferns, various berries and shrubs. Several tree species were also used, including alder, pine, fir and birch (Pacific Trails Pipeline Limited Partnership [PTP] 2007). Animals traditionally harvested include waterfowl, large carnivorous mammals, game birds, ungulates and small fur-bearing mammals. These wildlife species have been and are currently used for ceremonies, food and commercial purposes (PTP 2007).

Fishing is an important traditional activity for L'heidli T'enneh. Salmon is an important food source for L'heidli T'enneh, also having social and ceremonial value to the community (Lheidli T'enneh n.d.). Other common freshwater species are also caught, including whitefish, Dolly Varden and rainbow trout (PTP 2007).

5.2.3.2 Simpcw First Nation

Trans Mountain and Simpcw First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Simpcw First Nation elected to conduct an independent, community led TLU study for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Simpcw First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Winter home sites are located at Finn Creek, located approximately 0.5 km west of RK 641; at Birch Island, located approximately 0.8 km southwest of RK 711.2; at Chu Chua, located approximately 1.1 km east of RK 765; at the Barriere River, located approximately 7.5 km east of RK 766; at Louis Creek, located approximately 20 km south of RK 769; and at Tête Jaune, located approximately 3 km northwest of RK 506.8 (Simpcw First Nation 2013). Simpcw community members currently hunt in the mountains above the Fraser River (Simpcw First Nation 2013).

A traditional trail network connecting Snake River, Little Smokey, Goat River, Bowron Lakes and Williams Lake, is located at its nearest point approximately 21.8 km southwest of RK 339.4. Other traditional trails and travelways exist at Canoe River Crossing, located at RK 508.3, and the Fraser River, located approximately 1 km northwest of RK 493 (North Thompson Indian Band 1998). Traditional plant gathering sites include Jasper, located approximately 50.6 km southwest of RK 339.4, and Blue River, crossed by the proposed pipeline corridor at RK 613.8. Traditional hunting sites include: Moberly Flats, located approximately 35.9 km southwest of RK 339.4; along the waterways from Mount Robson to Yellowhead Pass, located approximately 17 km southwest of RK 490; Tête Jaune Cache, located approximately 3.7 km west of RK 505; Finn Creek, located approximately 809 km southwest of RK 641; North Thompson Valley, located approximately 1.6 km southwest of RK 655; Avola, located at RK 655.5; the

area around Battle Mountain, located approximately 34.1 km northwest of RK 687; and Clearwater River, crossed by the proposed pipeline corridor at RK 725.5 (North Thompson Indian Band 1998) .

Traditional trapping sites include Jasper (into the Red Pass), located approximately 50.6 km southwest of RK 339.4, along the waterways from Mount Robson to Yellowhead Pass, located approximately 17 km southwest of RK 490 and Finn Creek, located approximately 809 km southwest of RK 641. Traditional fishing sites include the Miette River, located approximately 52.9 km southwest of RK 339.4, Moose Lake, located approximately 85.8 km southwest of RK 339.4, Canoe River located at RK 508.3 along the proposed pipeline corridor, Finn Creek, located approximately 809 m southwest of RK 641 and Raft River crossed by the proposed pipeline corridor at RK 717.7 (North Thompson Indian Band 1998).

Traditional habitation sites include: Lac Ste. Anne, located approximately 12.9 km north of RK 95; Devona Flats to Jasper, located approximately 22.5 km southwest of RK 339.4; Yellowhead Lake, located approximately 70.3 km southwest of RK 339.4; Fraser River, located approximately 1 km northwest of RK 493; Tête Jaune Cache, located approximately 3.7 km west of RK 505; Swift Creek, crossed by the proposed pipeline corridor at RK 522.5; Canoe River, Avola, located at RK 655.5, Raft River Crossing, crossed by the proposed pipeline corridor at RK 717.7; and Chu Chua, located approximately 1.2 km east of RK 764.8. A traditional gathering site is located at Green Lake, approximately 69.6 km west of RK 755 (North Thompson Indian Band 1998, TERA 2005b).

5.2.3.3 Lhtako Dene Nation

Lhtako Dene Nation elected to conduct a TERA-led TLU study for the Project. The TLU study will include field reconnaissance of areas of interest, concern or importance identified during the community map review. Lhtako Dene Nation also provided their preliminary ‘Letter of Understanding in respect of the Trans Mountain Pipeline Expansion Project’ to Trans Mountain on August 29, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Lhtako Dene Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Community members traditionally harvest plants during the spring, with plant shoots, such as *Tsulchun*, picked and boiled as part of a nutritional supplement. They also harvest wild rhubarb, cow parsnip, wild celery and other edible bulbs and roots such as tiger lily, wild onion, wild parsnip and bulrush or cattail, and *kwadas* roots. The outer bark of large Jack pines is removed and the cambium scraped off and eaten. Pine bark is also used as medicine (Archaeo 2002). During the summer, Lhtako Dene Nation community members harvest various species of berries, including Saskatoon berries, huckleberries, soapberries, wild raspberries, high-bush and low-bush blueberries, chokecherries, red cranberries, wild strawberries, thimbleberries, gooseberries, hazelnuts and rosehips. Plant and berry harvesting sites are located along the west side of the Fraser River which is crossed by the proposed pipeline corridor at RK 499.7 and surrounding regions (Archaeo 2002).

Community members primarily hunt muskrat and beaver. Waterfowl are shot or snared, including ducks, mudhen, grouse, geese, mallard and crane. Big game such as moose, deer, elk, caribou and bears, are hunted, as well as small game such as rabbit and grouse (Archaeo 2002). Historically, the Lhtako Dene trapped fur-bearing animals such as squirrel, weasel, mink, marten, lynx, fisher, fox and coyote in order to collect and sell the animal’s pelts (Archaeo 2002). Lhtako Dene Nation community members also fish various species throughout the year such as char, suckers, Dolly Varden, ling, whitefish, kokanee and spring salmon. In the winter, Lhtako Dene Nation ice fish for whitefish, suckers, char, Dolly Varden and sturgeon. Elders reported that they continue to harvest resources according to the seasonal round (Archaeo 2002).

5.2.3.4 Canim Lake Band

Canim Lake Band elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review, community and Elder interviews, overflight and ground reconnaissance that focused on Crown lands within the asserted traditional territory of Canim Lake Band crossed by the proposed pipeline

corridor. Canim Lake Band also provided their 'Trans Mountain Expansion Project Consultation and Information Gathering: Report of Consultation between Canim Lake Band and Kinder Morgan Canada' to Trans Mountain on June 27, 2013.

The map review, interviews and ground reconnaissance revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-3).

Background Data

There are a number of lakes within Canim Lake Band's asserted traditional territory on which community members depend for food and various culturally important plants (Canim Lake Band 2005).

5.2.3.5 Whispering Pines First Nation/Clinton Indian Band

Whispering Pines First Nation elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review meeting that focused on Crown lands within the asserted traditional territory of Whispering Pines First Nation crossed by the proposed pipeline corridor. Interest in conducting additional phases of a TLU study for the Project will be determined by Whispering Pines First Nation. Trans Mountain will continue to share Project information with Whispering Pines First Nation and to support Whispering Pines First Nation in Project activities.

To date, the map review revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-3).

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Whispering Pines First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.3.6 Métis Nation British Columbia

Trans Mountain and Métis Nation British Columbia have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Métis Nation British Columbia is currently completing an independent third-party engagement report for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Métis Nation British Columbia will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.4 Black Pines to Hope Segment

The Black Pines to Hope Segment crosses the traditional territories of 13 Aboriginal communities that have been identified as having an interest in the Project or having interests potentially affected by the Project (see Table 5.2-1).

Desktop traditional land and resource use information relative to the TLRU RSA was available for 7 of the 13 communities during the compilation of this ESA and is included in the subsections below.

The results of TLU studies conducted to date have not identified TLU sites potentially affected by the proposed Black Pines to Hope Segment and associated Project components requiring mitigation.

5.2.4.1 Tk'emlúps Te Secwépemc

Trans Mountain has shared Project information and has invited Tk'emlúps te Secwépemc to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Tk'emlúps te Secwépemc and to support Tk'emlúps te Secwépemc participation in Project activities. Interest in a TLU study will be determined by Tk'emlúps te Secwépemc.

Issues of concern, traditional use sites or features identified through ongoing engagement with Tk'emlúps te Secwépemc will be considered for incorporation into Project planning including the EPPs and the

Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.4.2 Skeetchestn Indian Band

Trans Mountain has shared Project information and invited Skeetchestn Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Skeetchestn Indian Band and to support Skeetchestn Indian Band participation in Project activities. Interest in a TLU study will be determined by Skeetchestn Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Skeetchestn Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Skeetchestn Indian Band community members rely on the use of collected natural resources in their daily lives. Community members have conducted multiple ventures to restore natural settings to the region, including self-imposed conservation closures along the Deadman River, located approximately 45 km northwest of RK 833, riverbank restoration work and the construction of a fish hatchery in 1988 (First Nations Environmental Contaminants Program n.d.).

Habitation sites are located along both sides of Kamloops Lake which is located west of the proposed pipeline corridor at RK 846.7. Pit houses, indicating historic habitation, were discovered near Prichard, located approximately 40 km east of RK 839 (Wonders 2008). Plant gathering is a fundamental part of traditional culture among all Secwépemc nations and a large variety of plants are harvested throughout the year. Various berries, indigenous vegetables, teas and roots are used for food and traditional medicines. Hunting locations, both traditional and modern, span the asserted traditional territory of Skeetchestn Indian Band, stretching from south of Kamloops Lake to the southern shores of Bonaparte Lake, located approximately 36 km north of RK 812 (Skeetchestn Indian Band n.d.). Traditional and modern fishing locations are located throughout the asserted traditional territory and vary by season. Spring fishing is known to take place at Tunkwa Lake, located approximately 30 km west of RK 858.5 and Leighton Lake located approximately 30 km west of RK 857.5. Summer and fall fishing takes place along the Fraser and Thompson rivers.

Skeetchestn Indian Band has invested a substantial portion of time and resources into the restoration, protection and maintenance of fish habitat and populations within its asserted traditional territory. Fishing has been a strong tradition and major food source for Skeetchestn Indian Band; families used to seasonally relocate to camps near salmon-bearing rivers in order to fish and dry their catch, storing it in tree box caches (Wonders 2008). Salmon populations were greatly depleted in the early 1900s, prompting the Skeetchestn Indian Band to move forward with programs to restore populations. The community is concerned that any construction and possibility of future contaminant leaks, could cause insurmountable damage to the fish habitat and populations that the Skeetchestn Indian Band has worked to save. Self-imposed conservation regulations have been placed on community members as a means of further safeguarding this resource (Ignace n.d.).

5.2.4.3 Penticton Indian Band

Trans Mountain has shared Project information and invited Penticton Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Penticton Indian Band and to support Penticton Indian Band participation in Project activities. Interest in a TLU study will be determined by Penticton Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Penticton Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.4.4 Upper Nicola Indian Band

Trans Mountain has shared Project information and invited Upper Nicola Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Upper Nicola Indian Band and to support Upper Nicola Indian Band participation in Project activities. Interest in a TLU study will be determined by Upper Nicola Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Upper Nicola Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.4.5 Lower Similkameen Indian Band

Trans Mountain has shared Project information and invited Lower Similkameen Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Lower Similkameen Indian Band and to support Lower Similkameen Indian Band participation in Project activities. Interest in a TLU study will be determined by Lower Similkameen Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Lower Similkameen Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Historically, Syilx villages were located in the valley bottoms and beside lakes of the Fraser River Canyon. In early spring, community members fished for kokanee, trout and sturgeon and gathered in permanent villages near lakes. Today, village sites are located near Nicola Lake, located approximately 5.7 km southeast of RK 906.6, and Douglas Lake, located approximately 20 km southeast of RK 906 (Golder Associates 2008).

During the early spring salmon runs, the Lower Similkameen Indian Band community members collected a variety of berries, including Saskatoon berries and strawberries, as well as food plants such as mushrooms and the roots of plants. Rhizomes were harvested in the early spring, including roots of the avalanche lily, tiger lily, cow parsnip and the nodding onion. The inner bark of the tree, its cambium layer, is stripped from lodgepole and ponderosa pine and eaten (Golder Associates 2008). Salmon fishing remains an important social, cultural and economic activity. Lower Similkameen First Nation have fished in the Thompson and Fraser rivers for generations for a variety of fish including salmon, kokanee, steelhead, rainbow and cutthroat trout, suckerfish and whitefish (Golder Associates 2008). As part of the seasonal round, the Lower Similkameen hunt in subalpine forest edges and alpine forests in the late summer and early fall for large game. The mountain forests yield mountain goat, bighorn sheep, elk and moose; with deer as the most important food resource. The fall hunt provided a steady food source and clothing during the wintertime. Presently, the Lower Similkameen Indian Band are concerned about the population and health of ungulate species in the Thompson/Okanagan region including deer (mule and white-tail), moose, bighorn sheep and mountain goat (Golder Associates 2008).

5.2.4.6 Upper Similkameen Indian Band

Trans Mountain has shared Project information and invited Upper Similkameen Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Upper Similkameen Indian Band and to support Upper Similkameen Indian Band participation in Project activities. Interest in a TLU study will be determined by Upper Similkameen Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Upper Similkameen Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Historically, villages were located in valley bottoms and beside waterbodies such as Nicola Lake, located approximately 3.2 km southeast of RK 906.6 and Douglas Lake, located approximately 20 km southeast of RK 906. Community members gathered in permanent villages in winter and used upland areas for hunting, collection of plants and ceremonial practices. Communities fished for kokanee, steelhead, rainbow and cutthroat trout, suckerfish and whitefish; hunted for deer, moose, bighorn sheep, bear, grouse, ducks; gathered eggs from waterfowl; collected berries, specifically Saskatoon berries, strawberries and food plants such as mushrooms, various roots and cambium as well as medicinal plants. Ceremonial restrictions and protocols were important within harvesting practices and while hunting and fishing strict protocols were also followed (Golder Associates 2008).

5.2.4.7 Lower Nicola Indian Band

Trans Mountain and Lower Nicola Indian Band have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Lower Nicola Indian Band elected to conduct an independent, community led TLU study for the Project.

The interim results of the Lower Nicola Indian Band TLU study have identified 75 separate uses or use areas with multiple uses along the proposed route and 150 traditionally used species within the Lower Nicola Indian Band TLU study area. Location specific data was not provided in the interim results.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Lower Nicola Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Historically, villages were located in the valley bottoms and beside lakes of the Fraser River Canyon such as Nicola Lake, located approximately 3.2 km southeast of RK 906.6 and Douglas Lake, located approximately 20 km southeast of RK 906, where a variety of fish species are caught. The Coquihalla Corridor, is a major travel route for hunting, fishing and traveling (Lower Nicola Indian Band 2010). Community members gathered in permanent villages in winter and used upland areas for hunting and the collection of plants. The remains of traditional semi-subterranean pit houses in Nicola village sites are located approximately 2.3 km east of RK 922 (Golder Associates 2008). In spring, communities gather green shoots of wild roses, stinging nettles, avalanche lilies, tiger lilies, cow parsnip, wild potatoes, bitterroot and nodding onion. Historically, cambium was gathered from lodgepole and ponderosa pine and provided a sweet delicacy (Golder Associates 2008). In early spring, community members fish for kokanee, trout, burbot and sturgeon. Currently, migrating salmon are caught on the Nicola River, located approximately 24.7 km southeast of RK 900 and are often netted or caught with dip nets in shallow waters (Amec Earth & Environmental [AMEC] 2010). The Lower Nicola Indian Band hunted for moose, mule deer, white-tail deer, mountain goat and bighorn sheep. Ceremonial restrictions and protocols are considered to be important to the success of harvesting practices and a strict division of labour, organized according to gender, was observed to ensure the success of the hunt (Golder Associates 2008).

5.2.4.8 Coldwater Indian Band

Trans Mountain has shared Project information and invited Coldwater Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Coldwater Indian Band and to support Coldwater Indian Band participation in Project activities. Interest in a TLU study will be determined by Coldwater Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Coldwater Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Salmon fishing, hunting and plant gathering continue to provide substantial portions of Coldwater Indian Band community member's diets (Focus Environmental Inc. [Focus] 2008). Community members use a variety of plants for food, medicinal and ceremonial purposes and the making of tools and other goods including black tree lichens, pine mushrooms, western red cedar, lodgepole pine, Douglas-fir, blackberries, blueberries, huckleberries, cow-parsnip, Indian hemp, western paper birch, soapberry, Alaska blueberry, avalanche lily, cascara, Saskatoon berries, service berries, balsam root, tiger lilies, bitter root and cambium from lodgepole and ponderosa pines. Berries are gathered at higher elevations in the late summer and the fall. Some plants have limited availability such as balsam root, bitterroot and hazelnuts (AMEC 2010). Historically, community members hunted deer, black bear, bighorn sheep, mountain goat, beaver, coyote, fox, marmot, snowshoe hare, squirrel and grouse for food and other purposes. Chipmunk, muskrat, weasel and wolverine were hunted for their fur only. Hunting continues with deer being the primary animal consumed (Focus 2008). Fishing, particularly for salmon, is an important part of traditional activities. Fishing occurs in late spring and summer when community members pursue migrating salmon along the Thompson and Nicola rivers. Presently, they are netted and dried for future consumption. Historically, spears, dip nets and hook and line were used in shallow waters and drift nets in deeper waters (AMEC 2010, Focus 2008).

5.2.4.9 Shackan Indian Band

Trans Mountain and Shackan Indian Band have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Shackan Indian Band elected to conduct a joint third-party TLU study for the Project with Nicomen Indian Band and Nooaitch Indian Band led by Nicola Tribal Association.

Issues of concern, traditional use sites or features identified through ongoing engagement with Shackan Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.4.10 Nicomen Indian Band

Trans Mountain and Nicomen Indian Band have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Nicomen Indian Band elected to conduct a joint third-party TLU study for the Project with Shackan Indian Band and Nooaitch Indian Band led by Nicola Tribal Association.

Issues of concern, traditional use sites or features identified through ongoing engagement with Nicomen Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.4.11 Nooaitch Indian Band

Trans Mountain and Nooaitch Indian Band have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Nooaitch Indian Band elected to conduct a joint third-party TLU study for the Project with Nicomen Indian Band and Shackan Indian Band led by Nicola Tribal Association.

Issues of concern, traditional use sites or features identified through ongoing engagement with Nooaitch Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Nooaitch Indian Band has indicated that traditional hunting continues to be practiced by community members throughout their asserted traditional territory (KDC Consulting [KDCC] 2011). Nooaitch Indian Band community members continue to gather berries, plants, tree bark and roots on their reserves and in their asserted traditional territory (Forest Practices Board 2004, KDCC 2011). Traditionally, bull trout,

Chinook salmon, coho salmon and Dolly Varden were caught in Nicola Lake, located approximately 3.2 km southeast of RK 906.6; Coldwater River, which is crossed by the proposed pipeline corridor at RK 957.8, RK 970.3, RK 980 and RK 990; the Anderson River, located approximately 7.7 km northwest of RK 951; the Fraser River, crossed by the proposed pipeline corridor at RK 499.7 and RK 1168.9; and Spius Creek, located approximately 18 km northwest of RK 936.6. Fish were used for food and were also traded with other communities for resources (KDCC 2011). Burial grounds are located north of the Nooaitch cemetery, located just outside Nooaitch IR 10 (KDCC 2011).

5.2.4.12 Yale First Nation

Trans Mountain and Yale First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Yale First Nation elected to conduct a third-party TLU study for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Yale First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

The Spirit Cave Trail near Yale, located approximately 15.4 km northwest of RK 1021, is an important heritage asset and spiritual site (Golder Associates 2008). The trail is well worn and still in use. Community members developed the Spirit Cave Trail as a means of creating greater local interest in heritage and as an attempt to foster heritage tourism in Yale (Golder Associates 2008).

5.2.4.13 Métis Nation British Columbia

Trans Mountain and Métis Nation British Columbia have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Métis Nation British Columbia is currently completing an independent third-party engagement report for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Métis Nation British Columbia will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.5 Hope to Burnaby Segment

The Hope to Burnaby Segment crosses the traditional territories of 20 Aboriginal communities that have been identified as having an interest in the Project or having interests potentially affected by the Project (see Table 5.2-1).

Desktop traditional land and resource use information relative to the TLRU RSA was available for 18 of the 20 communities during the compilation of this ESA and is included in the subsections below.

The results of TLU studies conducted to date have identified TLU sites potentially affected by the proposed Hope to Burnaby Segment and associated Project components requiring mitigation (see Table 5.2-4).

TABLE 5.2-4

TRADITIONAL LAND USE SITES IDENTIFIED BY PARTICIPATING ABORIGINAL COMMUNITIES FOR THE PROPOSED HOPE TO BURNABY SEGMENT

Approximate Distance and Direction from Project	Site Description
Shxw'ōwhámel First Nation	
At RK 1042	Gathering blueberries
At RK 1042	Hunting for bear
From RK 1054.1 to RK 1059	Sacred site
At RK 1058	Pithouses

TABLE 5.2-4 Cont'd

Approximate Distance and Direction from Project	Site Description
Popkum First Nation	
10 m north of RK 1060	Pithouses
10 m north of RK 1061	Fishing on the Fraser River

Further details regarding the results of TLU studies and the preliminary interests received to date can be found in the Traditional Land and Resource Use Technical Report of Volume 5D. A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B.

5.2.5.1 Union Bar First Nations

Trans Mountain and Union Bar First Nations have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Trans Mountain will continue to share Project information with Union Bar First Nations and to support Union Bar First Nations participation in Project activities. Interest in a TLU study will be determined by Union Bar First Nations.

Issues of concern, traditional use sites or features identified through ongoing engagement with Union Bar First Nations will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.5.2 Chawathil First Nation

Trans Mountain and Chawathil First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Chawathil First Nation elected to conduct an independent, community led TLU study for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Chawathil First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Much of the publicly available literature for Chawathil First Nation relevant to the TLRU RSA consists of data compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories. This information is provided below.

Stó:lō lands are divided into four "distinct geographical/biological 'food processing' zones" (Carlson 2001): the area in which all tributary rivers flow into the Pacific ocean, where marine mammals, shellfish and molluscs were harvested; the area of the Fraser Valley where several smaller rivers flow into the Fraser River, where bog cranberries and wapato were gathered; the section of the Fraser Canyon where the Fraser River becomes considerably narrower and has abundant salmon; and mountainous regions further inland (Carlson 2001, Chawathil First Nation 2010). Community members trade goods and move freely amongst villages within their asserted traditional territory. The diversity of resources found in Stó:lō territory allowed their ancestors to move about seasonally and use different areas for different traditional activities (Golder Associates 2008).

Salmon and salmon fishing is of great importance to the Stó:lō people as a primary source of wealth and sustenance. Most fishing has been practiced along the Fraser River, crossed by the proposed pipeline corridor at RK 1168.9 and following the proposed pipeline corridor from RK 1045 to RK 1078. In particular, the Fraser Canyon, located approximately 1.8 km north of RK 1046, is an area where salmon are most abundant and conditions for preparing the meat (wind-drying) are ideal (Carlson 2001). The area which sees the Fraser River reach the Pacific Ocean, crossed by the proposed pipeline corridor at

RK 1169, has been traditionally used for harvesting marine mammals, shellfish and molluscs; and the area of the Fraser Valley downstream of the Fraser Canyon, approximately 2.4 km southwest of RK 1046, at the confluence of the Pitt and Fraser rivers, approximately 5.3 km east of RK 1171, has been traditionally used for plant gathering, specifically bog cranberries and wapato (Carlson 2001). The Stó:lō people have also been historically known to engage in the building of large, permanent settlement sites, as opposed to being nomadic; the harvesting of salmonberries, thimbleberries and cow parsnip; and the hunting of birds, deer, elk and mountain goats (Golder Associates 2008). Because of their reliance on salmon from the Fraser River and the accessibility to different regions, there is a close connection between the river systems and Stó:lō settlement sites, with the largest and most populated settlements often located at the confluence of major waterways (Carlson 2001).

Sacred areas are located at Cultus Lake, located approximately 3.7 km southeast of RK 1104.5; Mount Cheam (Cheam Peak), located approximately 3.8 km east of RK 1079; Echo Island (Harrison Lake), located approximately 12 km northwest of RK 1064.5; Mount Slesse (Slesse Mountain), located approximately 23.5 km southeast of RK 1088.5; Mount McGuire in the Chilliwack River Valley, located approximately 15 km southeast of RK 1093.4; and Mount Hope and Lady Franklin Rock in the lower Fraser Canyon, located approximately 3.3 km northwest of RK 1046.4 (Carlson 2001, Stó:lō Nation and The Reach Gallery Museum Abbotsford 2012). Semá:th Lake (Sumas Lake), which is crossed by the proposed pipeline corridor at RK 1111.3, is also an important historical site for the community. It was a rich ecosystem which once supported an abundance of fish, plants and animals and wetlands which were destinations for migrating birds and breeding grounds for wildlife (Stó:lō Nation and The Reach Gallery Museum Abbotsford 2012). Coqualeetza, located in Sardis, BC, approximately 1.6 km northwest of RK 1096.5, is considered a significant historical and cultural site for the Stó:lō people and prior to European contact was used as a fishing site and farmland (Carlson 2001).

5.2.5.3 Shxw'ōwhámel First Nation

Shxw'ōwhámel First Nation elected to conduct the map review phase of their TLU study for the Project with TERA, that focused on Crown lands within the asserted traditional territory of Shxw'ōwhámel First Nation crossed by the proposed pipeline corridor. Shxw'ōwhámel First Nation is currently completing the remaining phases of their community led TLU study independently for the Project. Shxw'ōwhámel First Nation also provided their 'Shxw'ōwhámel Community Review of the Proposed KM Pipeline Project' to Trans Mountain on August 13, 2013.

To date, the TLU study did not reveal any TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-4).

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Shxw'ōwhámel First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Shxw'ōwhámel First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.4 Cheam First Nation

Trans Mountain and Cheam First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Cheam First Nation elected to conduct a joint third-party Integrated Cultural Assessment (ICA) for the Project with Sumas First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Skowkale First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Yakweakwioose First Nation led by Ts'elxweyeqw Tribe Management Limited.

Cheam First Nation also provided their 'CFN Community Engagement Workshop – KMC Trans Mountain Pipeline Expansion Project' to Trans Mountain on March 21, 2013.

Third-party consultants, Ts'elxwéyeqw Tribe Management Limited (TTML), Stó:lō Research and Resource Management Centre and Human Environment Group, conducted community interviews and surveys, organized regional, community and community staff/administration meetings and attended Grandmother's council meetings and other community events. These discussions focused on Crown lands within the asserted traditional territory of the communities that are part of Stó:lō Nation.

The draft Indicator Report of the TTML ICA received on November 15, 2013 provides information regarding the subsistence and cultural activities that are practiced throughout Stó:lō asserted traditional territory. Site-specific TLU information was not provided in the draft Indicator Report. A summary of the draft Indicator Report is provided in the Traditional Land and Resource Use Technical Report of Volume 5D.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Cheam First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Cheam First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.5 Sumas First Nation

Trans Mountain and Sumas First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Sumas First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Skowkale First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Yakweakwioose First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4) above.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Sumas First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Sumas First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.6 Peters Band

Trans Mountain has shared Project information and invited Peters Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Peters Band and to support Peters Band participation in Project activities. Interest in a TLU study will be determined by Peters Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Peters Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Peters Band was not available during compilation of this report. However, information compiled by representative organizations

acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.7 Seabird Island Band

Trans Mountain and Seabird Island Band have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Trans Mountain will continue to share Project information with Seabird Island Band and to support Seabird Island Band participation in Project activities. Interest in a TLU study will be determined by Seabird Island Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Seabird Island Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Seabird Island Band was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.8 Popkum First Nation

Popkum First Nation elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review meeting and community interviews that focused on Crown lands within the asserted traditional territory of Popkum First Nation crossed by the proposed pipeline corridor.

The map review, ground reconnaissance and interviews revealed TLU sites within the proposed pipeline corridor requiring mitigation (see Table 5.2-4).

Background Data

Popkum First Nation has established permanent village sites along the Fraser River. Permanent village sites were occupied primarily during the winter and the seasonal round allowed community members to access different areas for various traditional activities. Longhouses were used by Popkum First Nation community members as gathering places for engaging in traditional ceremonies (Golder Associates 2008).

In the spring months when the salmon run occurred in the Fraser River, Popkum First Nation community members harvested the shoots of cow parsnip, salmonberry and thimbleberry (Golder Associates 2008). Food plants and berries were harvested in upland areas during the summer months of June and July when they were sufficiently ripened. Edible rhizomes were also harvested here including the nodding onion. During this time berries were harvested and eaten or dried for the winter months when great ceremonial feasts were held. Once the sockeye salmon runs ended in the early fall, community members would gather in the lowlands to collect cranberries and wapato, or white potato, in the bog areas of their territory. Wapato is a nutritious tuber that is found scattered throughout marshy areas. Wapato or white potato harvests still occur today (Golder Associates 2008). Harvesting is organized according to a system of land management which restricted the right to harvest to specific families. The Fraser River is accessed by family groups that own the individual and collective rights to harvest there (Golder Associates 2008).

Popkum First Nation community members hunted in upland areas in the late fall and early winter for several ungulate species including elk, moose, white-tail deer and mule deer. Community members would also trap beaver, muskrat, rabbit, porcupine, black bear and mountain goat in the alpine areas after the salmon runs were complete. Fall and early winter would also bring hunting of migratory birds (Golder Associates 2008).

Fishing for salmon has retained its social, cultural and economic importance as it had in the past. In early spring, the migrating salmon are caught in the Fraser River. In shallower water, dip nets or gill nets are

used to catch fish from rock ledges or fishing platforms (Golder Associates 2008). Community members have also fished for trout and burbot in the Fraser River (AMEC 2010).

5.2.5.9 Scowlitz First Nation

Scowlitz First Nation elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review meeting that focused on Crown lands within the asserted traditional territory of Scowlitz First Nation crossed by the proposed pipeline corridor.

The map review did not reveal any TLU sites within the proposed pipeline corridor requiring mitigation.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Scowlitz First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Scowlitz First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.10 Skowkale First Nation

Trans Mountain and Skowkale First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Skowkale First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Skwah First Nation, Soowahlie First Nation, Squiala First Nation, Tzeachten First Nation and Yakweakwioose First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of the Skowkale First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Skowkale First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Skowkale First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.11 Yakweakwioose First Nation

Trans Mountain and Yakweakwioose First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Yakweakwioose First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Aitchelitz First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Skwah First Nation, Soowahlie First Nation, Squiala First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Yakweakwioose First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Yakweakwioose First Nation will be considered for incorporation into Project planning including the EPPs

and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Yakweakwioose First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.12 Aitchelitz Band

Trans Mountain and Aitchelitz First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Aitchelitz First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Yakweakwioose First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Aitchelitz First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Aitchelitz First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Aitchelitz Band was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.13 Skwah First Nation

Trans Mountain and Skwah First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Skwah First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Yakweakwioose First Nation, Aitchelitz First Nation, Soowahlie First Nation, Squiala First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Skwah First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Skwah First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Skwah First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.14 Kwaw-kwaw-apilt First Nation

Trans Mountain and Kwaw-kwaw-aplit First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Kwaw-kwaw-aplit First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Shxwha:y Village, Yakweakwioose First Nation, Aitchelitz First Nation, Skwah First Nation, Soowahlie First Nation, Squiala First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Kwaw-kwaw-aplit First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Kwaw-kwaw-aplit First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Kwaw-kwaw-apilt First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.15 Soowahlie First Nation

Trans Mountain and Soowahlie First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Soowahlie First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Kwaw-kwaw-apilt First Nation, Shxwha:y Village, Yakweakwioose First Nation, Aitchelitz First Nation, Skwah First Nation, Kwaw-kwaw-apilt First Nation, Squiala First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Soowahlie First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Soowahlie First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Soowahlie First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.16 Shxwha:y Village

Trans Mountain and Shxwha:y Village have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Shxwha:y Village elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Kwaw-kwaw-apilt First Nation, Soowahlie First Nation, Yakweakwioose First Nation, Aitchelitz First Nation, Skwah First Nation, Kwaw-kwaw-apilt First Nation, Squiala First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Shxwha:y Village, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Shxwha:y Village will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Shxwha:y Village was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.17 Tzeachten First Nation

Trans Mountain and Tzeachten First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Tzeachten First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Kwaw-kwaw-apilt First Nation, Soowahlie First Nation, Shxwha:y Village, Yakweakwioose First Nation, Aitchelitz First Nation, Skwah First Nation, Kwaw-kwaw-apilt First Nation and Squiala First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Tzeachten First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Tzeachten First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Tzeachten First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.18 Squiala First Nation

Trans Mountain and Squiala First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Squiala First Nation elected to conduct a joint third-party ICA for the Project with Cheam First Nation, Sumas First Nation, Skowkale First Nation, Kwaw-kwaw-apilt First Nation, Soowahlie First Nation, Yakweakwioose First Nation, Aitchelitz First Nation, Skwah First Nation, Kwaw-kwaw-apilt First Nation and Tzeachten First Nation led by Ts'elxweyeqw Tribe Management Limited (see Section 5.2.5.4).

On behalf of Squiala First Nation, Ts'elxweyeqw Tribe Management Limited also provided their 'Ts'elxweyéqw Tribe Preliminary Draft of Interests' to Trans Mountain on July 22, 2013.

Additional issues of concern, traditional use sites or features identified through ongoing engagement with Squiala First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Squiala First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.19 Leq'á:mel First Nation

Leq'á:mel First Nation elected to conduct a TERA-led TLU study for the Project. The TLU study included a map review meeting and community interviews that focused on Crown lands within the asserted traditional territory of Leq'á:mel First Nation crossed by the proposed pipeline corridor.

The map review and interviews did not reveal any TLU sites within the proposed pipeline corridor requiring mitigation.

Background Data

Desktop traditional land and resource use information relative to the TLRU RSA for Leq'á:mel First Nation was not available during compilation of this report. However, information compiled by representative organizations acting on behalf of one or more Stó:lō communities with shared areas of interest and use within their asserted traditional territories is provided in Section 5.2.5.2.

5.2.5.20 Métis Nation British Columbia

Trans Mountain and Métis Nation British Columbia have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Métis Nation British Columbia is currently completing an independent third-party engagement report for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Métis Nation British Columbia will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.6 Burnaby to Westridge Segment

The Burnaby to Westridge Segment crosses the traditional territories of 12 Aboriginal communities that have been identified as having an interest in the Project or having interests potentially affected by the Project (see Table 5.2-1).

Desktop traditional land and resource use information relative to the TLRU RSA was available for 7 of the 12 communities during the compilation of this ESA and is included in the subsections below.

The results of TLU studies conducted to date have not identified TLU sites potentially affected by the proposed Burnaby to Westridge Segment and associated Project components requiring mitigation.

5.2.6.1 Peters Band

Trans Mountain has shared Project information and invited Peters Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Peters Band and to support Peters Band participation in Project activities. Interest in a TLU study will be determined by Peters Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Peters Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.6.2 Semiahmoo First Nation

Semiahmoo First Nation is currently conducting an independent, community led TLU/TMRU study for the Project and also provided their 'Initial List of Aboriginal Interests' to Trans Mountain on August 6, 2013.

Issues of concern, traditional use sites or features identified through ongoing engagement with Semiahmoo First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Semiahmoo First Nation was a traditionally semi-nomadic people. Community members regularly traveled through the Fraser River Estuary to gather food (Simovic 2001). Permanent villages were located near Semiahmoo and Birch Bays (Simovic 2001). In the spring, Semiahmoo First Nation community members would set up camps at Point Roberts, Cannery Point and Crescent Beach to begin clamming, egg gathering, digging bulbs and fishing (Brown 2012). Devil's club was used for ceremonies. Cedar was also traditionally harvested and berries were picked in the summer (Forest Practices Board 2004, Simovic 2001). Deer were traditionally hunted. Duck and pheasant were also hunted along Crescent Beach (Simovic 2001). Semiahmoo First Nation members have traditionally fished for sockeye salmon in Boundary Bay. In the last 40 years, the Semiahmoo have resorted to fishing in the Fraser River rather than relying on salmon in Boundary Bay. In the Boundary Bay area, located approximately 22.4 km southwest of RK 1157, crab and bivalve fisheries complemented salmon fishing. Bullhead and shiners were sometimes caught (Simovic 2001). Mount Baker was historically used for traditional and ceremonial practices but due to the number of people using the area these ceremonies now take place on private land (Simovic 2001).

5.2.6.3 Matsqui First Nation

Trans Mountain has shared Project information and invited Matsqui First Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Matsqui First Nation and to support Matsqui First Nation participation in Project activities. Interest in a TLU study will be determined by Matsqui First Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Matsqui First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.6.4 Kwantlen First Nation

Trans Mountain has shared Project information and invited Kwantlen First Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Kwantlen First Nation and to support Kwantlen First Nation participation in Project activities. Interest in a TLU study will be determined by Kwantlen First Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Kwantlen First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Historically, Kwantlen First Nation villages were located in valley bottoms and beside lakes, with settlements most densely clustered along the Fraser River and its many tributaries, including the Stave River, located approximately 43 km north of RK 1119. However, families spent much of the year travelling away from these sites, both within and beyond asserted traditional territory boundaries, in order to fish, hunt, trade, harvest plants and medicines and visit relatives. The largest villages were Squalmetl and Klkalt, which were located in New Westminster, but Kwantlen settlements were also upstream along the Fraser River. With the establishment of Fort Langley, a Hudson's Bay trading post, in 1827, settlements were moved eastward along Fraser River to McMillan and Brae Islands (Neary 2011). The Stave River region was an important location for gathering several kinds of plants, while the swamp, meadows and sloughs of Port Hammond, located approximately 4.7 km northeast of RK 1155.6, provided ideal habitat for the wapato, a native tuber variety gathered by Kwantlen First Nation. Community members gathered in permanent villages in winter and used upland areas for hunting, collecting plants and performing ceremonies. Seasonal harvesting of bulbs, berries, mushrooms, roots, wild greens, tree bark and cambium has been done by community members, with harvesting activity being concentrated in summer and fall months (Neary 2011). Fruits, grains and tubers have also been cultivated and timber harvested on Langley Indian Reservations, located approximately 5.5 km north of RK 1112 (Neary 2011). Kwantlen people have hunted deer, elk, mountain goats and other small game such as ducks, geese and grouse.

They have also trapped beaver and marten and collected the eggs of many local bird species. Historically, the Stave River region was used extensively for hunting activities (Neary 2011). In early spring they would visit large lakes for kokanee, trout and sturgeon. Salmon were a primary resource for Kwantlen, serving as a major food staple and the basis of their economy (Kwantlen First Nation 2013). Extensive fishing was done and clams were collected by canoe on the shoals off Port Hammond, where a large midden was built over time. This archaeological site was largely destroyed by the early 1900s, however, and artifacts uncovered there were distributed to various museums and private collectors (Neary 2011).

A burial ground is known to exist at Qeqeyt (resting place), a historic settlement on the south bank of the Fraser River that lies to the east of the Patullo Bridge, located approximately 1.4 km west of RK 1036. Skeletons were transported here following tree burials and placed in cedar boxes before placement in grave houses (Neary 2011). Another grave site is located on Langley IR 7, located approximately 2.7 km southwest of RK 1134, which was historically home to only a single residence and was primarily used for burials and gardening (Neary 2011). The Stave River region, located approximately 43 km north of KP 1087, was used extensively for trapping by Kwantlen First Nation community members and was an important area for passing down knowledge of traditional practices (Neary 2011).

5.2.6.5 Katzie First Nation

Trans Mountain has shared Project information and invited Katzie First Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Katzie First Nation and to support Katzie First Nation participation in Project activities. Interest in a TLU study will be determined by Katzie First Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Katzie First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Katzie First Nation once included upwards of 10 villages throughout their asserted traditional territory. Halkomelem, meaning moss, was an ancient village site near the Katzie Indian Reserve at Pitt Meadows. An ancestral village site is also located in Grant Narrows Regional Park. Permanently occupied village sites were also at Barnston Island and Yorkston Creek in Langley (Glavin 2008). Historically, Katzie First Nation members moved to various sites within their territory to hunt, fish and harvest where they would live in temporary dwellings (Katzie First Nation 2002).

Katzie First Nation community members use the marshy areas within their asserted traditional territory for plant gathering. There are individually and communally owned cranberry bogs on both sides of Pitt River which flows into the Fraser River, approximately 4 km north of RK 1130. Wapato or white potato is a nutritious tuber unique to Katzie territory and is scattered throughout marshy areas (Glavin 2008). Historically, the Katzie people fished sockeye and other salmon species from a variety of fishing stations and seasonal villages along the Fraser, Pitt and Alouette (a tributary of the Pitt River, located approximately 10 km northeast of RK 1138) rivers. Katzie First Nation would share the *oolichan* or euchalon harvest with other communities but severe declines in euchalon populations have lead to abandonment of this practice. The mouth of the Pitt River, located approximately 6 km north of RK 1128, is known for its important fishing sites. Sturgeon are caught in Pitt Lake, located approximately 21.4 km north of RK 1118, sucker fish at Sheridan Hill, located approximately 12.2 km north of RK 1122 and a variety of fish in Alouette and North Alouette rivers, located approximately 10 km northeast of RK 1138. Community members have reported that the water in Pitt Lake, near Goose Island is not potable (Glavin 2008). Katzie First Nation hunt grizzly bears in the Upper Pitt watershed, approximately 60.8 km northwest of the Westridge Marine Terminal and duck-net sites are located on the marshy flats east of the Pitt River near Widgeon Creek, located approximately 13.2 km northeast of RK 1141 (Glavin 2008). The Stone Man at Davis Pool is an important ceremonial site, located along the Alouette River (Katzie First Nation 2002).

5.2.6.6 Kwikwetlem First Nation

Trans Mountain has shared Project information and invited Kwikwetlem First Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Kwikwetlem First Nation and to support Kwikwetlem First Nation participation in Project activities. Interest in a TLU study will be determined by Kwikwetlem First Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Kwikwetlem First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Historically, Kwikwetlem First Nation community members followed a seasonal round, travelling to different places within their asserted traditional territory to hunt, fish, gather plants, trap, trade, visit and engage in spiritual and ceremonial activities. Today, movement is more restricted but many traditional activities such as hunting, fishing, plant gathering and ceremonies continue (Kwikwetlem First Nation 2013).

Several settlements have been recorded near the mouth of the Coquitlam River, located approximately 11.3 km northeast of RK 1141 and the Pitt River, located approximately 6 km north of RK 1128. Elders also reported a number of smaller camps along the Coquitlam River up to Coquitlam Lake, located approximately 17 km northeast of RK 1141. Tree Island, located approximately 60 km southeast of RK 1147, is also used as a campsite. The lower Fraser River area historically experienced a surge in registered population during summer months in order to fish for salmon and sturgeon, as well as harvest plants such as cranberries and wapato. Elders also spoke about *Qiqa:yt*, an historic fishing camp on the south shore of the Fraser River near the Pattullo Bridge, located approximately 4.4 km west of RK 1135, which was used by a number of communities. The north Fraser River shoreline from the Pitt River to New Westminster, which is crossed by the proposed pipeline corridor at RK 1137, contains several village locations, fishing camps and intercommunity gathering places (Kwikwetlem First Nation 2007).

Plants used by Kwikwetlem First Nation include devil's club, cascara, cherry bark, hazelnuts, cranberries, stinging nettle and blueberries. Most of these plants are collected from sloughs, riverbanks and in upland environments; however, members travel further to areas like Pitt Lake, located approximately 21.4 km north of RK 1130, to collect blueberries and Labrador tea (Kwikwetlem First Nation 2007). The south side of the Fraser River between the Pattulo and Golden Ears bridges, located approximately 4 km west of RK 1136, is used for plant and wood gathering including salmon berries, huckleberries and blueberries. The north Fraser River shoreline from the Pitt River to New Westminster, located approximately 5.4 km southwest of RK 1136, contains several plant and wood gathering places for cedar bark and wood, cherry bark, cattails, cottonwood bark, stinging nettle, alder wood, hazelnuts, salmon berries, huckleberries, blueberries and cranberries (Forest Practices Board 2004, Kwikwetlem First Nation 2007).

Kwikwetlem First Nation community members historically travelled over a large region to hunt for large and small game. Specific hunting sites used by community Elders include the south side of the Fraser River for deer, Mary Hill, located approximately 4 km northeast of RK 1138 and at Coquitlam Lake, located approximately 17.5 km northeast of RK 1144. Some of these areas such as Mary Hill are no longer hunting sites as they have been heavily developed. The area surrounding Pitt Lake, located approximately 21.4 km north of RK 1118, was and continues to be a favoured hunting site for big game including mountain goats (Kwikwetlem First Nation 2007). The south side of the Fraser River between the Pattulo and Golden Ears bridges is used for hunting deer. The north Fraser River shoreline from the Pitt River to New Westminster is also used for hunting deer, lynx, duck, beaver, geese, grouse, pheasant, mink, rabbit and bear (Kwikwetlem First Nation 2007).

Fishing is important to Kwikwetlem First Nation. Historically, the Kwikwetlem caught salmon, sturgeon, euchalon, trout, catfish and carp in the Coquitlam, Fraser and Pitt rivers. Today, fishing is more regulated and declining fish stocks have affected fishing practices (Kwikwetlem First Nation 2007). Specific fishing sites used by community members cluster around the mouths of the Coquitlam and Pitt rivers, at Tree Island and also extending from Barnston Island downstream to the Pattullo Bridge, from approximately 2.7 km northeast of RK 1126 to approximately 4 km west of RK 1130. The south side of the Fraser River

between the Pattulo and Golden Ears bridges and the north Fraser River shoreline from the Pitt River to New Westminster are used for fishing for salmon, euchalon and sturgeon. *Xvmuthkvi'um* is a named creek and fishing location on the south bank of the Fraser River under the Port Mann Bridge, located approximately 2 km northeast of RK 1135.

There is a well-established network of land and water routes in Kwikwetlem First Nation asserted traditional territory. Historically, rivers were used for travel, but overland routes were used where travel by canoe was not possible. Community members described trails that ran around the base of Mary Hill, located approximately 4 km northeast of RK 1138 to fishing spots along the lower Pitt River, located approximately 4 km north of RK 1130; northward beside the Coquitlam River to Coquitlam Lake and over New Westminster to Lulu Island, located approximately 9.6 km southwest of RK 1135. Many of these trails are now the roads used today by the Kwikwetlem (Kwikwetlem First Nation 2007).

Kwikwetlem asserted traditional territory was historically a fishing area and gathering place. Neighboring groups would come to fish and gather plant foods. The North Fraser River shoreline from the Pitt River to New Westminster contains several intercommunity meeting sites as well as several name spirit sites and pictographs (Kwikwetlem First Nation 2007).

5.2.6.7 Qayqayt First Nation

Trans Mountain has shared Project information and invited Qayqayt First Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Qayqayt First Nation and to support Qayqayt First Nation participation in Project activities. Interest in a TLU study will be determined by Qayqayt First Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Qayqayt First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.6.8 Squamish Nation

Trans Mountain has shared Project information and invited Squamish Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Squamish Nation and to support Squamish Nation participation in Project activities. Interest in a TLU study will be determined by Squamish Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Squamish Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Many smaller settlements once existed in areas that are now urbanized districts of Vancouver, such as Kitsilano and North Vancouver (Wonders 2008). Longhouses are traditional gathering places for Squamish community members engaging in traditional ceremonies (Squamish Nation 2001). Permanent village sites were occupied primarily during the winter and a seasonal round allowed people to move about seasonally and access different areas for different purposes.

In the spring months the Squamish people traditionally harvested the edible young shoots of the cow parsnip, salmonberries and thimbleberries (Golder Associates 2008). Food plants and berries were harvested in upland areas during the summer months of June and July. Edible rhizomes were also harvested including the nodding onion. Devil's club is known as a powerful medicinal herb by many Squamish Nation community members (Golder Associates 2008). Harvesting sites exist at various points along the Fraser River (Golder Associates 2008). Several berry species are harvested, including blueberries, salmonberries, huckleberries, chokecherries and deer berries (British Columbia Environmental Assessment Office [BC EAO] 2010). Freshwater plant species collected by community members include wild celery, cranberries and wapato, a variety of wild potato that is found scattered throughout marshy areas (BC EAO 2010). Old, mature forests of Douglas fir and cedar are located in

valleys of the Squamish asserted traditional territory. Western red cedar is harvested for functional and cultural uses (Forest Practices Board 2004). Douglas fir has been used to build shelters (Squamish Nation 2001, Wonders 2008).

Local ungulates, such as moose, elk and deer and fowl, including waterbirds, grouse and pheasant, have been hunted throughout the asserted traditional territory and used as food sources (Squamish Nation 2001). Goat and bear have been harvested for spiritual uses. There are registered traplines within Squamish asserted traditional territory; however, few families have continued this practice. Historically, several small mammals including marmot and squirrel were trapped for their furs (Squamish Nation 2001). The harvest of marine and freshwater fish species is an important traditional activity of Squamish Nation. Eulachon, once fished by the Squamish, are no longer caught because of reduced populations in local areas. Howe Sound was once an important area for fishing (Squamish Nation 2001).

Squamish Nation burial grounds and sacred areas are traditionally located along watercourses (Squamish Nation 2001). Furry Creek, located approximately 37.6 km northwest of RK 5, was a historic sacred bathing area for community members (Wonders 2008). Wild Spirit Places, where community members can experience solitude in nature, are considered to be sacred locations (Squamish Nation 2001).

5.2.6.9 Tsleil-Waututh First Nation

Trans Mountain has shared Project information and invited Tsleil-Waututh Nation to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Tsleil-Waututh Nation and to support Tsleil-Waututh Nation participation in Project activities. Interest in a TLU study will be determined by Tsleil-Waututh Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Tsleil-Waututh Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.2.6.10 Musqueam Indian Band

Trans Mountain has shared Project information and invited Musqueam Indian Band to participate in the development of a TLU study. Trans Mountain will continue to share Project information with Musqueam Indian Band and to support Musqueam Indian Band participation in Project activities. Interest in a TLU study will be determined by Musqueam Indian Band.

Issues of concern, traditional use sites or features identified through ongoing engagement with Musqueam Indian Band will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Musqueam Indian Band has established permanent village sites along the Fraser River and hunted and fished throughout the lowlands and highlands of the Fraser Delta up to the Fraser Canyon (Metro Vancouver 2012). Vegetation harvested includes huckleberries, salmonberries, blueberries, cranberries, strawberries, thimbleberries, currants, salal, wild onion, horsetail rush, devil's club and skunk cabbage. Tree species used are the Western Red Cedar for wooden utensils and ceremonial objects, pine, cottonwood, buckthorn, dogwood, willow and vine maple (Forest Practices Board 2004, Musqueam Indian Band 2011). In the spring months when salmon run in the Fraser River, the Musqueam Indian Band community members harvested the edible young shoots of the cow parsnip, salmonberries, thimbleberries and nodding onion. Food plants and berries were harvested in upland areas during the summer months of June and July and dried for winter months when great ceremonial feasts were held (Golder Associates 2008).

Fishing for salmon in the Fraser River has retained its social, cultural and economic importance within Musqueam Indian Band culture. In early spring the migrating salmon are caught in the Fraser River (Golder Associates 2008). Musqueam Indian Band community members have also fished for trout and

burbot in these rivers (AMEC 2010). When the sockeye salmon run ends in the early fall, community members collect cranberries and wapato, or white potato in low, boggy regions. The wapato harvest is done from canoes or by wading into the shallows, treading on the plants until the roots float to the surface (Golder Associates 2008).

Musqueam Indian Band community members hunt in upland areas in the late fall and early winter where historically they have hunted for several ungulate species including elk, moose, white-tail deer and mule deer. Community members have also trapped beaver, muskrat, rabbit, porcupine, black bear and mountain goat in the alpine areas after the salmon runs were complete. Fall and early winter would also bring hunting of migratory birds (Golder Associates 2008).

Musqueam Indian Band is associated with extensive shell and bone middens which served as burial sites extending as far back as 400 to 450 Before Present. Several midden sites have been designated as historical sites. The Musqueam Marpole Midden Site (also known as the Great Fraser Midden) is a village and burial site located in the south end of Vancouver located approximately 15 km southwest of RK 2. In 1933, the Historical Sites and Monuments Board of Canada declared it a National historical site owing to its preservation of the cultural remains of the first inhabitants of the Fraser Delta and their culture (Parks Canada 2013).

5.2.6.11 Tsawwassen First Nation

Trans Mountain and Tsawwassen First Nation have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Trans Mountain will continue to share Project information with Tsawwassen First Nation and to support Tsawwassen First Nation participation in Project activities. Interest in a TLU study will be determined by Tsawwassen First Nation.

Issues of concern, traditional use sites or features identified through ongoing engagement with Tsawwassen First Nation will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

Background Data

Hunting sites used by Tsawwassen First Nation community members include English Bluff, located approximately 32 km south of the Westridge Marine Terminal and the New Westminster region, located approximately 9.6 km south of the Terminal (Rose 2004). A variety of birds have also been hunted by the Tsawwassen people, including ducks, mallards and loons. The tidal flats of Westham Island, located approximately 28 km southwest of the Westridge Marine Terminal and Boundary Bay, located approximately 32 km southwest of the Westridge Marine Terminal, are used as bird-hunting grounds. Seafaring mammals such as porpoises, seals and sea lions also were hunted (Rose 2004). Fishing is still an element of livelihood and culture for Tsawwassen First Nation members. Sockeye, Chinook, coho, chum and pink salmon are all fished for consumption, social and ceremonial use. Sockeye, chum and pink salmon are also fished commercially. Clams, oysters, crabs and other shellfish have also been harvested (Rose 2004).

5.2.6.12 Métis Nation British Columbia

Trans Mountain and Métis Nation British Columbia have engaged in discussions to determine the community's interest and a process for their involvement in Project activities. Métis Nation British Columbia is currently completing an independent third-party engagement report for the Project.

Issues of concern, traditional use sites or features identified through ongoing engagement with Métis Nation British Columbia will be considered for incorporation into Project planning including the EPPs and the Environmental Alignment Sheets, as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

5.3 Social and Cultural Well-Being

This subsection presents an overview of existing conditions in the Socio-Economic RSA pertaining to social and cultural well-being. In the context of the Project, social and cultural well-being refers to a range

of factors that influence social and cultural change in a community or region. This includes: population and demographic change related to temporary or permanent presence of workers; community-worker interactions and changes in patterns of certain social issues; changes in Aboriginal cultural traditions; and potential Project interactions with community events and assets. It also considers the perspectives that community residents have about the Project and how the Project may or may not affect them.

The potential Project-related effects and mitigation pertaining to social and cultural well-being are discussed in Section 7.2.3. The Socio-Economic Technical Report in Volume 5D provides a full discussion of existing conditions pertaining to social and cultural well-being.

As mentioned above, the setting pertaining to social and cultural well-being is discussed by the socio-economic regions. A description of the six socio-economic regions of the Project, including their boundaries and the specific pipeline segments and facilities located in each region, is provided in Table 5.0-1. The Socio-Economic RSA is divided into the six socio-economic regions. The Socio-Economic RSA includes communities crossed by the Project as well as communities close enough to potentially be: a source of labour; source of procured goods or services; location of community infrastructure/services influenced by the Project; accommodation or camp location for Project workers; or Project construction office location. A detailed list of all communities included in the Socio-Economic RSA, by socio-economic region, is found in Table 3.3-2 of the Socio-Economic Technical Report of Volume 5D.

Although the Jasper National Park Region is a socio-economic region and forms part of the Socio-Economic RSA, no new pipeline construction will occur in this region. Therefore, the focus of the discussion on existing conditions pertaining to social and cultural well-being in this section will focus on the Edmonton, Rural Alberta, Fraser-Fort George/Thompson-Nicola, Fraser Valley and Metro Vancouver regions. It should be noted that any reference to the Socio-Economic RSA as a whole includes the Jasper National Park Region since some Project-related work will be required at the Jasper Pump Station, though the construction hub related to these activities is anticipated to be the Town of Hinton (see Section 5.10.1). The Socio-Economic Technical Report in Volume 5D provides further information on existing social and cultural well-being conditions in the Jasper National Park Region.

Communities and regions that are crossed by the proposed pipeline corridor are presented in Table 5.3-1. As noted, the Socio-Economic RSA extends beyond these “footprint communities” to also consider communities and regions in the wider vicinity that could be a source of labour and/or services to the Project. All communities and regions that are within the Socio-Economic RSA are presented in Table 3.3-2 of the Socio-Economic Technical Report in Volume 5D.

TABLE 5.3-1

INCORPORATED MUNICIPALITIES, REGIONS AND INDIAN RESERVES CROSSED BY THE PROPOSED PIPELINE CORRIDOR

Community/Regions Crossed by Proposed Pipeline Corridor (Pipeline and Facilities)	Pipeline RK Range	Population (2011)
Edmonton Region		
Strathcona County	RK 0.0 to RK 12.2	92,490
City of Edmonton	RK 12.0 to RK 45.1	812,195
City of Spruce Grove	RK 57.1 to RK 61.3, RK 62.2 to RK 62.7	26,175
Parkland County	RK 45.1 to RK 135	30,570
Town of Stony Plain	RK 61.3 to RK 62.3, 62.4 to RK 68.4	15,050
Village of Wabamun	RK 98.4 to RK 99.9	661
Rural Alberta Region		
Yellowhead County	RK 135.0 to RK 339.4	10,470
Town of Edson	RK 228.0 to RK 235.5, RK 235.6 to RK 237.3	8,475
Town of Hinton	RK 321.7 to RK 326.3	9,640
Fraser-Fort George/Thompson-Nicola Region		
Electoral Area H, Regional District of Fraser-Fort George	RK 489.6 to RK 549.3	1,665
Village of Valemount[1]	N/A	1,020
Electoral Area B, Thompson-Nicola Regional District	RK 548.9 to RK 682.4, RK 682.9 to RK 683.8	283
Electoral Area A, Thompson-Nicola Regional District	RK 682.4 to RK 683.1, RK 683.9 to RK 714.6, RK 726.2 to RK 739.0	1,536
Electoral Area O, Thompson-Nicola Regional District	RK 738.9 to RK 769.0	1,335
Electoral Area P, Thompson-Nicola Regional District	RK 811.8 to RK 923.3	3,620
Electoral Area J, Thompson-Nicola Regional District	RK 824.6 to RK 829.4, RK 856.4 to RK 885.2	1,560
Electoral Area M, Thompson-Nicola Regional District	RK 885.1 to RK 917.4, RK 918.4 to RK 925.9	1,823
Electoral Area N, Thompson-Nicola Regional District	RK 927.5 to RK 928.5, RK 931.0 to RK 990.9	749
District of Clearwater	RK 714.3 to RK 726.6	2,331
City of Kamloops	RK 823.2 to RK 824.7, RK 829.3 to RK 856.4	85,675
City of Merritt	RK 925.9 to RK 927.6, RK 928.3 to RK 930.4	7,115
Zoht 5	RK 912.0 to RK 912.8	Not reported
Zoht 4	RK 917.5 to RK 918.5	25[2]
Joeyaska 2	RK 930.3 to RK 930.7, RK 930.8 to RK 931.2	44[2]
Fraser Valley Region		
Electoral Area B, Fraser Valley Regional District	RK 990.5 to RK 1037.9, RK 1055.4 to RK 1057.7, RK 1058.6 to RK 1063.1, RK 1064.1 to RK 1064.6	721
Electoral Area D, Fraser Valley Regional District	RK 1064.5 to RK 1075.7, RK 1076.0 to RK 1076.6, RK 1077.1 to RK 1082.6	1,346
Electoral Area E, Fraser Valley Regional District	RK 1103.4 to RK 1103.8	3,358
District of Hope	RK 1038.2 to RK 1055.6	5,969
City of Chilliwack	RK 1082.3 to RK 1082.6, RK 1082.7 to RK 1103.5, RK 1103.7 to RK 1108.0	77,936
City of Abbotsford	RK 1108.0 to RK 1137.4	133,497
Ohamil 1	RK 1057.6 to RK 1058.8	77
Peters 1	RK 1062.9 to RK 1064.9	27
Peters 1A	RK 1064.5 to RK 1064.6	Not reported
Popkum 1	RK 1075.8 to RK 1077.2	5[3]

TABLE 5.3-1 Cont'd

Community/Regions Crossed by Proposed Pipeline Corridor (Pipeline and Facilities)	Pipeline RK Range	Population (2011)
Grass 15	RK 1091.1 to RK 1091.6	Not reported
Tzeachten 13	RK 1096.9 to RK 1097.6	1,467[4]
Matsqui Main 2	RK 1129.4 to RK 1129.6	81
Metro Vancouver Region		
Township of Langley	RK 1137.4 to RK 1156.1	104,177
City of Surrey	RK 1156.1 to RK 1168.9	468,251
City of Coquitlam	RK 1168.9 to RK 1175.2	126,456
City of Burnaby	RK 1175.1 to RK 1183.6	223,218

Source: Statistics Canada 2012

Notes:
1 The Village of Valemount is not crossed by the proposed pipeline corridor, however, it is considered a footprint community due to its close proximity to the Project and because it has been identified by Trans Mountain as a construction hub community.

2 Data quality index showing a global non response rate higher than or equal to 10% but lower than 25%.

3 Data quality index showing a global non response rate higher than or equal to 25% (suppressed).

4 Data quality index showing a global non response rate higher than or equal to 5% but lower than 10%.

- Jasper National Park has also been identified as a socio-economic region. It is not discussed here, as it pertains only to the reactivation activities for the Hinton to Hargreaves Segment and relocation of existing pumps at the Jasper Pump Station, not to the proposed new pipeline and facilities. No new pipeline or facilities are proposed in the Jasper National Park Region. Refer to Section 6.1.6 and Section 5.10.1 for a discussion of the setting in the Jasper National Park Region.

- Not reported: Statistics Canada does not provide information for this community.

The overall sense of community well-being related to the Project could be affected by a range of other socio-economic and environmental elements discussed in the ESA (Volumes 5A and 5B). Other elements with potential effects related to overall community well-being include air quality, water quality, noise, human and community health, TLRU, employment and economy, HORU and infrastructure and services. These elements are discussed throughout the ESA (Volumes 5A and 5B).

5.3.1 Population and Demographics

This subsection presents an overview of existing conditions in the Socio-Economic RSA pertaining to population and demographics. The proposed pipeline corridor will cross a portion of west-central Alberta and the entire width of BC. The proposed pipeline corridor crosses 18 incorporated municipalities, 7 rural counties or regional districts, and 10 IRs across Alberta and BC. Total population of the Socio-Economic RSA in 2011 was approximately 3.9 million (Table 5.3-2).

There is great diversity in the population characteristics of the communities and regions crossed by the Project. Two large urban hubs are on the east and west ends of the Project: the Edmonton Metropolitan Area to the east; and the Metro Vancouver Metropolitan Area to the west. Between Edmonton and Vancouver are more sparsely populated regions.

The Edmonton Region contains the Edmonton Metropolitan Area (which includes the City of Edmonton and numerous surrounding cities, towns, villages, reserves and regions) and select other surrounding communities and regions that could provide labour or services to the Project in the Edmonton area. The Edmonton Metropolitan Area is the sixth largest Metropolitan Area in Canada. In 2011, the total population of the Edmonton Region was approximately 1.2 million, an 11.8% increase from 2006. In 2011, approximately 77.3% of the population was between the ages of 25 and 64 years old, and the median age was 39.8 (Statistics Canada 2012). Approximately 5.5% of the population identified as Aboriginal (Statistics Canada 2013a). There are several IRs and communities in this region; however, no IRs are crossed by the proposed pipeline corridor.

The Rural Alberta Region includes the less industrial and more agricultural areas west of Edmonton, and includes the entire Yellowhead County. The Town of Edson and the Town of Hinton are crossed by the proposed pipeline corridor. In 2011, the total population of the Rural Alberta Region was approximately 29,300; a 3.5% increase from 2006. The median age of the Rural Alberta Region was 43.5 and 11.5% of

the population identified as Aboriginal (Statistics Canada 2012, 2013a). There are several IRs and communities in this region, however, no IRs are crossed by the proposed pipeline corridor.

The Fraser-Fort George/Thompson-Nicola Region extends from the Alberta/BC border through Electoral Area H of the Regional District of Fraser-Fort George (RDFFG) and south the entire length of the Thompson-Nicola Regional District (TNRD). In 2011, the total population of the Fraser-Fort George /Thompson-Nicola Region was approximately 129,000, a 4.6% increase from 2006. Key incorporated population centres crossed by the proposed pipeline corridor in this region include the District of Clearwater, the City of Kamloops, the City of Merritt, as well as some smaller unincorporated communities such as Blue River, Vavenby, Avola and Little Fort. Though not crossed by the proposed pipeline corridor, the Village of Valemount is located in the HORU LSA (approximately 400 m from the proposed pipeline corridor) and has been identified as a construction hub for Project activities; the District of Barriere is located along the existing TMPL right-of-way and the Darfield to Black Pines reactivated segment. In 2011, the median age of the Fraser-Fort George/Thompson-Nicola Region was 45 and 10.6% of the population identified as Aboriginal (Statistics Canada 2012, 2013a). Numerous IRs and communities are located in this region; three reserves are crossed by the proposed pipeline corridor.

The Fraser Valley Region extends from the eastern border of the Fraser Valley Regional District (FVRD) (halfway between the City of Merritt and the District of Hope) to its western border at the Metro Vancouver Region. It is a largely agricultural region, with key incorporated municipalities being the District of Hope, the City of Chilliwack and the City of Abbotsford. In 2011, the total population of the Fraser Valley Region was approximately 274,400, an 8.1% increase from 2006. In 2011, the median age of the Fraser Valley Region was 42.6 and 6.4% of the population identified as Aboriginal (Statistics Canada 2012, 2013a). Numerous IRs and communities are located in this region; seven reserves are crossed by the proposed pipeline corridor.

Metro Vancouver is the third largest Metropolitan area in Canada. It consists of numerous municipalities and one rural electoral area that together are known as Metro Vancouver (or Greater Vancouver Regional District [GVRD]). The largest city within the region is the City of Vancouver. In 2011, the total population of the Metro Vancouver Region was over 2.3 million, a 9.3% increase from 2006. In 2011, the median age of the Metro Vancouver Region was 41 and 2.4% of the population identified as Aboriginal (Statistics Canada 2012, 2013a). There are several IRs and communities in this region; however, no reserves are crossed by the proposed pipeline corridor.

Table 5.3-2 provides a summary of select population characteristics for the Socio-Economic RSA as a whole.

TABLE 5.3-2

SUMMARY OF SELECT POPULATION CHARACTERISTICS OF THE SOCIO-ECONOMIC RSA (2011)

Location	2006 Population	2011 Population	Population Change 2006 to 2011 (%)	Population 0 to 14 (%)	Population 15 to 64 (%)	Median Age	Male Population (%)	Female Population (%)	Aboriginal Identity Population (%)	First Nation Single Identity Population (%)	Private Dwellings Occupied By Residents On A Permanent Basis (%)
EDMONTON REGION											
Sub-Total Municipal Areas	896,824	1,009,837	12.6	17.4	77.3	36.8	49.8	50.2	5.2	2.2	93.5
Sub-Total Rural Areas	162,570	175,214	7.8	19.3	76.8	51.3	50.7	49.2	4.9	1.3	91.6
Sub-Total Indian Reserves	4,222	3,917	-7.2	34.8	72.9	21.7	51.7	48.0	97.9	96.3	79.6
Edmonton Region Total	1,063,626	1,188,968	11.8	17.7	77.3	39.8	49.9	50.0	5.5	2.4	93.2
RURAL ALBERTA REGION											
Sub-Total Municipal Areas	17,836	18,115	1.6	19.6	78.2	35.8	51.3	48.7	9.7	2.5	91.4
Sub-Total Rural Areas	10,045	10,469	4.2	18.5	74.3	43.5	52.1	48.0	8.1	2.2	86.7
Sub-Total Indian Reserves	450	751	66.9	41.3	66.6	19.5	49.3	51.3	99.3	99.3	80.9
Rural Alberta Region Total	28,331	29,335	3.5	19.8	76.5	38.5	51.5	48.5	11.5	4.9	89.5

TABLE 5.3-2 Cont'd

Location	2006 Population	2011 Population	Population Change 2006 to 2011 (%)	Population 0 to 14 (%)	Population 15 to 64 (%)	Median Age	Male Population (%)	Female Population (%)	Aboriginal Identity Population (%)	First Nation Single Identity Population (%)	Private Dwellings Occupied By Residents On A Permanent Basis (%)
JASPER NATIONAL PARK REGION											
Sub-Total Municipal Areas	4,265	4,051	-5.0	13.6	84.7	34.8	51.6	48.5	2.2	0.6	86.6
Sub-Total Rural Areas	24	34	41.7	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	0
Sub-Total Indian Reserves[2]	-	-	-	-	-	-	-	-	-	-	-
Jasper National Park Region Total	4,289	4,085	-4.8	13.5	84.0	34.8	51.2	48.1	2.2	0.6	86.6
FRASER-FORT GEORGE/THOMPSON-NICOLA REGION											
Sub-Total Municipal Areas	100,486	106,164	5.7	15.6	74.0	45.0	49.1	51.0	7.9	4.4	92.0
Sub-Total Rural Areas	18,350	17,388	-5.2	12.7	73.9	50.3	51.1	48.9	11.4	6.5	72.5
Sub-Total Indian Reserves	4,415	5,426	22.9	17.3	71.2	36.2	46.9	46.5	61.6	60.1	85.2
Fraser-Fort George / Thompson-Nicola Region Total	123,251	128,978	4.6	15.2	73.9	45.4	49.2	50.5	10.6	7.0	88.4
FRASER VALLEY REGION											
Sub-Total Municipal Areas	240,476	260,960	8.5	18.8	73.0	42.6	49.5	50.5	5.3	2.9	93.3
Sub-Total Rural Areas	7,487	7,189	-4.0	14.7	73.9	47.0	51.5	48.5	4.4	2.6	69.2
Sub-Total Indian Reserves	5,846	6,255	7.0	17.5	59.6	30.2	47.5	48.4	54.6	52.4	95.2
Fraser Valley Region Total	253,809	274,404	8.1	18.7	72.8	39.8	49.5	50.4	6.4	4.0	92.4
METRO VANCOUVER REGION											
Sub-Total Municipal Areas	2,098,655	2,292,919	9.3	15.3	77.4	41.1	48.9	51.1	2.3	1.3	93.9
Sub-Total Rural Areas	11,050	13,035	18.0	16.8	82.9	32.6	48.1	51.9	7.3	0.0	83.1
Sub-Total Indian Reserves	6,876	7,374	7.2	13.0	73.3	41.1	44.0	48.5	38.2	37.4	95.7
Metro Vancouver Region Total	2,116,581	2,313,328	9.3	15.3	77.4	41.0	48.9	51.1	2.4	1.4	93.9
SOCIO-ECONOMIC RSA TOTAL	3,589,887	3,939,098	9.7	16.3	76.9	38.6	49.3	50.7	4.0	2.1	93.3

Sources: Statistics Canada 2012, 2013a

Notes: 1 Data for this area have been suppressed for data quality or confidentiality reasons.

2 No IRs are found in the Jasper National Park Region.

Population across the Socio-Economic RSA is generally projected to grow. While available information on population projections in Alberta is based on census divisions (CD), the boundaries of which do not directly mirror those of the Socio-Economic RSA as described in this report, it is still indicative of anticipated trends for the socio-economic regions. Table 5.3-3 outlines population growth projections for comparable areas for each socio-economic region. All regions are projecting strong growth, due to a range of unique factors. For example, population growth in the Metro Vancouver and Fraser Valley regions is related to the fact that, in general terms, the Lower Mainland area receives most of the international immigrants (90%) and interprovincial in-migrants (45%) in BC (BC Stats 2011). Population growth in the Thompson-Okanagan area is tied to a strong manufacturing base, as well as growing opportunities in forestry and mining; agriculture and tourism also influence migration flows to and from this region (BC Stats 2011). In the Edmonton Region, the urbanization process is expected to continue as the population of the Edmonton CD is expected to grow faster than the provincial average (Alberta Treasury Board and Finance 2012).

TABLE 5.3-3

POPULATION GROWTH PROJECTIONS IN THE SOCIO-ECONOMIC RSA

Socio-Economic Region	Comparable Census Division (CD)	2011 Population of Comparable CD	Projected Future Population (Year)
Edmonton Region	CD 11	1,238,756	2,012,310 (in 2041)
Rural Alberta Region	CD 14	29,111	29,635 (in 2041)
Jasper National Park Region	CD 15	40,032	47,110 (in 2041)
Fraser-Fort George/Thompson-Nicola Region	Thompson-Nicola Regional District	128,473	160,713 (in 2036)
Fraser Valley Region	Fraser Valley Regional District	277,593	405,483 (in 2036)
Metro Vancouver Region	Greater Vancouver Regional District	2,313,328	3,251,870 (in 2036)

Sources: Alberta Treasury Board and Finance 2012, BC Stats 2012, Statistics Canada 2012

Notes: Population totals for CD 15 include communities included in the Jasper National Park Region as defined for this assessment, but also others, hence the notably larger population for the comparable CD. Population projections are only available on a CD/Regional District basis.

Population mobility varies across the Socio-Economic RSA. Population mobility (represented by the percentage of population that are migrants, or those who moved to census subdivision between census periods) was highest in the Metro Vancouver Region (6.6% of the population moved to the region between 2009 and 2011) and lowest in the Fraser-Fort George/Thompson-Nicola Region and Fraser Valley Region (5.4% in both regions). Population mobility can be seen as an indication of the extent to which the work force is willing to move for work opportunities.

Many communities within the Socio-Economic RSA experience shadow populations. The shadow population in a community or region is the temporary population living in an area for certain times of the year, but who have a permanent residence elsewhere. Shadow populations may reside in project accommodations, hotels/motels and campgrounds or in private or rental accommodations. They can present local governance issues since they use local services and infrastructure in the municipality where they temporarily reside without contributing to the municipal tax base.

The percentage of private dwellings occupied by usual (permanent) residents compared to the total number of private dwellings can be an indication of the presence of a shadow population. Using that as a gauge, the Edmonton Region had the highest incidence of shadow population (with about 70% of private dwellings occupied by permanent residents) (Table 5.3-2). This, however, is tied to the numerous summer villages in the Edmonton Region which have a large flux of seasonal residents during the summer months. In 2011, in the City of Edmonton and Town of Stony Plain (key service centres crossed by the proposed pipeline corridor in the Edmonton Region), 91.3% and 93.8%, respectively, of private dwellings were occupied by permanent residents.

The Fraser-Fort George/Thompson-Nicola Region had the second highest indication of a shadow population. In 2011, the average percentage of private dwellings occupied by permanent residents was 88.4% across the region. Most communities and rural areas ranged from 75-94% of private dwellings occupied by permanent residents. The community with the lowest percentage was Sun Peaks Mountain Resort Municipality with 16.1%. This is likely due to the community's focus on recreational activities. Consultations with key informants in the Rural Alberta Region noted the presence of shadow populations due to the seasonal oil and gas industry workforce needs. Yellowhead County noted that, while their population is relatively steady (due to a consistent farming and agricultural economy), there are periodic population increases as a result of industrial resource based activities in the western part of the county. It has been noted that during periods of industrial activity in the past, there has been a shadow population in Yellowhead County of approximately 8,000 above the permanent population (Ramme, Lyons pers. comm.). During consultation, the City of Abbotsford in the Fraser Valley Region indicated that it receives approximately 3,500 to 4,000 seasonal workers annually for the farming industry (Koole pers. comm.).

Section 8.4.5 of the Socio-Economic Technical Report in Volume 5D provides information on housing (temporary and permanent accommodations) in the Socio-Economic RSA.

5.3.2 Income Levels and Distribution

This subsection presents an overview of current income levels and distribution in the Socio-Economic RSA. Income levels vary across the Socio-Economic RSA. In 2011, the median income of adults (population aged 15 or older) on a regional basis varied from a low of approximately $23,400 per year in the Fraser Valley Region to a high of approximately $39,800 per year in the Edmonton Region. For adults working full-year, full-time with employment income, the median income ranged from a low of approximately $45,700 per year in the Fraser-Fort George/Thompson-Nicola Region to a high of approximately $57,500 per year in the Edmonton Region. Table 5.3-4 provides further information on regional median incomes for all socio-economic regions.

TABLE 5.3-4

MEDIAN REGIONAL INCOMES ACROSS THE SOCIO-ECONOMIC RSA (2011)

Socio-Economic Region	Median Income, Population Aged 15+	Median Income, Population Aged 15+ Working Full-Year, Full-Time
Edmonton Region	$39,754	$57,525
Rural Alberta Region	$34,701	$59,090
Jasper National Park Region	$35,035	$50,092
Fraser-Fort George/Thompson-Nicola Region	$24,385	$46,196
Fraser Valley Region	$23,434	$45,707
Metro Vancouver Region	$32,412	$53,078

Source: Statistics Canada 2013a

5.3.3 Community Way-of-Life

This subsection draws attention to unique elements of the overall way-of-life in communities and regions across the Socio-Economic RSA that have been identified during stakeholder engagement. It discusses any key community events or assets that could interface directly or indirectly with the Project. This subsection also addresses key socio-cultural issues and interests identified by stakeholders related to the Project; drawing, at times, on issues related to other elements discussed elsewhere in the ESA. By its nature, community way of life is integrated with many issues and factors.

5.3.3.1 Edmonton Region

Generally, the Edmonton Region includes a range of communities from larger urban centres such as the City of Edmonton, to smaller communities such as the Village of Wabamun and various unincorporated hamlets such as Entwistle and Gainford (which are crossed by the proposed pipeline corridor). There are numerous summer villages in the Edmonton Region such as Sunrise Beach, Betula Beach and Seba Beach. Summer villages are small settlements with populations of less than 300 people that historically were mainly active in the summer and where most residents were seasonal. Such smaller communities, including the Village of Wabamun, experience seasonal increases in population that are based on summer tourism.

Given the high level of industrial activity in the Edmonton area, various communities in the region have experienced major projects. The proposed pipeline corridor is located in the Transportation/Utility Corridor (TUC) for approximately 90% of the length through the City of Edmonton, thus will minimize interference with community use areas. Communities west of Edmonton, including the City of Spruce Grove, the Town of Stony Plain and the Village of Wabamun, are very environmentally conscious and have an increased sensitivity to environmental issues as a result of the 2005 CN spill in Wabamun (Frostad, Hannah pers. comm.). The City of Spruce Grove and the Town of Stony Plain have experienced large population growth in recent years, given their proximity to the City of Edmonton and diversifying economies.

The Edmonton Social Plan consists of a collection of reports focusing on neighbourhoods, population, social needs and issues. Report topics include children, crime and victimization, families, people with disabilities, youth and young adults and new Canadians and Visible Minorities (City of Edmonton 2006).

Key community events and assets that have been identified in the region that could interface with the Project include the following.

- In Strathcona County, land crossed by the proposed pipeline corridor is used for recreation activities (approximately RK 4.0 to RK 5.0). Facilities include a rugby field and a dog-training facility at RK 5.5.

Key socio-cultural interests and issues in the region that have been identified by stakeholders related to the Project include:

- opportunities to use the right-of-way, particularly in the TUC, for recreational purposes (*e.g.*, walking, cross-country skiing, snowmobiling, community gardening);
- opportunities for local businesses, workers, and contractors;
- construction-related noise and traffic congestion;
- presence of temporary construction workers in smaller centres and the potential for social issues and strain on community services; and
- protection of land, vegetation, watercourses, and wildlife used for traditional Aboriginal livelihood and cultural purposes.

For further information on stakeholder and Aboriginal issues raised during the Project-specific consultation program, refer to Volume 3.

5.3.3.2 Rural Alberta Region

The Rural Alberta Region is more agricultural in nature than the Edmonton Region, with the Project crossing land primarily in the unincorporated rural areas of Yellowhead County. The region includes two municipal centres, the Town of Edson and the Town of Hinton (both of which are crossed by the proposed pipeline corridor), as well as several hamlets. Outdoor recreation opportunities and activities such as hiking, biking and skiing, are plentiful in both urban and unincorporated areas of the region, and are an important part of community way-of-life. The Town of Edson and the Town of Hinton have experience with major projects and oil and gas activities, as well as associated temporary workers.

Key community events and assets that have been identified in the region that could interact with the Project include:

- in the Town of Edson, the proposed pipeline corridor crosses Vision Park (approximately RK 228.8 to RK 229.8), which has heavily used baseball diamonds; and
- in the Town of Edson, existing trails used commonly for snowmobiling are located from RK 231 to RK 234.

Key socio-cultural interests and issues in the region that have been identified by stakeholders related to the Project include:

- opportunities for local businesses, workers, and contractors;
- economic spin-offs related to temporary Project workforce residing in regional communities;
- opportunities to use the right-of-way for recreational purposes (*e.g.*, walking, biking, horseback riding, snowmobiling), and the management of various recreational users of the right-of-way;
- the potential for crowding in housing, service pressures, and social issues related to temporary workers;
- construction-related noise;
- protection of cultural or heritage sites; and

- protection of land, vegetation, watercourses and wildlife used for traditional Aboriginal livelihood and cultural purposes.

For further information on stakeholder and Aboriginal issues raised during the Project-specific consultation program, refer to Volume 3.

Fraser-Fort George/Thompson-Nicola Region

As noted, the Fraser-Fort George/Thompson-Nicola Region includes a range of communities from a larger urban, service centre (the City of Kamloops) to smaller communities such as the Village of Valemount, District of Clearwater and the City of Merritt. Various unincorporated communities such as Blue River and Avola are also located in the Fraser-Fort George/Thompson-Nicola Region and are crossed by the proposed pipeline corridor. Outdoor recreation opportunities and activities such as hiking, skiing, snowmobiling and quad biking are plentiful in the region, in both urban areas and unincorporated areas; tourism and recreation opportunities are important parts of the local cultural identity in many communities.

Various communities in the region have experienced temporary population fluctuations from the construction of major projects. As a larger regional centre with a more diverse economy, the City of Kamloops is familiar with temporary construction crews and local businesses anticipate benefits from temporary workers, particularly temporary accommodation providers such as hotels and motels (Morris pers. comm.). The Village of Valemount was a construction hub during the TMX Anchor Loop Project, housing many workers during the construction period. The City of Merritt has experience with temporary workers related to transmission line development and highway development projects, and welcomes business opportunities associated with such projects.

The Kamloops Social Plan has a goal of enhancing the well-being of the residents of Kamloops. The plan focuses on housing and homelessness; safe places, alternative transportation and environmental health; youth issues; Aboriginal community; building social agencies and community capacity; children and families; and health and addictions (City of Kamloops 2009).

Key community events and assets that have been identified in the region that could interact with the Project include:

- in the District of Clearwater, the proposed pipeline corridor crosses the field of an elementary school (RK 720.2 to RK 720.5) and the field of a middle school (RK 1097.5 to RK 1097.8);
- near the Community of Little Fort, the proposed pipeline corridor crosses the Little Fort Cemetery (approximately RK 756.2 to RK 756.4);
- community trails are crossed in the Jacko Lake area of the City of Kamloops;
- Lac Du Bois Grasslands Protected Area is crossed in the City of Kamloops; and
- winter tourist season is highly valued in the northern parts of the region (*e.g.*, in Valemount and Blue River), while summer tourist season is highly valued in the southern parts of the region (*e.g.*, Clearwater, Kamloops, and Merritt).

Key socio-cultural interests and issues in the region that have been identified by stakeholders related to the Project include:

- opportunities for local businesses, workers, and contractors;
- economic spin-offs related to temporary Project workforce residing in regional communities;
- ensuring the protection of recreational trails and areas from over-use by temporary workers;
- potential for crowding in housing, service pressures, and social issues related to temporary workers;

- construction-related noise and traffic congestion in smaller communities and the potential to disturb tourists; and

- protection of land, vegetation, watercourses and wildlife used for traditional Aboriginal livelihood and cultural purposes.

For further information on stakeholder and Aboriginal issues raised during the Project-specific consultation program, refer to Volume 3.

Fraser Valley Region

The Fraser Valley Region includes various communities that represent urban and rural ways of life. Larger urban service centres such as the City of Abbotsford also have rural areas where agriculture plays an important role in the local economy. The region also has smaller service-based communities, such as the District of Hope. Outdoor recreation opportunities for hiking and camping are plentiful in the region.

The City of Chilliwack Healthier Community Strategic Action Plan outlines priorities for the city to address, including homelessness and affordable housing, crime and public safety, and addictions and mental health (Main Street Communications Ltd. 2011). The plan aims to build on previous initiatives, including neighbourhood-specific initiatives, to address community well-being issues for the city as a whole.

The City of Abbotsford's social plan, Abbotsford Cares, identifies key priority areas and recommendations. Priority areas include affordable and accessible housing, children's issues, community networks, community safety and crime prevention, diversity and inclusion, general community well-being, health issues, seniors' issues and youth issues (City of Abbotsford 2006).

Key community events and assets that have been identified in the region that could interact with the Project include:

- the proposed pipeline corridor crosses Mountain View Cemetery (approximately RK 1042.3) in the District of Hope;

- Cheam Lake Wetlands Regional Park is crossed by the proposed pipeline corridor (RK 1079.9 to RK 1080.0 and RK 1080.1 to RK 1080.4);

- the proposed pipeline corridor crosses an elementary school and a middle school in the City of Chilliwack (RK 1098.1 to RK 1098.3 and RK 1097.5 to RK 1097.8, respectively);

- the Ledgeview Golf and Country Club in the City of Abbotsford is crossed by the Project (approximately RK 1118.8 to RK 1119.8);

- popular community trails, including the Hope Lookout trail, in the District of Hope are crossed (approximately RK 1045.0);

- Othello Road in the District of Hope is a key road for residents, tourists and local business;

- camping areas located near the proposed crossing location along the Coquihalla River;

- the City of Abbotsford also hosts the Abbotsford Airshow annually in August, which attracts large crowds and typically fills all available hotels in Abbotsford, Chilliwack, Langley and Surrey is fully booked (Teichroeb pers. comm.); and

- agricultural production is key to the region's identity and economy.

Key socio-cultural interests and issues in the region that have been identified by stakeholders related to the Project include:

- opportunities for local businesses, workers, and contractors;

- economic spin-offs related to temporary Project workforce residing in regional communities;

- opportunities for improved access to and improved conditions of the Trans Canada Trail;
- potential for crowding in housing, service pressures, and social issues related to temporary workers;
- construction-related noise and traffic congestion; and
- protection of land, vegetation, watercourses, and wildlife used for traditional Aboriginal livelihood and cultural purposes.

For further information on stakeholder and Aboriginal issues raised during the Project-specific consultation program, refer to Volume 3.

Metro Vancouver Region

The Metro Vancouver Region is the most populous area in BC and includes multiple large urban, service centres, as well as the Village of Belcarra and Bowen Island. Municipalities that are crossed by the Project include the Township of Langley, the City of Surrey, the City of Coquitlam and the City of Burnaby. Outdoor recreation opportunities and activities such as boating, cycling and hiking are plentiful in both urban areas and unincorporated areas of the region.

The Metro Vancouver Region is experienced with large construction projects, with many occurring at any time given the strong pattern of urban growth and development in many member municipalities. Recent linear projects in municipalities crossed by the proposed pipeline corridor include the rapid transit Evergreen Line (currently under construction), the Port Mann Bridge and multiple highway upgrades.

The Township of Langley's Sustainability Charter seeks to balance social/cultural, economic and environmental present and future needs of the community. The social/cultural goals outlined in the charter include: celebrate our heritage; protect our people and properties; build corporate and community capacity; provide and support community-based leisure opportunities; and nurture a mindset of sustainability (Township of Langley 2008).

The City of Surrey's Plan for the Social Well-Being of Surrey Residents identifies priority areas and directs development. Priority issues include children and youth, housing and homelessness, and community development and inclusion (The Social Planning and Research Council of BC 2006). Additional issues identified by the Social Plan, including crime, public safety, substance abuse and addictions, are the focus of the Crime Reduction Strategy (City of Surrey 2007, 2013). The City of Surrey also has a Cultural Plan, the goals of which are to enhance arts, heritage and urbanization in the following areas: the city centre; town centres; the sense of community; community involvement potential; and the economy and city efforts (City of Surrey 2011a).

The City of Coquitlam focuses social planning on improving well-being and quality of life in the community. Social planning strategies include housing affordability and the Multiculturalism Strategic Plan (City of Coquitlam 2013).

The Burnaby Social Sustainability Strategy outlines various goals, priorities and actions to improve the quality of life of Burnaby citizens and provides a 10 year framework for city decisions. The strategic priorities build upon past work and include: meeting basic needs; celebrating diversity and culture; getting involved; learning for life; enhancing neighbourhoods; getting around; and protecting the community (City of Burnaby 2011). From the Burnaby Social Sustainability Strategy, an implementation plan was developed, outlining approved actions to focus on for approximately 5 years (City of Burnaby 2013).

Key community events and assets that have been identified in the region that could interact with the Project include:

- the proposed pipeline corridor crosses municipal and regional parks including the Hope Redwoods Natural Area in the Township of Langley (approximately RK 1151.2 to RK 1151.5), the Surrey Bend Regional Park in Surrey (approximately RK 1160.5 to RK 1164) and the Burnaby Mountain Conservation Area in Burnaby (approximately RK 0.3 to RK 1); and

- the proposed pipeline corridor crosses the Eaglequest Coquitlam golf course in the City of Coquitlam (approximately RK 1172.2 to RK 1173).

Key socio-cultural interests and issues in the region that have been identified by stakeholders related to the Project include:

- opportunities for local businesses, workers, and contractors;
- construction related noise and traffic congestion;
- disruption to residential and community use areas;
- noise impacts as well as visual impacts due to night lighting during construction and the expanded dock at the Westridge Marine Terminal; and
- protection of land, watercourses, vegetation and wildlife used for traditional Aboriginal livelihood and cultural purposes.

For further information on stakeholder and Aboriginal issues raised during the Project-specific consultation program, refer to Volume 3.

5.3.4 Aboriginal Culture

This subsection presents an overview of existing conditions in the Socio-Economic RSA pertaining to Aboriginal culture. Aboriginal people living both on and off reserve represent a unique demographic in the socio-economic regions. Across the Socio-Economic RSA, approximately 4% of the population is of Aboriginal identity (based on 2011 data). On a regional basis, the percentage of the population that identifies as Aboriginal varies from a low of 2.2% in the Jasper National Park Region to a high of 11.5% in the Rural Alberta Region (Table 5.3-2).

Overall, 62 Aboriginal communities have been identified as potentially affected by or as having interests in the Project. Ten IRs are crossed by the proposed pipeline corridor, all in BC. The location of these IRs and potentially affected Aboriginal communities in relation to the socio-economic regions is discussed in Section 5.4.2.

Key traditional land uses practiced by Aboriginal communities across the Socio-Economic RSA include hunting, fishing, trapping, gathering (food and medicinal plants, plants used for traditional crafts) and the ceremonial use or maintenance of spiritual sites. While these traditional land use or harvesting activities in many areas continue to play a role in subsistence or livelihoods for some, they also involve a sense of being in harmony with the land and animals, and a sense of independence and dignity to the harvester. In many Aboriginal communities, traditional land and resource use activities are a factor in the transmission of traditional culture and language, as much is learned culturally through working on the land during harvesting activities. Overall, these activities continue to have a high cultural value for many communities.

Given the high level of urbanization and the history of development in the Socio-Economic RSA, there is a relatively high degree of social and economic integration between Aboriginal and non-Aboriginal populations in many areas. Aboriginal people in many communities potentially affected by the Project participate in the wage economy and local industry, working as contractors and business owners in oil and gas, forestry and contracting/development. During Project engagement, many Aboriginal communities expressed interest in employment, contracting and economic opportunities associated with the Project. The relatively low levels of the use of Aboriginal language by those of Aboriginal identity in the Socio-Economic RSA reflect this social and economic integration. Use and knowledge of Aboriginal languages tends to be higher on-reserve.

Detailed overviews of the 62 potentially affected Aboriginal communities are found in Section 5.0 of the Socio-Economic Technical Report in Volume 5D. These Aboriginal community profiles summarise available information on the socio-economic setting and interests of each community, including: population; labour force; economic interests and capabilities; traditional livelihoods and culture; community services and infrastructure; community health; and overall way-of-life. Further detail on

Aboriginal traditional harvesting activities and areas is found in Section 5.2 of this volume and in the Traditional Land and Resource Use Technical Report in Volume 5D.

5.4 Human Occupancy and Resource Use

This subsection describes the current HORU in the HORU RSA. The spatial boundary for the HORU RSA is shown on Figures 5.4-1 to 5.4-7 and consists of the area extending beyond the HORU LSA (*i.e.*, the Footprint plus 1 km on both sides) where the direct and indirect influence of other land uses and activities could overlap with Project-specific effects and cause cumulative effects on the HORU indicators. This includes the RSA boundaries of fish and fish habitat, wetlands, vegetation and wildlife elements from Volume 5A. The HORU RSA was selected to reflect the general Project setting and to describe resource-use related elements that could be indirectly affected by the Project (*e.g.*, consumptive and non-consumptive recreation, hunting, trapping and fishing).

Information in this subsection is provided on parks and protected areas, residential use, IRs and traditional use areas, agricultural use, outdoor recreational use, other land and resource uses, water supply and use, aesthetic attributes and marine commercial, recreational and tourism use.

Potential Project-related effects and mitigation pertaining to HORU are discussed in Section 7.2.4.

The proposed pipeline corridor will cross a portion of west-central Alberta and the entire width of BC. The Alberta portion of the proposed pipeline corridor crosses trapping areas and land used for agricultural, commercial, industrial, oil and gas, recreational, rural and urban residential purposes. The BC portion of the proposed pipeline corridor crosses land uses for agricultural, commercial, forestry, industrial, mining, recreational, rural and urban residential, trapping areas, guide-outfitting and tourism purposes.

TRANS MOUNTAIN

FIGURE 5.4.1

HUMAN OCCUPANCY AND RESOURCE USE STUDY AREA BOUNDARIES

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Proposed Power Line
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- Human Occupancy and Resource Use Regional Study Area Boundary
- Human Occupancy and Resource Use Local Study Area Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: Modified Lambert Conformal Conic. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009; World Shaded Relief: Copyright:© 2009 ESRI

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DATE December 2013	TERA REF. 7894	REVISION 0
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0 25 50 75 100 km

ALL LOCATIONS APPROXIMATE

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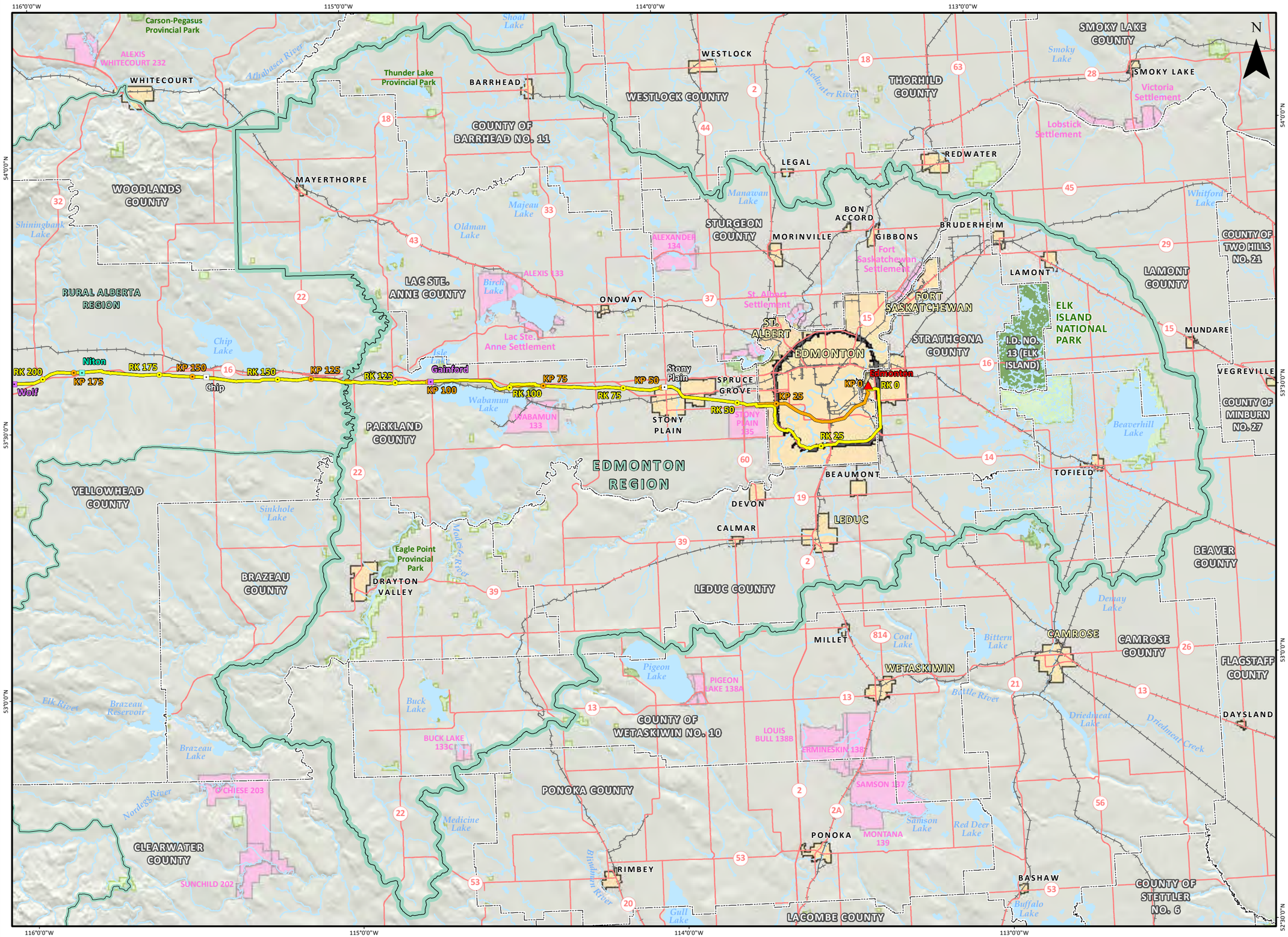

TRANSMOUNTAIN

FIGURE 5.4-2

HUMAN OCCUPANCY AND RESOURCE USE STUDY AREA BOUNDARIES – EDMONTON REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- HORU RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- Transportation and Utility Corridor (TUC)
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary

Projection: NAD 1983 UTM 11N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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DATE December 2013	TERA REF 7894	REVISION 0
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0 5 10 15 20 25 km

ALL LOCATIONS APPROXIMATE

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- Town / Vilage / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- HORU RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Regional District Boundary
- Provincial Boundary

Projection: NAD 1983 UTM 11N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

TRANS MOUNTAIN

FIGURE 5.4-3

HUMAN OCCUPANCY AND RESOURCE USE STUDY AREA BOUNDARIES – RURAL ALBERTA REGION

TRANS MOUNTAIN EXPANSION PROJECT

MAP NUMBER 201309_MAP_TERA_SE_00427_REV0_02		PAGE SHEET 2 OF 6
DATE December 2013	TERA REF. 7894	REVISION 0
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0 10 20 30 40 50 Km

ALL LOCATIONS APPROXIMATE

TRANSMOUNTAIN

FIGURE 5.4-4

HUMAN OCCUPANCY AND RESOURCE USE STUDY AREA BOUNDARIES – JASPER NATIONAL PARK REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Existing Pump Station
- Highway
- Railway
- HORU RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- Provincial Boundary

Projection: NAD 1983 UTM 11N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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DATE December 2013	TERA REF. 7894	REVISION 0
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0 5 10 15 20 25 km

ALL LOCATIONS APPROXIMATE

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Town / Village / Hamlet
Reference Kilometre Post (RK)
Kilometre Post (KP)
Trans Mountain Pipeline (TMPL)
Trans Mountain Expansion Project Proposed Pipeline Corridor
Proposed Power Line
Terminal
Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
New Pump Station (Proposed)
Existing Pump Station
Highway
Railway
HORU RSA Boundary
City / Town / District Municipality
Indian Reserve / Métis Settlement
National Park
Provincial Park
Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
Regional District Boundary
Provincial Boundary
International Boundary

TRANS MOUNTAIN

FIGURE 5.4-5

SOCIO-ECONOMIC AND HUMAN OCCUPANCY AND RESOURCE USE STUDY AREA BOUNDARIES – FRASER-FORT GEORGE / THOMPSON-NICOLA REGION

TRANS MOUNTAIN EXPANSION PROJECT

Projection: NAD 1983 UTM 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2013 Esri.

MAP NUMBER 201309_MAP_TERA_SE_00427_REV0_04			PAGE SHEET 4 OF 6
DATE December 2013	TERA REF. 7894		REVISION 0
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0 20 40 60 80 Km

ALL LOCATIONS APPROXIMTE

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TRANSMOUNTAIN

FIGURE 5.4-6

HUMAN OCCUPANCY AND RESOURCE USE STUDY AREA BOUNDARIES – FRASER VALLEY REGION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Proposed Power Line
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Existing Pump Station
- Highway
- Railway
- HORU RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- International Boundary

Projection: NAD 1983 UTM 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright© 2009 ESRI.

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0 4 8 12 16 20 km

ALL LOCATIONS APPROXIMATE

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TRANS MOUNTAIN

FIGURE 5.4-7

HUMAN OCCUPANCY AND RESOURCE USE
STUDY AREA BOUNDARIES – METRO VANCOUVER REGION

TRANS MOUNTAIN

- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Existing Pump Station
- Highway
- Railway
- HORU RSA Boundary
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Municipal / District Boundary
- International Boundary

Projection: NAD 1983 UTM 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Edmonton TUC: Alberta Infrstructure, 2011; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2013 Esri.

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DATE December 2013	TERA REF. 7894	REVISION 0
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0 2 4 6 8 10 km

ALL LOCATIONS APPROXIMATE

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Current and future land use in the vicinity of the proposed pipeline corridor is governed by a wide range of land use and development plans. Key regional and municipal land use and development plans and strategies developed for the area crossed by the proposed pipeline corridor are listed in Table 5.4-1. As described in the Section 5.4 and in the Socio-Economic Technical Report of Volume 5D, the Project will cross areas zoned or otherwise noted for a range of land uses or protection, including: environmental significance; residential and future residential; commercial and industrial; parks, open spaces and natural areas within urban settings; trail systems; resource/mineral potential; and community watersheds. In the Alberta regions, some plans account for the likelihood of pipeline development and provide guidance, which the Project will follow, to ensure compatibility between pipeline development and other land other uses. Most plans in BC do not explicitly discuss the coordination of pipeline activity in the context of other uses. It is anticipated that Trans Mountain will continue to engage with municipal representatives to ensure the principles and vision of long-term land development in the areas through which the Project passes are respected.

TABLE 5.4-1

KEY LAND USE PLANS IN THE PROPOSED PIPELINE CORRIDOR AND HORU LSA

Socio-Economic Region	Land Use Plan/Strategy
Edmonton Region	• Strathcona County Municipal Development Plan (MDP) Bylaw 1-2007 • The Way We Grow: MDP, Bylaw 15100 (City of Edmonton) • Your Bright Future: MDP 2010-2020 (City of Spruce Grove) • Entwistle Area Structure Plan Bylaw No. 23-2012 • Parkland County MDP, Bylaw No. 37-2007 • Parkland County Land Use Bylaw No. 20-2009 • Town of Stony Plain MDP 2005-2020 • Village of Wabamun MDP
Rural Alberta Region	• Yellowhead County MDP Bylaw No. 1.06 • Yellowhead County Land Use Bylaw No. 2.06 • Town of Edson MDP • Edson Urban Fringe Intermunicipal Development Plan • Town of Hinton MDP • Town of Hinton Community Development and Enhancement Plan • Hamlet of Evansburg Area Structure Plan Bylaw No. 12.03 • Hamlet of Wildwood Area Structure Plan • Coal Branch Sub-Regional Integrated Resource Plan • The Northern East Slopes Sustainable Resource and Environmental Management Strategy
Fraser-Fort George/Thompson-Nicola Region	• Robson Valley-Canoe Upstream Official Community Plan (OCP) • Valemount to Blue River Winter Recreation Sustainable Resource Management Plan (SRMP) • Robson Valley Land and Resource Management Plan-Summary • Eight Peaks Winter Recreation SRMP • Village of Valemount OCP • Blue River OCP • Avola OCP • District of Clearwater OCP • Nicola Valley OCP • Kamloops Land and Resource Management Plan (LRMP) • KAMPLAN OCP (City of Kamloops) • Kamloops North OCP • Kamloops Airport Area Land Use and Development Plan • Thompson-Nicola Regional District Zoning Bylaw No. 2400, 2012 • City of Merritt OCP • City of Merritt Zoning Bylaw No. 1894, 2004

TABLE 5.4-1 Cont'd

Socio-Economic Region	Land Use Plan/Strategy
Fraser Valley Region	• Fraser Valley Regional District OCP for Popkum-Bridal Falls part of Electoral Area "D" • Fraser Valley Regional District OCP for Portions of Electoral Area "B" Yale, Emory Creek, Dogwood Valley and Choate Bylaw No. 150, 1998 • Fraser Valley Regional District OCP for Electoral Area "E" Bylaw No. 1115, 2011 • Chilliwack Forest District SRMP • District of Hope OCP • City of Chilliwack OCP • City of Chilliwack Zoning Bylaw 2011 • City of Abbotsford OCP
Metro Vancouver Region	• Greater Vancouver Regional District OCP • Township of Langley OCP • City of Coquitlam Citywide OCP • Coquitlam Lougheed Neighbourhood Plan • City of Surrey OCP • Burnaby OCP • Port Metro Vancouver Consolidated Land Use Plan • Vancouver Fraser Port Authority Land Use Plan

Note: Land use plans pertaining to reactivated pipeline segments and particular facilities are discussed in Sections 5.9 and 6.0 respectively.

5.4.1 Parks and Protected Areas

This subsection identifies parks and protected areas with known human use within the proposed pipeline corridor and HORU LSA for each socio-economic region. Additional information on protected or conservation areas with an environmental or biological protection purpose is found in the Wildlife Technical Report, Fisheries (Alberta) Technical Report, Fisheries (British Columbia) Technical Report, Vegetation Technical Report and Wetland Evaluation Technical Report in Volume 5C. Refer to Section 7.1 of the Socio-Economic Technical Report in Volume 5D for a full discussion of parks and protected areas by socio-economic region. Figure 5.4-8 provides a summary of provincial parks, protected areas and recreation areas crossed by the proposed pipeline corridor. Refer to Section 7.1 of the Socio-Economic Technical Report of Volume 5D for figures of provincial parks, protected areas and recreation areas broken out by socio-economic region on a more detailed scale.

TRANS MOUNTAIN

FIGURE 5.4-8

PROVINCIAL PARKS, PROTECTED AREAS AND RECERATION AREAS ALONG THE PROPOSED PIPELINE CORRIDOR

TRANS MOUNTAIN EXPANSION PROJECT

- Town / Village / Hamlet
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Addition, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Highway
- Railway
- City / Town / District Municipality
- Indian Reserve / Métis Settlement
- National Park
- Provincial Park
- Protected Area / Natural Area / Provincial Recreation Area / Wilderness Provincial Park / Conservancy Area
- Provincial Boundary
- International Boundary

Projection: Modified LCC. Baseline TMPL provided by KMC, 2012; Study Corridor V6 provided by IPP, August 2013; Facilities: Provided by KMC, 2012; Transportation: IHS Inc., 2013, BC Forests, Lands and Natural Resource Operations, 2012 & Natural Resources Canada, 2012; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2013, IHS Inc., 2011, BC FLNRO, 2007 & ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2013, AltaLIS, 2012 & BC FLNRO, 2008; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2009 ESRI.

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ALL LOCATIONS APPROXIMATE

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Parks and protected areas with known human use along the proposed pipeline corridor are listed in Table 5.4-2. Parks and protected areas with known human use in the HORU LSA are listed in Table 5.4-3.

TABLE 5.4-2

PARKS AND PROTECTED AREAS CROSSED BY THE PROPOSED PIPELINE CORRIDOR

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
EDMONTON REGION				
Menisa	Municipal Park	• Menisa Park is a municipal park in the City of Edmonton. The park was named in October, 1984.	Unknown	Approximately RK 20.0 to RK 20.5
Richford	Municipal Park	• Richford Park is a municipal park located in the City of Edmonton.	Unknown	Approximately RK 24.5 to RK 24.7
Granville	Municipal Park	• Granville Park is a municipal park located in the City of Edmonton.	Unknown	Approximately RK 42.8 to RK 43
RURAL ALBERTA REGION				
No parks and protected areas are along the proposed pipeline corridor in the Rural Alberta Region.				
FRASER-FORT GEORGE/THOMPSON-NICOLA REGION				
Fraser River	Canadian Heritage River	• The Canadian Heritage Rivers System (CHRS) designated the Fraser River as a Canadian Heritage River in 1998. The Fraser River is largest river in BC (1,375 km), contains high value salmon habitat as well as staging and nesting areas for shorebirds and waterfowl. The river also contains high recreation values including fishing, rafting and boating. The headwaters are located in the Rocky Mountain Range, while the lower reaches and delta are located in the Lower Mainland, facilitating the development of the port of Vancouver.	N/A	RK 499.7
Finn Creek	Class A Provincial Park	• Established in 1996 as a result of recommendations made in the Kamloops LRMP. Grizzly bear, moose Chinook, coho and bull trout spawning habitat is present within the park. No facilities or services are located within the park. Management objectives for the park include maintaining the natural qualities and conditions of the park, fostering relationships with First Nations, maintaining visual, recreational and tourism values, maintaining diversity of wildlife species and habitats, allowing for continued casual recreation use, discouraging the introduction of non-native plant species and recognizing the long term potential to develop day and overnight facilities.	303	RK 638.7 to RK 639.3
North Thompson River	Class A Provincial Park	• Park offers picnicking, fishing, camping, and hiking opportunities. Established in 1967 with a campground on the shores of the Clearwater and North Thompson Rivers. The primary role of the park is to serve as a strategically situated overnight and stay-use stopover for the travelling public on Highway 5. As a secondary role, the park conserves river riparian habitats and a small but important example of the Interior Douglas-fir Thompson Moist Warm BGC subzone/variant. As a tertiary role, the park protects locally important archaeological values (kekuli pits).	126	RK 725.5 to RK 725.9
Lac du Bois Grasslands	Protected Area	• The protected area was established in 1996 resulting from the Kamloops LRMP process, and includes two Ecological Reserves: McQueen Creek Ecological Reserve and Tranquille Ecological Reserve. • The Lac du Bois Grasslands Protected Area encompasses native grassland communities, dry forests, rock outcrops, canyons, wetlands, ponds and small lakes. • The BC Ministry of Environment (MOE) is currently proposing additions to the protected area. These would extend the protected area east near the Rayleigh community and south with the Bachelor and Bachelor South additions.	15,000	RK 829.0 to RK 836.9
Ord Road	Municipal Dog Park	• Ord Road Dog Exercise Park is a municipal off-leash area for dogs in the City of Kamloops.	Unknown	Approximately RK 844.8 to RK 844.9
Kenna Cartwright	Municipal Nature Park	• Kenna Cartwright Nature Park is located in the City of Kamloops. It is the largest municipal park in BC and includes over 40 km of trails for hiking or cycling.	800	Approximately RK 848.4 to RK 850

TABLE 5.4-2 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
FRASER VALLEY REGION				
Coquihalla Summit	Recreation Area	• The recreation area was established in 1987 and contains four BGC zones and recreation activities such as fishing, hunting, horseback riding and hiking.	5,750	RK 992.4 to RK 1005.2
F.H. Barber[2]	Class A Provincial Park	• Established in 1978 to offer public access to the Fraser River.	8.5	RK 1062.8 to RK 1062.9
Cheam Lake Wetlands	Regional Park	• Cheam Lake Wetlands is a regional park located in Electoral Area D of the FVRD. The park's natural features include a lake, marsh and forested land. Recreational amenities include a 2 km trail system and wildlife viewing and picnicking opportunities.	107	Approximately RK 1079.9 to RK 1080.0 and RK 1080.1 to RK 1080.4
Straiton	Municipal Park	• Straiton Park is a 0.7 km municipal woodland trail in the City of Abbotsford.	Unknown	RK 1119.7 to RK 1120.3
METRO VANCOUVER REGION				
Ponder	Municipal Park	• Ponder Park is a municipal park in the Township of Langley. The park contains trails and a treed nature area.	Unknown	Approximately RK 1142.5 to RK 1143.3
Hope Redwoods	Municipal Natural Area	• Hope Redwood Natural Area is located in the Township of Langley. The natural area includes trails and a treed nature area.	Unknown	Approximately RK 1151.2 to RK 1151.5
Greenbelt (28A)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately RK 1158.2 to RK 1159
Greenbelt (27A)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately RK 1159.4 to RK 1159.5
Surrey Bend	Regional Park	• Surrey Bend Park is located in the northeast of the City of Surrey on the Fraser River and is owned by the City of Surrey and Metro Vancouver. The Surrey Bend Park protects a large undyked wetland in the lower Fraser River basin. Surrey Bend Park contains diverse wetland types and habitats for wildlife species. • The City of Surrey and Metro Vancouver initiated the development of a Management Plan for the park in 2009. The Management Plan endeavours to protect the unique natural characteristics of the park as well as provide recreational opportunities. The Management Plan includes a Concept Plan delineating the proposed locations of unfragmented areas of sensitive wetland habitats as well as recreational opportunities such as trails and a viewing pier and car park. The City of Surrey website notes that the development of park amenities is anticipated in the next two years.	348	Approximately RK 1160.5 to RK 1163.7
Fraser River	Canadian Heritage River	• The CHRS designated the Fraser River as a Canadian Heritage River in 1998. The Fraser River is largest river in BC (1,375 km), contains high value salmon habitat as well as staging and nesting areas for shorebirds and waterfowl. The river also contains high recreation values including fishing, rafting and boating. The headwaters are located in the Rocky Mountain Range, while the lower reaches and delta are located in the Lower Mainland, facilitating the development of the port of Vancouver.	N/A	RK 1168.9
Brunette River	Municipal Conservation Area	• The Brunette River Conservation Area forms part of Burnaby's Central Valley and drains into the Fraser River from Burnaby Lake. This river has a rich cultural heritage; the Kwantlen First Nations people had winter villages at this location. In recent years, volunteer organizations have worked to help re-establish the fish and wildlife populations of the river. The Brunette River watershed provides critical salmon habitat. The Brunette River Conservation Area contains a trail that follows the banks of the river.	Unknown	Approximately RK 1176.6
Meadowood	Municipal Neighbourhood Park	• Meadowood Park is a municipal neighbourhood park in the City of Burnaby.	0.7	Approximately RK 1179.2 to RK 1179.3

TABLE 5.4-2 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
Burnaby Mountain	Municipal Conservation Area	• Burnaby Mountain was established in 1930 and the Burnaby Mountain Conservation Area Plan was adopted by City of Burnaby Council in 1977. The Burnaby OCP notes that contemporary management plans are under preparation for Burnaby Mountain. The City of Burnaby is working towards consolidating ownership of the entire designated park and conservation area (700 ha). Burnaby Mountain is viewed as an important natural feature in the City and surrounding region. Within the conservation area boundaries are two industrial sites designated for petroleum storage and distribution uses, Trans Mountain's Burnaby terminal and a Petro Canada facility. • Burnaby Mountain offers environmental and recreational values. Burnaby Mountain contains numerous trails of varying difficulty and use and forms the headwaters of watersheds that drain into Burrard Inlet and Central Valley watersheds. Goals of the conservation area are to limit and regulate development in order to protect the natural area. The Burnaby Mountain Park and Conservation System includes Burnaby Mountain Conservation Area, Naheeno Park, Simon Fraser University Conservation Lands and Forest Grove Conservation Area.	700	Approximately RK 0.3 to RK 1
Westridge	Municipal Neighbourhood Park	• Westridge Park offers amenities related to sun-heated wading pools.	2.9	Approximately RK 1.6 to RK 1.8
Burrard Inlet	Municipal Conservation Area	• The Burrard Inlet Conservation Area is part of the City of Burnaby's park and conservation system on the Burrard Inlet foreshore. It is currently not fully developed.	2.3	Approximately RK 2 to RK 2.4

Sources: ATPR 2012, BC Integrated Land Management Bureau (ILMB) 1999, BC Parks 2013a, BC Parks 2013b, CHRS 2013, City of Abbotsford 2013, City of Burnaby 1998, City of Burnaby 2013, City of Chilliwack 2013, City of Coquitlam 2013, City of Edmonton 2013a, City of Kamloops 2013, City of New Westminster 2013, City of Spruce Grove 2013, City of Surrey 2010, City of Surrey 2013, FVRD 2008, Parkland County 2013, Tourism Burnaby 2013, Township of Langley 2013, Vyse and Clarke 2000

Notes: 1 Locations are approximate.

2 Though F.H. Barber Provincial Park is crossed briefly by the proposed pipeline corridor, Trans Mountain has determined the final right-of-way will avoid this park.

TABLE 5.4-3

PARKS AND PROTECTED AREAS IN THE HORU LSA

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
EDMONTON REGION				
Strathcona Science	Provincial Park	• The park is connected to Rundle Park by a pedestrian bridge and is a part of the Capital City Park trail system. It is within the Parkland-Central Parkland Natural Region. The park has no facilities on-site but does allow for recreational activities such as tobogganing, mountain biking and cycling, hiking, downhill and cross country skiing.	109.2	Approximately 1.1 km from RK 0.0
Village Park	Municipal Park	• Village Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.6 km from RK 4.0
Fountain Creek	Municipal Park	• Fountain Creek Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.8 km from RK 6.0
Maple Ridge Industrial	Municipal Park	• Maple Ridge Industrial Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.9 km from RK 6.5
Ivor Dent	Municipal Sports Park	• Ivor Dent Sports Park is a tournament facility offering soccer, rugby and cricket fields.	55.8	Approximately 0.8 km from RK 17.5
Charlesworth	Municipal Park	• Charlesworth Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.7 km from RK 18.5
Thomas Opalinski	Municipal Park	• Thomas Opalinski Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.9 km from RK 23.5
Big Bear	Municipal Park	• Big Bear Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.4 km from RK 24.0
MacEwan	Municipal Park	• MacEwan Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.4 km from RK 25.5

TABLE 5.4-3 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
Whitemud Ravine	Municipal Nature Reserve/Park	• Whitemud Ravine Park is located adjacent to Whitemud Nature Reserve in the City of Edmonton. The park offers the Alfred H. Savage Centre with washrooms and warm-up space. The park has on-site parking, picnic sites and hiking trails.	Unknown	Approximately 0.1 km from RK 28.0
Terwillegar South	Municipal Park	• Terwillegar Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.1 km from RK 29
Windermere Ravine	Municipal Park	• Windermere Ravine Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.3 km from RK 32.5
Cameron Heights	Municipal Park	• Cameron Heights Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.8 km from RK 36
Rural West	Municipal Park	• Rural West Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.9 km from RK 36.5
The Hamptons	Municipal Park	• The Hamptons Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.3 km from RK 38.5
Glastonbury	Municipal Park	• Glastonbury Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.3 km from R 40.3
Guinevere	Municipal Park	• Guinevere Park is a municipal park located in the City of Edmonton.	Unknown	Approximately 0.6 km from RK 40.5
Henry Singer	Municipal Ball Park	• Henry Singer Ball Park is a municipal ball park located in the City of Spruce Grove. The park has five baseball diamonds, all available for rent.	Unknown	Approximately 0.5 km from RK 58.2
Century	Municipal Off Leash Dog Park	• Century Off- Leash Dog Park is a municipal dog park located in the City of Spruce Grove.	Unknown	Approximately 0.1 km from RK 57.2
Rotary Centennial	Municipal Park	• Rotary Centennial Park is a municipal ball park located in the City of Spruce Grove.	Unknown	Approximately 0.6 km from RK 60.5
Meridian	Municipal Sports Park	• Meridian Sports Park is a municipal sports park located in Parkland County. The park has four baseball diamonds, a soccer field, bathrooms, picnic tables and parking for 120 vehicles.	Unknown	Approximately 0.4 km from RK 65.5
Wabamun Lake	Provincial Park	• The park is characterized by rolling terrain, a result of past glaciations. The proximity of Wabamun Lake and Lake Isle make the park an ideal birding location. Recreational activities also include hiking, camping and fishing.	213.3	Approximately 0.2 km from RK 96.4
Nojack	Campground/ Provincial Recreation Area	• This campground offers 24 campsites for both tents and RVs. Water, fire wood, picnic tables, dry toilets and a community camp kitchen are also available.	N/A	Approximately 0.2 km from RK 175.5
Yates	Natural Area	• Yates Natural Area has a diverse landscape dominated by black spruce-tamarack muskeg and several orchid species. The park is located in the Foothills-Lower Foothills Natural Region. No facilities are located onsite within the park. Recreational activities include hunting and hiking.	190.8	Approximately 0.1 km from RK 222.0
Unknown	Municipal Park	• This park is located at 2nd Avenue and 42nd Street in the Town of Edson.	Unknown	Approximately 0.8 km from RK 230.6
Unknown	Municipal Park	• This park is located at 8th Avenue and 46th Street in the Town of Edson.	Unknown	Approximately 0.7 km from RK 231.3
Unknown	Municipal Park	• This park is located between 45th and 46th Streets in the Town of Edson.	Unknown	Approximately 0.5 km from RK 231.5
Kinsmen	Municipal Park	• Kinsmen Park is a municipal park located in the Town of Edson. The park offers picnic areas, a children's playground and the Kinsmen Spray Park.	Unknown	Approximately 0.7 km from RK 231.8
Unknown	Municipal Park	• This park is located at 12th Avenue and 48th Street in the Town of Edson.	Unknown	Approximately 0.5 km from RK 232.1
Hornbeck Creek	Provincial Recreation Area	• Facilities within the park include fire pits, toilets and water pumps. Recreational activities include camping and swimming.	5.3	Approximately 0.6 km from RK 249.5
Obed Lake	Provincial Park	• Facilities within the park include firepits, a boat launch, fish-cleaning stations, a hand launch, pit/vault toilets and a water pump. Recreational activities available in the park include camping, canoeing/kayaking, fishing, ice fishing and power boating.	3,401.5	Approximately 0.2 km from RK 278.5

TABLE 5.4-3 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
FRASER-FORT GEORGE/THOMPSON-NICOLA REGION				
Mount Robson	Class A Provincial Park	• Established in 1913, Mount Robson is the second oldest provincial park in BC. The park features Mount Robson, the highest peak in the Canadian Rockies, the headwaters of the Fraser River, undisturbed wilderness and recreation and tourism opportunities including camping, hiking, canoeing, caving and wildlife viewing. Mount Robson is part of the United Nations Educational, Scientific and Cultural Organization Canadian Rocky Mountain Parks World Heritage Site. Management objectives include the use of an ecosystem-based management approach and development of a cultural interpretation program in collaboration with the Simpcw First Nation.	224,866	Approximately 1.1 km from RK 489.6
Rearguard Falls	Class A Provincial Park	• Rearguard Falls offers a viewpoint for visitors to witness Chinook salmon completing their journey from the Pacific. Recreational activities in the park include fishing, hiking, wildlife viewing and winter recreation activities including snowshoeing. A management plan is not available for the Rearguard Falls Provincial Park at this time.	48	Approximately 0.5 km from RK 498.3
Rearguard Falls	Class A Provincial Park	• Rearguard Falls offers a viewpoint for visitors to witness Chinook salmon completing their journey from the Pacific. Recreational activities in the park include fishing, hiking, wildlife viewing and winter recreation activities including snowshoeing. A management plan is not available for the Rearguard Falls Provincial Park at this time.	48	Approximately 0.5 km from RK 498.3
Jackman Flats	Class A Provincial Park	• The park is home to rare plant communities, shifting sand dunes and an ecosystem that is unique in BC. Recreational activities within the park include hiking, cross country skiing, bird watching and plant identification. It is a Class A park, established in 2000 as the result of recommendations in the Robson Valley LRMP. In addition to rare plant communities, Jackman Flats is known as an important winter range for ungulates and as a travel corridor for deer moose and elk. The Robson Valley LRMP outlines land and resource management direction for Jackman Flats Provincial Park; including, managing the park as a non-motorized use area, minimizing disturbance by restricting hiking to designated areas, considering closure of the existing road with public input and comments from BC Parks will be considered before resource activities adjacent to protected areas are approved.	615	Approximately 0.1 km from RK 508.4
Irvins	Regional Park and Campgrounds	• Irvins Park and Campgrounds are located in the Fraser-Fort George Regional District.	Unknown	Approximately 0.1 km from RK 522
George Hicks	Regional Park	• George Hicks Regional Park is located in the Fraser-Fort George Regional District.	Unknown	Approximately 0.1 km from RK 523
Pyramid Creek Falls	Class A Provincial Park	• Established in 1996 as a result of recommendations made in the Kamloops LRMP. The park was established to protect the waterfall and hanging valley as well as mixed old-growth cedar and hemlock mixed forests. No facilities or services are located within the park. Management objectives outlined in the Management Direction Statement for Pyramid Creek Falls Provincial Park include maintaining the natural qualities and conditions of the park, fostering relationships with First Nations, maintaining the visual setting of the falls for recreational and tourism values and allowing for continued casual recreation use.	13	Approximately 0.9 km from RK 585.0
Blue River Black Spruce	Class A Provincial Park	• Established in 1996 as a result of recommendations made in the Kamloops LRMP. The park was established to protect the southern portion of black spruce within the region. Ecological study opportunities are available within the area as well as river access for canoeing. No facilities or services are located within the park. Management objectives for the park include maintaining the natural qualities and conditions of the park, fostering relationships with First Nations, maintaining the visual, recreational and tourism values, allowing for continued casual recreation use and discouraging the introduction of non-native plant species.	175	Approximately 0.1 km from RK 610.7

TABLE 5.4-3 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
Blue River Pine	Class A Provincial Park	• Established in 1996 as a result of recommendations made in the Kamloops LRMP. The park was established to protect wetland and upland on sandy fluvial-glacial soils along the lower portion of the Blue River as well as dry lodgepole pine forests, uncommon in the North Thompson valley. No facilities or services are located within the park. Management objectives for the park include maintaining the natural qualities and conditions of the park, fostering relationships with First Nations, maintaining visual, recreational and tourism values, allowing for continued casual recreation use and discouraging the introduction of non-native plant species.	26.4	Approximately 0.4 km from RK 613.6
Wire Cache	Class A Provincial Park	• The park consists of a series of old river bends in the North Thompson River. Conservation values for the park include wetland habitat with old-grown cottonwood, spruce and cedar. No facilities or services are located within the park. Recreational activities in the park include canoeing, fishing, hunting, wildlife viewing and winter recreation. A management plan is not available for Wire Cache Provincial Park at this time.	50	Approximately 0.5 km from RK 662.7
Eakin Creek Canyon	Class A Provincial Park	• Includes a narrow rock canyon with steep walls, natural tunnels, and rock outcrops, and an 8 m waterfall. The park is accessed by gravel road off Highway 24, 5 km west of Little Fort. There are no developed trails and no facilities in the park. The park offers hiking, wildlife viewing, nature study, fishing, hunting, snowshoeing, and cross country skiing opportunities. The park was established in 1996 as a result of recommendations made in the Kamloops LRMP. Park values include conservation, recreation and tourism and cultural heritage, specifically the remnants of old placer gold mining operations (sluice box).	10	Approximately 0.2 km from RK 752.4
North Thompson Islands	Class A Provincial Park	• Established in 1996, the park contains remnants of Hudson Bay Company trail, as well as undisturbed floodplain islands. No facilities are provided in the park. Recreational activities include canoeing, fishing, hunting and wildlife viewing.	78.6	Approximately 0.5 km from RK 762.3
Chu Chua Cottonwood	Class A Provincial Park	• Protects typical, undisturbed floodplain islands in the North Thompson River lowlands. The park is accessed only by boat. There are no camping or day-use facilities provided. Recreational opportunities include wildlife viewing, boating, hunting, and fishing. Snowshoeing is permitted, but there are no designated trails. The park was established in 1996 as a result of recommendations made in the Kamloops LRMP. Park values include conservation, recreation and tourism and cultural heritage.	100	Approximately 0.1 km from RK 765.3
North Thompson Oxbows Jensen Island	Class A Provincial Park	• Established in 1996 from recommendations made in the Kamloops LRMP. • It consists of an oxbow feature that provides seasonal riparian habitats.	30	Approximately 0.5 km from RK 822.7
McQueen Creek	Ecological Reserve	• Established in 1982 to protect vegetation typical of the Middle Grassland in interior BC.	34	Approximately 0.2 km from RK 829.3
Westsyde Centennial	Municipal Park	• Westsyde Centennial Park is a neighbourhood park in the City of Kamloops.	Unknown	Approximately 0.9 km from RK 838.0
Rivers Trail	Municipal Park	• Rivers Trail Park is a linear municipal park in the Westsyde neighbourhood of the City of Kamloops.	Unknown	Approximately 0.6 km from RK 839.1
Crestline	Municipal Park	• Crestline Park is a neighbourhood park in the City of Kamloops.	Unknown	Approximately 0.2 km from RK 846.2
Pineview Valley	Municipal Park	• Pineview Valley Park is a linear municipal park in the City of Kamloops.	Unknown	Approximately 0.4 km from RK 852
Coldwater River	Class A Provincial Park	• Established in 1986 to protect portions of the Coldwater River valley ecosystem and for outdoor recreation activities.	Unknown	Approximately 0.1 km from RK 980.1
FRASER VALLEY REGION				
Coquihalla River	Class A Provincial Park	• Established in 1986 to provide recreation and rest stop opportunities to travellers on the Coquihalla Highway.	103	Approximately 0.1 km from RK 1025.4
Coquihalla Canyon	Class A Provincial Park	• Established in 1986 and contains the Othello Tunnels, built for the old Kettle Valley Railway.	159	Approximately 0.2 km from RK 1039
Kawkawa Lake	Municipal Park	• Kawkawa Lake Park is a former provincial park; currently a municipal park in the District of Hope.	Unknown	Approximately 0.1 km from RK 1041.6
Glenhalla	Municipal Park	• Glenhalla Park is a municipal park in the District of Hope.	Unknown	Approximately 0.3 km from RK 1042.9

TABLE 5.4-3 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
Thacker	Regional Park	• Thacker Park is a FVRD regional park located in the District of Hope. The park offers viewing opportunities of spawning and rearing channels for various salmon species.	11	Approximately 0.8 km from RK 1043
Bridal Veil Falls	Class A Provincial Park	• Established in 1965 to conserve scenic values, and offers day-use recreational opportunities such as hiking and viewing the falls.	32	Approximately 0.5 km from RK 1079.6
Sardis	Municipal Park	• Sardis Park is a municipal park located in the City of Chilliwack. The park features a trail, pond and play area.	5	Approximately 0.6 km from RK 1096.3
Watson Glen	Municipal Park	• Watson Glen Park is a municipal park located in the City of Chilliwack. The park includes a walking trail, playground area and other recreation features.	11.1	Approximately 0.5 km from RK 1099.1
Great Blue Heron	Municipal Nature Reserve	• The Great Blue Heron Nature Reserve is located in the City of Chilliwack. The nature reserve features an interpretive centre for a breeding colony of great blue herons. The Great Blue Heron Nature Reserve Society manages the reserve.	130	Approximately 0.9 km from RK 1104
Callaghan	Municipal Park	• Callaghan Park is a municipal park located in the City of Abbotsford.	Unknown	Approximately 0.5 km from RK 1118.3
Clayburn Creek	Municipal Park	• Clayburn Creek Park features a 2.6 km streamside trail in the City of Abbotsford.	Unknown	RK 1118.5 to RK 1118.8
McKinley	Municipal Park	• McKinley Park is a municipal park in the City of Abbotsford with sports courts.	Unknown	Approximately 0.4 km from RK 1119.9
Sandy Hill	Municipal Park	• Sandy Hill Park is a municipal park in the City of Abbotsford.	Unknown	Approximately 0.3 km from RK 1120.4
Kootenay	Municipal Park	• Kootenay Park is a municipal park in the City of Abbotsford.	Unknown	Approximately 0.5 km from RK 1121.3
Stoney Creek	Municipal Park	• Stoney Creek Park is a municipal park in the City of Abbotsford.	Unknown	Approximately 0.4 km from RK 1121.8
Bateman	Municipal Park	• Bateman Park is a municipal park in the City of Abbotsford with soccer fields.	Unknown	Approximately 0.4 km from RK 1121.8
Douglas Taylor	Municipal Park	• Douglas Taylor Park is a municipal park in the City of Abbotsford.	Unknown	Approximately 0.1 km from RK 1130.4
METRO VANCOUVER REGION				
Topham	Municipal Park	• Topham Park is a municipal park located in the Township of Langley. Amenities include sports fields, a playground and trails.	Unknown	Approximately 0.8 km from RK 1151.7
Telegraph Trail	Municipal Park	• Telegraph Trail is a municipal park located in the Township of Langley. Amenities include sports fields, a playground and trails.	Unknown	Approximately 0.7 km from RK 1152.6
West Langley	Municipal Park	• West Langley is a municipal park located in the Township of Langley. Amenities include sports fields, a playground and trails.	Unknown	Approximately 0.8 km from RK 1153.3
Greenbelt (27C)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.1 km from RK 1159
Barnston	Municipal Park	• Barnston Park is a municipal park in the City of Surrey with a nature area protecting two sensitive creeks and an open field.	3	Approximately 0.1 km from RK 1159.6
Greenbelt (27E)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.1 km from RK 1159.6
Greenbelt (26C)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.2 km from RK 1160.7
Abbey Glen	Municipal Park	• Abbey Glen is a municipal park in the City of Surrey and consists of an open greenspace and natural forested area.	Unknown	Approximately 0.6 km from RK 1161.2
Greenbelt (16A/B)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.4 km from RK 1161.6
J.R. Douglas	Municipal Park	• J.R. Douglas Park is a municipal park located in the City of Surrey. It includes forested areas, trails, open space and a playground.	Unknown	Approximately 0.8 km from RK 1163.1
Greenbelt (15M)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.3 km from RK 1163.2
North Slope	Municipal Park	• North Slope Park is a municipal park located in the City of Surrey. The park includes a wooded natural area and is intended as a conservation area.	Unknown	Approximately 0.1 km from RK 1164
Fraser View	Municipal Park	• Fraser View Park is a municipal park located in the City of Surrey. It contains open meadows and forest groves.	6.5	Approximately 0.1 km from RK 1164.6
Community (4F)	Municipal Park	• Community 4F Park is a municipal park located in the City of Surrey.	3.1	Approximately 0.1 km from RK 1165.2

TABLE 5.4-3 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
Northview	Municipal Park	• Northview Park is a municipal park located in the City of Surrey. It contains a trail and playground.	Unknown	Approximately 0.8 km from RK 1165.4
Greenbelt (4E)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.7 km from RK 1165.9
Robin	Municipal Park	• Robin Park is a municipal park located in the City of Surrey. It includes a multi-use grass field and a forest grove.	Unknown	Approximately 0.7 km from RK 1166.4
Greenbelt (3B)	Municipal Natural Area	• Greenbelts are natural linear areas in the City of Surrey designed to connect parks and open spaces.	Unknown	Approximately 0.5 km from RK 1166.9
Invergarry	Municipal Park	• Invergarry Park is a municipal park located in the City of Surrey and contains natural forest and riparian creek habitat. The park includes a mountain bike park.	37.5	Approximately 0.1 km from RK 1167.6
Victoria	Municipal Park	• Victoria Park is a municipal park located in the City of Surrey.	Unknown	Approximately 0.1 km from RK 1167.9
Mackin	Municipal Park	• Mackin Park is a municipal park located in the City of Coquitlam. The park includes sports and recreation amenities.	Unknown	Approximately 0.3 km from RK 1172.5
Burns	Municipal Park	• Burns Park is a municipal park located in the City of Coquitlam. It consists of a playground and spray park.	Unknown	Approximately 0.4 km from RK 1174
Hume	Municipal Park	• Hume Park is a municipal park located in the City of New Westminster. Facilities include sports fields, open spaces, a dog area, playgrounds and an outdoor pool.	Unknown	Approximately 0.7 km from RK 1174.2
Lower Lougheed	Municipal Park	• Lower Lougheed Park is a municipal park located in the City of Coquitlam. Amenities include a playground and sports courts.	Unknown	Approximately 0.2 km from RK 1174.3
Guilby	Municipal Park	• Guilby Park is a municipal park located in the City of Coquitlam that includes a playground.	Unknown	Approximately 0.1 km from RK 1174.5
Brookmere	Municipal Park	• Brookmere Park is a municipal park located in the City of Coquitlam that includes baseball fields.	Unknown	Approximately 0.5 km from RK 1175.2
Keswick	Municipal Neighbourhood Park	• Keswick Park is a municipal park located in the City of Burnaby and includes a playground.	3.3	Approximately 0.1 km from RK 1175.7
Lyndhurst	Municipal Neighbourhood Park	• Lyndhurst Park is a municipal park located in the City of Burnaby.	1.8	Approximately 0.8 km from RK 1176.1
Cameron	Municipal Neighbourhood Park	• Cameron Park is a municipal park located in the City of Burnaby that includes a playground.	6.1	Approximately 0.3 km from RK 1176.2
Bell	Municipal Neighbourhood Park	• Bell Park is a municipal park located in the City of Burnaby.	2.0	Approximately 0.1 km from RK 1176.4
Stoney Creek	Municipal Park	• Stoney Creek is a municipal park located in the City of Burnaby with important wildlife values. The park includes a trail system, playground and sports field.	7.6	Approximately 0.5 km from RK 1176.4
Eastlake	Municipal Neighbourhood Park	• Eastlake Park is a municipal park located in the City of Burnaby.	0.7	Approximately 0.1 km from RK 1176.6
Simon Fraser Hills	Municipal Neighbourhood Park	• Simon Fraser Hills Park is a municipal park located in the City of Burnaby.	1.8	Approximately 0.7 km from RK 1176.6
Burnaby Lake	Regional Nature Park	• Burnaby Lake Regional Nature Park is located in the City of Burnaby. The lake provides recreational opportunities such as rowing. The park is a regional wildlife sanctuary.	317.9	Approximately 0.4 km from RK 1177
Charles Rummel	Municipal Neighbourhood Park	• Charles Rummel Park is a municipal park located in the City of Burnaby. The park includes a playground and spray park.	8.3	Approximately 0.6 km from RK 1178
Eagle Creek	Municipal Ravine Park	• Eagle Creek Ravine Park is a municipal park located in the City of Burnaby.	7.2	Approximately 0.1 km from RK 1178.9
Burnaby 200	Municipal Conservation Area	• Burnaby 200 is a municipal conservation area in the City of Burnaby.	23.9	Approximately 0.5 km from RK 1178.9
Squint Lake	Municipal Neighbourhood Park	• Squint Lake Park is a municipal park located in the City of Burnaby. It includes walking trails, a playground and sports facilities.	10.7	Approximately 0.2 km from RK 1179.9

TABLE 5.4-3 Cont'd

Name	Designation	Overview of Purpose/Goal	Size (ha)	RK Range[1]
Glen Abbey Creek	Municipal Ravine Park	• Glen Abbey Creek Ravine is a municipal park located in the City of Burnaby.	0.4	Approximately 0.4 km from RK 1180
Duthie Union	Municipal Neighbourhood Park	• Duthie Union Park is a municipal park located in the City of Burnaby.	4.1	Approximately 0.1 km from RK 1

Sources: ATPR 2012, BC Integrated Land Management Bureau (ILMB) 1999, BC Parks 2013a, BC Parks 2013b, CHRS 2013, City of Abbotsford 2013, City of Burnaby 1998, City of Burnaby 2013, City of Chilliwack 2013, City of Coquitlam 2013, City of Edmonton 2013a, City of Kamloops 2013, City of New Westminster 2013, City of Spruce Grove 2013, City of Surrey 2010, City of Surrey 2013, FVRD 2008, Parkland County 2013, Tourism Burnaby 2013, Township of Langley 2013, Vyse and Clarke 2000

Notes: 1 Locations are approximate.

5.4.1.1 Edmonton Region

No provincial parks or protected areas are directly crossed by the proposed pipeline corridor in the Edmonton Region. However, three municipal parks within the City of Edmonton are crossed by the proposed pipeline corridor: Menisa Municipal Park (approximately RK 20.0 to RK 20.5); Richford Municipal Park (approximately RK 24.5 to RK 24.7); and Granville Municipal Park (approximately RK 42.8 to RK 43), described in Table 5.4-2. There are 2 provincial parks, 15 municipal parks, 1 nature reserve, 2 municipal sports parks, 1 municipal ball park and 1 municipal off-leash dog park located in the HORU LSA in this region, described in Table 5.4-3. The closest provincial park is Wabamun Lake Provincial Park; the proposed pipeline corridor is located about 200-300 m north of the park from approximately RK 95 to RK 97 (Village of Wabamun 2010).

There are a range of parks and protected areas in the HORU RSA. While these are not located within or near the proposed pipeline corridor, access to these areas in some instances may be via roads crossed by the proposed pipeline corridor and utilized by the Project. Overall, there are 6 provincial parks, 1 national park, 42 natural areas and 5 provincial recreation areas in the HORU RSA in this region. Additionally, there is one Important Bird Area located in the HORU RSA of the Edmonton Region (Important Bird Areas Canada 2013). Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values. Site-specific management plans are not available for each park within the Edmonton Region. A framework for provincial parks within this region is outlined within the Alberta Plan for Parks 2009-2019 (ATPR 2009), created in alignment with the Government of Alberta's Land Use Framework (2008). The vision for Alberta parks is to "inspire people to discover, value, protect and enjoy the natural world and the benefits it provides for current and future generations" (ATPR 2009).

There are a number of land use and management plans relevant to the region that contain references pertaining to parks and protected areas. According to the Parkland County MDP, the proposed pipeline corridor crosses three areas zoned as environmentally significant (approximately RK 64, RK 81 and RK 126). The MDP further describes these as regionally significant areas, and plans to protect environmentally significant areas from inappropriate development (Parkland County 2007). The Parkland County Recreation Plan stresses the importance (culturally and environmentally) of the river valleys within Parkland County (crossed by the proposed pipeline corridor at RK 33.5). The plans indicates that these areas must be protected through careful planning of any proposed development. The county aims to continue expanding its park and open space system by acquiring new parcels of land (but must be more than 2.0 ha) (RC Strategies 2009). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as environmentally significant.

The proposed pipeline corridor crosses several areas zoned as parks, open spaces and natural areas in the Town of Stony Plain (approximately RK 62, RK 63, RK 64, RK 65 and RK 67). The Stony Plain MDP promotes linkages between these natural areas and other parks within the city (Armin A. Preiksaitis & Associates 2005). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as parks, open spaces and natural areas.

According to the Spruce Grove MDP, the proposed pipeline corridor crosses through five areas zoned as open space (at approximately RK 58, RK 60, RK 62, RK 63 and RK 64). Of these five areas, two are identified as existing Stormwater Management Facilities (RK 58 and RK 60), one is a proposed park (RK 63) and the larger one is identified as an environmentally significant area (RK 60). The Spruce Grove MDP further describes this Environmentally Significant Area (Area F) as containing a mix of upland forest and wetlands, which could act as a wildlife corridor between other areas of the city. The Spruce Grove MDP requires an assessment for any proposed development within these areas. The assessment should include a description of the development and potential effects, mitigation measures, and the viability and sustainability of the natural area (City of Spruce Grove 2010). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as environmentally significant.

5.4.1.2 Rural Alberta Region

There are no known Provincial or municipal parks or protected areas crossed by the proposed pipeline corridor in the Rural Alberta Region, described in Table 5.4-2. There is one provincial park (Obed Lake Provincial Park), one natural area, two provincial recreation areas and five municipal parks located in the HORU LSA in this region, described in Table 5.4-3.

There are a range of parks and protected areas in the HORU RSA. While these are not located within or near the proposed pipeline corridor, access to certain of these areas may be via roads crossed by the proposed pipeline corridor and utilized by the Project. Overall, there are 3 provincial parks (with 1 special management zone), 12 natural areas, 2 wildland provincial parks, 20 provincial recreation areas, 1 wilderness area, 1 ecological reserve, 1 wilderness park and 1 wildland park in the HORU RSA in this region. Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values. Jasper National Park is located west of the Rural Alberta Region, outside of the Rural Alberta Region HORU RSA; the proposed pipeline corridor does not traverse the Jasper National Park (see Section 6.1.6 for the setting pertaining to the Jasper Pump Station).

Site-specific management plans are not available for each provincial park within the Rural Alberta Region. A framework for parks within this section is outlined in the Alberta Plan for Parks 2009-2019 (ATPR 2009), created in alignment with the Government of Alberta's Land Use Framework (2008).

There are a number of land use and management plans relevant to the region that contain references pertaining to parks and protected areas. Yellowhead County plans to develop a Recreation Master Plan to guide management of, and investment in parks, open spaces and trails (Yellowhead County 2006). According to the Edson MDP, the proposed pipeline corridor crosses through an area zoned as existing schools, parks and public open spaces at approximately RK 229 (Vision Park) (Town of Edson 2006). The plan does not specify any restrictions or considerations pertaining to pipeline construction within this zone. The proposed pipeline corridor crosses an area zoned as neighbourhood and district open space in the Hinton Parks Master Plan. The Hinton Parks Master Plan defines open space as all undeveloped and developed reserve land, right-of-ways, Environmental Reserve, buffers, boulevards, trails, natural areas and utility lots. The Hinton Parks Master Plan indicates that these areas will serve aesthetic and buffering functions for nearby transportation and utility rights-of-way (ISL Infrastructure Systems 2003). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as neighbourhood and district open space.

The proposed pipeline corridor crosses an area zoned as open space - passive recreation/environment along the southern border of the town. The Hinton MDP describes the need for passive recreation areas for amenity, aesthetics and activities such as walking and picnicking (Town of Hinton 1998). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as open space – passive recreation/environment.

5.4.1.3 Fraser-Fort George/Thompson-Nicola Region

The proposed pipeline corridor crosses three provincial parks or protected areas in this region: Finn Creek Provincial Park (approximately RK 638.7 to RK 639.3); North Thompson River Provincial Park (approximately RK 725.5 to RK 725.9); and Lac du Bois Grasslands Protected Area (approximately RK 829.0 to RK 836.9). The proposed pipeline corridor also crosses two municipal parks in this region: Ord Road Municipal Park in the City of Kamloops (approximately RK 844.8 to RK 844.9); and Kenna

Cartwright Municipal Park in the City of Kamloops (approximately RK 848.4 to RK 850.0), described in Table 5.4-2.

There are 12 Class A provincial parks, 1 ecological reserve, 2 regional parks and 1 municipal park located in the HORU LSA in this region, described in Table 5.4-3. Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values.

There are a number of parks and protected areas in the HORU RSA. While these are not located near the proposed pipeline corridor, access to these areas in some instances may be via roads crossed by the proposed pipeline corridor and utilized by the Project. Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values.

There are a number of land use and management plans relevant to the region that contain references pertaining to parks and protected areas. According to the Fraser-Fort George Regional District Robson Valley-Canoe Upstream OCP, the proposed pipeline corridor crosses through two areas zoned as public development/institutional at approximately RK 519 and RK 522. This zone is described as an area for community related uses such as recreation areas, parks, public open spaces, treatment sites or school sites (RDFFG 2006). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as public development/institutional. The TNRD RGS notes its objective to create an open space planning system and to work with communities to create more parks, recreation sites and open space facilities (TNRD 2000). This plan does not specify any restrictions or considerations pertaining to pipeline construction.

5.4.1.4 Fraser Valley Region

The proposed pipeline corridor crosses two Provincial parks or protected areas in this region: Coquihalla Summit Recreation Area (approximately RK 992.4 to RK 1005.2); and a very small portion of F.H. Barber Provincial Park (approximately RK 1062.8 to RK 1062.9). The proposed pipeline corridor also crosses Cheam Lake Wetlands Regional Park in the FVRD (approximately RK 1079.9 to RK 1080.0 and RK 1080.1 to RK 1080.4) and Straiton Municipal Park in the City of Abbotsford (approximately RK 1119.7 to RK 1120.3), described in Table 5.4-2. There are 3 provincial parks, 1 regional park, 1 municipal nature reserve and 12 municipal parks located in the HORU LSA in this region, as described in Table 5.4-3. Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values.

There are a range of parks and protected areas in the HORU RSA. While these are not located near the proposed pipeline corridor, access to some of these areas may be via roads crossed by the proposed pipeline corridor and utilized by the Project. For example, access to Cultus Lake Provincial Park (located in the HORU RSA) is crossed by the proposed pipeline corridor. Overall, there are 17 provincial parks, 10 ecological reserves, 1 wildlife management area, 3 protected areas and 1 Canadian Heritage River in the HORU RSA in this region. Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values.

There are a number of land use and management plans relevant to the region that contain references pertaining to parks and protected areas. Within the urban area of Abbotsford, the proposed pipeline corridor crosses areas zoned as city parks and open space at approximately RK 1118.6 and RK 1120.6, and crosses a proposed park space at approximately RK 1117.6 (City of Abbotsford 2005). In the rural area of Abbotsford, the proposed pipeline corridor crosses a city parks and open space area at approximately RK 1130.6 (City of Abbotsford 2005).

5.4.1.5 Metro Vancouver Region

The proposed pipeline corridor crosses the Surrey Bend Regional Park (approximately RK 1160.5 to RK 1163.7), Burnaby Mountain Municipal Conservation Area (approximately RK 0.3 to RK 1); Westridge Municipal Neighbourhood Park (approximately RK 1.6 to RK 1.8); and Brunette River Municipal Conservation Area in the City of Burnaby (approximately RK 1176.6), as well as several other municipal parks and a Canadian Heritage River (Fraser River), described in Table 5.4-2. There is 1 municipal conservation area, 7 municipal natural areas, 30 municipal and neighbourhood parks and 1 regional nature park located in the HORU LSA in this region, as described in Table 5.4-3. Each protected area

was established with specific management objectives, to conserve environmental, scenic and recreational values.

There are a range of parks and protected areas in the HORU RSA. While these are not located within the pipeline corridor, access to these areas is available via roads that may be crossed by the proposed pipeline corridor and utilized by the Project. Overall, there are 8 provincial parks, 2 ecological reserves and 7 wildlife management areas in the HORU RSA in this Region. Additionally, there are two national wildlife areas, a National Historic Site of Canada, a Ducks Unlimited Canada project, a Ramsar wetland site and a migratory bird sanctuary in the HORU RSA. Each protected area was established with specific management objectives, to conserve environmental, scenic and recreational values.

There are a number of land use and management plans relevant to the region that pertain to parks and protected areas. The proposed pipeline corridor crosses several conservation and recreational areas in Burnaby, Coquitlam and Surrey. The Metro Vancouver RGS describes the Metro Vancouver Regional Parks and Greenways Plan as a way to protect and improve conservation and recreational areas and to create buffers along these areas to protect them from other nearby activities. The Metro Vancouver RGS also notes that utility companies should avoid fragmentation of these areas and where unavoidable, should consider mitigation measures (Metro Vancouver 2010a).

The GVRD OCP further outlines plans to develop the Metro Vancouver Regional Recreational Greenway Network, which are connections/corridors between conservation and recreational areas within the region (for both recreational and conservation purposes). Although the proposed pipeline corridor crosses these connections, the network is currently conceptual (Metro Vancouver 2010a).

According to the Southwest Coquitlam and the Waterfront Village Neighbourhood Plans in the City of Coquitlam, the proposed pipeline corridor crosses two areas zoned as parks/open spaces/natural areas at approximately RK 1171.6 (City of Coquitlam 2001). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as parks/open spaces/natural areas.

5.4.2 Indian Reserves, Métis Settlements and Asserted Traditional Territories

This subsection discusses IRs and Métis Settlements along the proposed pipeline corridor and in the HORU RSA within each socio-economic region, as well as the asserted Aboriginal traditional territories potentially affected by the Project. Refer to Section 7.2 of the Socio-Economic Technical Report of Volume 5D for a full discussion of IRs and communities.

The proposed pipeline corridor crosses 10 IRs, 3 of which are within the Fraser-Fort George/Thompson-Nicola Region and 7 of which are in the Fraser Valley Region as described in Table 5.4-4. No IRs are crossed by the proposed pipeline corridor in the Edmonton, Rural Alberta or Metro Vancouver regions.

TABLE 5.4-4

INDIAN RESERVES CROSSED BY THE PROPOSED PIPELINE CORRIDOR

Indian Reserve Crossed	Aboriginal Community	Populated (Yes/No)	Approximate RK Range
Fraser-Fort George/Thompson-Nicola Region			
Zoht 5	Lower Nicola Band	No	RK 912 to RK 912.8
Zoht 4	Lower Nicola Band	Yes	RK 917.5 to RK 918.5
Joeyaska No. 2	Lower Nicola Band	Yes	RK 930.4 to RK 931.1
Fraser Valley Region			
Ohamil 1	Shxw'owhamel Band	Yes	RK 1057.6 to RK 1058.8
Peters 1	Peters Band	Yes	RK 1062.9 to RK 1064.9
Peters 1A	Peters Band	No	RK 1064.5 to RK1064.6
Popkum 1	Popkum Band	Yes	RK 1075.8 to RK 1077.2

TABLE 5.4-4 Cont'd

Indian Reserve Crossed	Aboriginal Community	Populated (Yes/No)	Approximate RK Range
Grass 15	Aitchelitz Kwaw-kwaw-apilt Shxwha:y Village Skowkale Skwah Soowahlie Squiala Tzeachten Bane Yakweakwioose	No	RK 1091.1 to RK 1091.6
Tzeachten 13	Tzeachten Band	Yes	RK 1096.9 to RK 1097.5
Matsqui Main 2	Matsqui Band	Yes	RK 1129.4 to RK 1129.6

Source: Statistics Canada 2012

Within the HORU RSA as a whole (including the proposed pipeline corridor), the Edmonton Region includes 6 IRs, the Rural Alberta Region includes 3 IRs, the Fraser-Fort George/Thompson-Nicola Region includes 49 IRs, the Fraser Valley Region includes 88 IRs and the Metro Vancouver Region includes 21 IRs.

Overall, 62 Aboriginal communities have been identified as potentially affected by the Project, as discussed in Section 5.2. Of these, 9 of the Aboriginal communities are located in the Edmonton Region, 5 are located in the Rural Alberta Region, 15 are located in the in the Fraser-Fort George/Thompson-Nicola Region, 23 are located in the Fraser Valley Region and 9 are located in the Metro Vancouver Region. One additional potentially affected Aboriginal community is located in the Jasper National Park Region, which is unaffected by the proposed pipeline corridor. Some asserted traditional territories fall in more than one socio-economic region, but for the purposes of discussion each Aboriginal community is located only once. Detailed overviews of the Aboriginal communities identified as potentially affected by the Project are found in Section 5.0 of the Socio-Economic Technical Report of Volume 5D.

Key traditional land use practices by Aboriginal communities across the HORU RSA include hunting, fishing, trapping, gathering (food and medicinal plants, plants used for traditional crafts) and the ceremonial use or maintenance of spiritual sites. These traditional practices are carried out today for both cultural and subsistence purposes. Further detail on traditional harvesting activities and areas is found in Section 5.2 as well as in the Traditional Land and Resource Use Technical Report of Volume 5D.

5.4.3 Residential Use

This subsection identifies residential use areas crossed by and near the proposed pipeline corridor in each socio-economic region. For the purposes of this assessment, residential use areas as identified through available municipal maps and plans are the focus of discussion, as opposed to particular residential properties. Residential use areas may encompass municipal parks, playgrounds and schools as well as housing. One of the key routing principles for the Project was the avoidance of residential areas to the greatest extent possible. Several routing decisions have been made to avoid more densely populated residential areas (*i.e.*, avoidance of Westsyde neighbourhood in the City of Kamloops). Refer to Section 7.3 of the Socio-Economic Technical Report of Volume 5D for a full discussion of residential use areas.

5.4.3.1 Edmonton Region

In the Edmonton Region, the proposed pipeline corridor crosses urban and residential centres such as Strathcona County, the City of Edmonton, the City of Spruce Grove and the Town of Stony Plain.

Rural residential parcels are also present within the Edmonton Region and are typically located in the western portion.

While the proposed pipeline corridor is within the TUC within Strathcona County, it is within about 100 m of a residential area that is adjacent to the TUC from approximately RK 3 to RK 5.2 according to the Strathcona County MDP (Strathcona County 2007). There currently have been no residences identified in areas crossed by the proposed pipeline corridor in the City of Edmonton. However, in the City of Edmonton the proposed pipeline corridor crosses through an area zoned as developing, planned and future neighbourhoods from approximately RK 42 to RK 45. The Edmonton MDP explains that the completion of these neighbourhoods is dependent on achieving population thresholds, the use of existing infrastructure and the provision of new infrastructure and public services (City of Edmonton 2010). In the City of Spruce Grove, the proposed pipeline corridor crosses two areas that are zoned for residential use (approximately RK 61 and RK 63). Residential properties with residences are crossed by the proposed pipeline corridor in the City of Spruce Grove. In the Town of Stony Plain, the proposed pipeline corridor crosses through several areas zoned for urban residential use at approximately RK 63, RK 67 and RK 68 according to the Stony Plain MDP. It is the objective of the Stony Plain MDP to develop complete neighbourhoods (with local facilities and services) within these zones (Armin A. Preiksaitis & Associates 2005). There have been no residences identified in areas crossed by the proposed pipeline corridor in the Town of Stony Plain to date. In the Village of Wabamun, the proposed pipeline corridor does not cross through land zoned for residential use, nor residential properties (Village of Wabamun 2010). There currently have been no residences identified in areas crossed by the proposed pipeline corridor in the Village of Wabamun.

The proposed pipeline corridor also crosses the Hamlet of Entwistle, as well as rural residential areas in the region. Rural residential properties crossed by the proposed pipeline corridor generally occur near incorporated municipalities and hamlets, including the Town of Stony Plain, the City of Spruce Grove, the Hamlet of Entwistle and the Village of Wabamun. In Parkland County, the proposed pipeline corridor crosses through land zoned as country residential core (approximately RK 74 to RK 77, and RK 81, RK 111 to RK 115). From the Town of Stony Plain to Highway 43 there is a high density of country residential land use (approximately RK 67 to RK 92) (Hanlan pers. comm.).

5.4.3.2 Rural Alberta Region

In the Rural Alberta Region, the proposed pipeline corridor crosses residential land use in the Town of Edson and Town of Hinton. The proposed pipeline corridor also crosses through three hamlet growth areas within Yellowhead County: Niton Junction (approximately RK 187); Wildwood (approximately RK 151); and Evansburg (approximately RK 137). The Yellowhead County MDP notes that these growth areas have a 3 km radius around existing hamlets and provides space to accommodate new development (Yellowhead County 2006). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as hamlet growth areas.

Within the Town of Edson, the northern portion of the proposed pipeline corridor is mainly residential and the south is mainly commercial/light industrial. Zoning changes have occurred to the area directly south of RK 231 where a new residential area (Hillendale Phase II) is planned (108 lots, 2 apartments and some multiplex lots). Land use along the proposed pipeline corridor, within the Town of Edson, is mainly residential (Lemieux pers. comm.).

The proposed pipeline corridor also crosses close (approximately 500 m from the southern boundary) to the community districts of Terrace Heights, Hillcrest, Eaton and Thompson Lake in the Town of Hinton. The Hinton MDP indicates future residential and recreational development in both the Eaton and Thompson Lake districts (Town of Hinton 1998). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as future growth areas.

5.4.3.3 Fraser-Fort George/Thompson-Nicola Region

In the Fraser-Fort George/Thompson-Nicola Region, the proposed pipeline corridor crosses various types of residential land use, from rural parcels with residences to urban centres such as the City of Kamloops. Generally, other Project facilities do not occur in residential areas. The Kamloops Pump Station is located within the boundaries of the City of Kamloops but is not located in the vicinity of a residential neighbourhood.

The proposed pipeline corridor crosses two special residential development areas (Brocklehurst West at approximately RK 845 and Batchelor Hills at approximately RK 840) outlined in the Kamloops OCP 2004.

The Kamloops Airport Land Use and Development Plan indicates that the proposed pipeline corridor crosses land that is zoned for future residential use (approximately RK 845) (Urban Systems 2000). These plans do not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as residential development areas or future residential use.

5.4.3.4 Fraser Valley Region

In the Fraser Valley Region, the proposed pipeline corridor crosses residential land use in the District of Hope, the City of Chilliwack and the City of Abbotsford. The Sumas Terminal is located in the vicinity of residential use land in the City of Abbotsford.

In the District of Hope, the proposed pipeline corridor crosses areas zoned for country residential, single family residential, multiple family residential and a mobile home park (approximately RK 1048.6). In Chilliwack, the proposed pipeline corridor crosses areas zoned as one-family residential, low density multi-family residential and rural residential (City of Chilliwack 2001). These plans do not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as country residential, single family residential, multiple family residential, mobile home park or one-family residential, low density multi-family residential and rural residential.

According to the Abbotsford OCP, the proposed pipeline corridor crosses two areas zoned as urban residential and an area zoned as city residential (City of Abbotsford 2005). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as urban residential or city residential. In Abbotsford, there has been a fair amount of development around the existing TMPL right-of-way (Teichroeb pers. comm.). There are also developments anticipated on top of Sumas Mountain, including Auguston, an area which is anticipating approximately 1,500 new homes and the Vicarro Ranch (Teichroeb pers. comm.).

5.4.3.5 Metro Vancouver Region

In the Metro Vancouver Region, the proposed pipeline corridor crosses residential land use in the Township of Langley, City of Coquitlam and the City of Burnaby.

The proposed pipeline corridor crosses an area zoned for residential use (approximately RK 1146.6), which the Langley OCP labels as Salmon River Uplands (Township of Langley 1979). According to the Lougheed Neighbourhood Plan in the City of Coquitlam, the proposed pipeline corridor crosses areas zoned as high and medium density apartments, compact one-family residential and neighbourhood attached residential (approximately RK 1174.6) (City of Coquitlam 2001). These plans do not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as Salmon River Uplands, high and medium density apartments, compact one-family residential or neighbourhood attached residential.

According to the Burnaby OCP, the proposed pipeline corridor crosses various residential areas, including areas zoned as single family suburban (approximately RK 2), single and two family urban (approximately RK 2), urban village (approximately RK 1) and a town centre (approximately RK 1174.6 to RK 1175.6) known as Lougheed Town Centre (City of Burnaby 1998). The Burnaby OCP describes town centres as having high density housing and commercial activities. Urban villages are described as multi-family development areas with some commercial facilities. Single family suburban and single and two family urban areas are both described as residential neighbourhoods. The urban village and residential neighbourhood that the proposed pipeline corridor crosses is called Westridge (City of Burnaby 1998). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as single family suburban, single and two family urban, urban village or town centre.

5.4.4 Agricultural Use

This subsection discusses agricultural land use located along the proposed pipeline corridor and in the HORU LSA. A notable portion of the proposed pipeline corridor crosses land use for agricultural purposes. Agriculture is an important component of both the Alberta and BC economies. In 2011, agriculture was 1.8% of Alberta`s GDP with farm receipts of $10.5 billion; in BC agriculture contributed to

1.6% of provincial GDP with farm receipts of $2.6 billion. Refer to the Agricultural Assessment Technical Report of Volume 5D for a full discussion of agricultural use in each of the socio-economic regions.

There is a range of different agricultural land uses found along the proposed pipeline corridor including:

- natural pasture and grazing areas (consisting of: grazed woodlands, grazed open range, and natural pasture);
- field crop areas (consisting of: improved pasture tame or hay; corn or grass forage; dry land grain, oil seed and pulse crops; mixed vegetable crops; irrigated alfalfa; turf);
- organic and specialty crop areas (consisting of: blueberries, raspberries, mixed berries, organic farms; and container nurseries); and
- livestock and poultry farms (consisting of: livestock barns, equestrian facilities).

5.4.4.1 Edmonton Region

In the Edmonton Region, the proposed pipeline corridor is located in mixed farmland from the City of Edmonton to the City of Spruce Grove and Town of Stony Plain. In the HORU LSA, the eastern portion of the region consists of large parcels of mixed crop farming; in the western portion there is a mixture of crop lands, grazing beef, hay and pasture. There are areas of field crops crossed by the proposed pipeline corridor in the Edmonton Region. The proposed pipeline corridor also crosses areas of specialty crops (*i.e.*, a berry farm and nursery). There are three beef facilities (*i.e.*, beef lots or wintering lots, including small fenced holding areas and corrals) located within the proposed pipeline corridor.

5.4.4.2 Rural Alberta Region

Along the eastern portion of the Rural Alberta Region, agricultural land within the proposed pipeline corridor is mostly field cropping and pasture, interspersed with forested areas. Towards the western part of the region, forest land becomes more prominent; west of the Town of Edson, agricultural land use is virtually non-existent. The proposed pipeline corridor does not cross areas of natural pasture and grazing in the Rural Alberta Region. In terms of field crops, of the 61 km of the proposed pipeline corridor going through agricultural land in the region, approximately 59 km (97%) is under tame pasture and approximately 1 km (1.6%) is under mixed field crops, with the remainder as unspecified farm yards. There are three beef facilities crossed by proposed pipeline corridor, and there is one beef facility located about 100 m beyond the HORU LSA (approximately 1,100 m from the proposed pipeline corridor). There are no specialty crop areas crossed by the Project in this region.

5.4.4.3 Fraser-Fort George/Thompson-Nicola Region

In the Fraser-Fort George/Thompson-Nicola Region, the northeastern portion of the proposed pipeline corridor is primarily forested but with occasional grazing areas and permanent pastures near the Village of Valemount, Community of Blue River, Community of Avola and District of Clearwater. Beyond the District of Clearwater to the southwest, the North Thompson River valley widens and the land in the valley bottom is mainly pasture and forest grazing. Of the total length of the proposed pipeline corridor in the region (approximately 502 km), approximately 281 km (56%) passes through farmland or grazing land. Between Black Pines and the Coquihalla Lakes, the Project passes through almost 100% agricultural land (*e.g.*, either private grazing land or leased or licensed Crown grazing land). The proposed pipeline corridor in this region also passes through field crop areas, including irrigated forage and smaller areas of pasture and irrigated mixed crops.

The proposed pipeline corridor passes in proximity to 19 beef facilities: of these 10 are located within the proposed pipeline corridor and 9 are within the HORU LSA. There are no specialty crop areas crossed by or proximate to the Project in this region.

5.4.4.4 Fraser Valley Region

The Fraser Valley can be divided into several distinct areas with intensive agriculture. Agricultural areas are interspaced with forest land on mountains (Sumas and Vedder mountains) and residential and

commercial areas of the City of Chilliwack and City of Abbotsford. Of the total length of the proposed pipeline corridor in the Fraser Valley Region (approximately 146 km), approximately 46 km (32%) is on land with agricultural use. The main agricultural land use types within the region are:

- dairy production west of the District of Hope;
- dairy, poultry and field crops between the Community of Rosedale and City of Chilliwack;
- mixed vegetable crops and floriculture, dairy, blueberries and other berries from the City of Chilliwack to Sumas Mountain;
- dairy and blueberries from Sumas Mountain to Matsqui Prairie (City of Abbotsford);
- smaller scale farming including poultry, nurseries, berries and pasture west of Matsqui Prairie; and
- the Matsqui uplands to the Township of Langley-City of Abbotsford border, where a large portion of the designated agricultural land is still covered in forest.

Field crops crossed include tame pasture, corn/grass forage rotation, mixed vegetables and turf production. Of the approximate 46 km of the proposed pipeline corridor traversing agricultural lands in the region, approximately 37 km (80%) is field crops. Of this, approximately 16.9 km is represented by the corn-forage rotation, 8.9 km by tame pasture and 8.8 km by mixed vegetables. Turf represents approximately 0.5 km of the length of the proposed pipeline corridor in the Fraser Valley Region.

Several areas of specialty crops are crossed by the proposed pipeline corridor, including a field nursery, a container nursery, a specialty nursery, blueberries, raspberries and organic production. Of the approximately 46 km of pipeline route in this region, approximately 1 km spans field nursery and 1.5 km spans container nurseries, including one specialty nursery. The proposed pipeline corridor also crosses approximately 2.9 km of blueberries, 0.6 km of raspberries and 0.26 km of organic production.

The proposed pipeline corridor also passes in proximity to the following agricultural facilities:

- poultry facilities: 17 facilities are within the proposed pipeline corridor, and an additional 29 facilities are located in the HORU LSA;
- dairy facilities: 19 facilities are located within the proposed pipeline corridor, and an additional 36 facilities are located in the HORU LSA;
- equestrian facilities: three facilities are located within the proposed pipeline corridor;
- other livestock facilities: two facilities are location within the proposed pipeline corridor; and
- mushroom growing facilities: one facility is located within the proposed pipeline corridor.

5.4.4.5 Metro Vancouver Region

In the Metro Vancouver Region, the proposed pipeline corridor crosses some agricultural land mainly located in the Salmon River valley near Fort Langley, BC. Approximately 9.2 km (20%) Of the length of the proposed pipeline corridor in the Metro Vancouver Region (approximately 47 km) is in agricultural use.

The proposed pipeline corridor does not cross areas of natural pasture and grazing in the region, but does cross areas of field crops. In terms of field crops, of the 9.2 km of agricultural land crossed, approximately 4.8 km is tame pasture, 3.9 km is abandoned pasture and approximately 100 m crosses a turf farm. The proposed pipeline corridor also crosses approximately 0.18 km of specialty crops represented by a container nursery, as well as crosses in proximity to the following agricultural facilities:

- poultry facilities: four facilities located within the proposed pipeline corridor;
- dairy facilities: two facilities located within the proposed pipeline corridor;

- equestrian facilities: one facility located in the proposed pipeline corridor; and
- other livestock facilities: one facility (mink farm) located in the HORU LSA.

5.4.5 Outdoor Recreational Use

This subsection discusses outdoor recreational use areas located along the proposed pipeline corridor and in the HORU LSA.

The Government of Alberta's Recreation Corridor and Trails Designation Program promotes the sustainable growth of recreation trails and provides a framework to assist in assessing trails, helps trail groups in planning, design and construction, and aids land managers with operating decisions. Designated recreation corridors and trails promote economic development, tourism and rural diversification, enhance environmental protection, align with other land uses and objectives and honour history and historical investments (ATPR 2012).

The Recreation Sites and Trails branch of the BC MFLNRO manages forest recreation sites in BC in partnership with recreation clubs, forest companies, First Nations, and local governments and contractors. The sites are located on Crown land and may include campgrounds, day-use areas, boat launches and other facilities that enable the public to enjoy a recreation experience in a forest setting (BC MFLNRO 2012a).

Many provincial parks in the HORU LSA offer recreational opportunities including hiking, fishing, boating and camping. Section 5.4.2 discusses provincial parks along the proposed pipeline corridor. Refer to Section 7.5 of the Socio-Economic Technical Report of Volume 5D for a full discussion of outdoor recreation use in each socio-economic region.

5.4.5.1 Edmonton Region

A range of outdoor recreational pursuits, such as hiking, dog walking, skating, swimming and sailing, are conducted along and near the proposed pipeline corridor and in the HORU LSA of the Edmonton Region. For example, the Strathcona Rugby Field, home of the Strathcona Druids Rugby Football Club, and a dog training facility are located at approximately RK 4.5.

There are 5 provincially-designated recreation trails and 13 commercial recreation areas located within the proposed pipeline corridor and HORU LSA in the region. Details are provided in the Socio-Economic Technical Report in Volume 5D.

The Strathcona County MDP aims to maintain and expand the existing trail network as well as implement recommendations laid out in the Strathcona County Trails Master Plan as well as ensuring that issues related to recreational and trail development within (or close to) industrial areas be addressed (Strathcona County 2007). This plan does not specify any restrictions or considerations pertaining to pipeline construction with regard to trail networks.

The City of Edmonton plans to develop a coordinated network of trails, which would connect different areas of the city and the region. Part of this plan is to integrate utility corridors into this network (City of Edmonton 2009). The proposed pipeline corridor does not cross through areas used for outdoor recreational purposes in the City of Edmonton (City of Edmonton 2010). Within the City of Edmonton, the proposed pipeline corridor crosses and parallels the West River Trail (approximately RK 33.2 to RK 34.5), located in the North Saskatchewan River valley (River Valley Alliance 2013).

The Parkland County Recreation, Parks and Open Space Plan aims to expand rural non-motorized trails to connect rural communities, of which priority will be given to connections with major multi-jurisdictional resources (such as the TransCanada Trails) (RC Strategies 2009). This plan does not specify any restrictions or considerations pertaining to pipeline construction with regard to trails.

The City of Spruce Grove offers a range of outdoor recreational activities, however, the proposed pipeline corridor does not cross through areas zoned for this use (City of Spruce Grove 2010).

The proposed pipeline corridor crosses over two areas zoned for future trail routes in the Town of Stony Plain, at approximately RK 62. The Town of Stony Plain also has a Trail Master Plan, which recommends future trail extensions and development standards (Armin A. Preiksaitis & Associates 2005). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as future trail routes.

The proposed pipeline corridor does not cross through areas zoned for outdoor recreational use in the Village of Wabamun. With the development of Wabamun Lakefront Park, a private marine and boat launch, marine recreational and tourism use has increased in the village, primarily serving boating enthusiasts from the City of Edmonton (Village of Wabamun 2010).

The parks and protected areas within the proposed pipeline corridor and HORU LSA offer recreational opportunities including hiking, fishing, boating and camping. Two provincial parks are located in the HORU LSA, however, none are crossed by the proposed pipeline corridor in the Edmonton Region. Section 5.4.1 provides a description of provincial parks encountered by the proposed pipeline corridor.

Tourism and recreation opportunities are abundant throughout the HORU RSA of the Edmonton Region. The Alberta Recreation Survey for Edmonton lists walking, golf, camping and swimming as top outdoor recreation activities occurring in the Edmonton Region (ATPR 2008). In Strathcona County, recreation use on the existing TMPL right-of-way is discouraged, although, there is some recreation activity on lakes and in the south of the county (Mills pers. comm.).

Pembina Tubing operates a commercial recreation business on the Pembina River. Tubing takes place south of the proposed pipeline corridor (RK 135) and through the Pembina River Provincial Park. Kayaking also takes place on the Pembina River (Hanlan pers. comm.).

5.4.5.2 Rural Alberta Region

In Yellowhead County, a variety of recreational activities occur such as snowmobiling, cross-country skiing, all-terrain vehicle (ATV) use, mountain biking, canoeing, bird watching and camping. Some outdoor recreational pursuits, such as hiking, snowmobiling and ATVing are conducted along and near the proposed pipeline corridor. However, most outdoor recreation in the Rural Alberta Region occurs north and west of the Project. Outside of the Town of Edson, there is skiing in Hornbeck Park and Silver Summit. Snowmobiles are used throughout Yellowhead County. Camping is common in the southern parts of Yellowhead County (Ramme, Lyons pers. comm.).

There are 53 provincially-designated recreation trails and 17 commercial recreation areas located within the proposed pipeline corridor and HORU LSA in the region. Details are provided in the Socio-Economic Technical Report in Volume 5D.

Yellowhead County is working with the province to protect public access to Crown Lands for recreational use and to create a county-wide trail system (Yellowhead County 2006). The Town of Edson plans to use some of the existing TMPL right-of-way as pedestrian trail links between parks and open spaces (Town of Edson 2006). The Hinton MDP states that land along the banks of creeks/rivers and lakes must be protected for recreational access. Any development close by must create a transition between development and natural areas (Town of Hinton 1998). The proposed pipeline corridor crosses 'gravel or unimproved' trails at approximately RK 323. The Hinton Parks Master Plan notes that multi-purpose trails may be located within utility rights-of-way (ISL Infrastructure Systems 2003).

The Town of Edson has a large baseball tournament on August long weekend. The town is considering a trail to reduce this risk of people walking along the highway to access the baseball park, as the baseball diamonds are used frequently (Butler pers. comm.).

The Town of Hinton identified that trails are always ranked as important on community service surveys. Hinton has a trail master plan. The town hopes to avoid increased ATV use on the trails (Engerdahl pers. comm.).

Alberta Environment and Sustainable Resource Development (AESRD) is working to identify specific land use “nodes” as part of the West Yellowhead Corridor Tourism and Recreation Project. Nine nodes have been recognized west of the Town of Hinton, including the Overlander Node which has been classified for

commercial development/recreation and tourism (located north of the proposed pipeline corridor between Hinton and the eastern border of Jasper National Park) (Karmacharya pers. comm.).

The Brule Sand Dunes, on the eastern shores of Brule Lake (approximately 7 km west of RK 339), are a popular spot for ATVs. A designated access road leads from Highway 16 to Brule Lake. AESRD commented that the Project will need to maintain access and be aware of designated access points. Hunters and ATVs like to use the reclaimed areas of the TMPL easement (Karmacharya pers. comm.).

5.4.5.3 Fraser-Fort George/Thompson-Nicola Region

Tourism and recreation opportunities are abundant throughout the HORU LSA and RSA of the Fraser-Fort George/Thompson-Nicola Region. Some of BC Parks' protected areas, particularly provincial parks, provide outdoor recreation opportunities. Many of the recreation and tourism opportunities in the region depend on maintaining wildlife, fish, old forests, scenic views, wilderness areas, and on providing full service front-country and backcountry recreation opportunities.

Both local residents and visitors participate in summer activities such as hunting, fishing, boating, golf, mountain biking, hiking, horseback riding, ATV tours and rentals, and helicopter tours. Winter activities include cross-country skiing, helicopter skiing, snowmobiling, dog sledding, ice fishing, skating and curling (TNRD 2011). In the Fraser-Fort George/Thompson-Nicola Region, snowmobiling brings in substantial value to the tourism economy (Kekula pers. comm.). The Clemina Ski Area is located approximately 30 km south of the Village of Valemount off the east side of Highway 5 (in the HORU LSA). There are a few organizations within Valemount (such as the Yellowhead Outdoor Recreation Association) that use areas outside of the village boundaries for recreational purposes.

Local guide and helicopter services are also available in the region. The Mike Wiegele Helicopter Skiing operation, located beside Eleanor Lake near Blue River, offers backcountry skiing packages from a self-contained resort village with 25 hand-built log chalets, a main lodge and a ski shop. Mike Wiegele Helicopter Skiing also offers weddings and family reunions in the summer months (Wiegele pers. comm.). The proposed pipeline corridor crosses over a series of existing and proposed trail routes within the Community of Blue River (approximately RK 612 to RK 616) (TNRD 2011).

Near the City of Kamloops, Stake Lake (approximately 6 km from RK 866) is a popular site for Nordic skiing, and Sun Peak Mountain Resort (approximately 25 km from RK 820) offers diverse winter activities including 30 km of groomed trails (Morris pers. comm., Sun Peaks Resort Corporation 2012). The Kamloops LRMP notes that the proposed pipeline corridor crosses the Allan Creek area which is popular for recreational uses such as skiing, hiking, snowmobiling and hunting (approximately RK 550) (BC ILMB 1995). The Kamloops OCP outlines zones for future parks and trails. The proposed pipeline corridor crosses these zones at approximately RK 837, RK 841, RK 847 and RK 851 (City of Kamloops 2004). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as future parks or trails. Outdoor recreational pursuits, such as hiking and dog walking are popular around Jacko Lake, Coal Hill and River's Trail in Kamloops.

In the limits of the City of Merritt, there are no recreation uses noted along the proposed pipeline corridor since the Project is crossing largely privately-owned land and farmland (O'Flaherty pers. comm.). Between the City of Merritt and the District of Hope, there are many dispersed recreational sites that are not designated by BC MFLNRO or are privately operated, but have high occupancy use all year round (Kekula pers. comm.).

There are 23 provincially designated recreation areas and trails crossed by the proposed pipeline corridor and HORU LSA in the Fraser-Fort George/Thompson-Nicola Region. These include Keyhole Trail, Clemina Creek Trails, Colly Lake Recreation Reserve, Little Angus Home Recreation Reserve, the parking area for Finn Creek, Groundhog Snowmobile Trail, Lac du Bois ATV Area, Lac Le Jeune Snowmobile Trails and 2010 Spirit Trail. There are 20 commercial recreation tenures located in the in the proposed pipeline corridor and the HORU LSA in the region. The commercial recreation activities include guided freshwater recreation, heli-skiing, heli-hiking, snowmobiling and community outdoor recreation. Details are provided in the Socio-Economic Technical Report in Volume 5D.

5.4.5.4 Fraser Valley Region

Outdoor recreational pursuits, such as hiking, boating and fishing, are conducted along and near the proposed pipeline corridor in the Fraser Valley Region. The District of Hope's network of trails, the Trans Canada Trail, the Vedder River and numerous undesignated areas along the Coquihalla Highway are on or near the proposed pipeline corridor. The construction of the Coquihalla Highway opened the area for recreation access (Peters pers. comm.). The Coquihalla Summit Recreation Area is crossed by the proposed pipeline corridor from RK 992.3 to RK 1005.2. The Coquihalla Summit Recreation Area was established to protect the Coast-Cascade Dry belt landscape as well as to provide recreational opportunities such as fishing, hiking, skiing and horseback riding for travellers with access from the Coquihalla Highway (BC Parks 2013a).

Various parks in the proposed pipeline corridor and the HORU LSA offer recreational opportunities including hiking, fishing, boating and camping. Access to Cultus Lake Provincial Park and Cultus Lake Waterpark is crossed by the proposed pipeline corridor. Cultus Lake Waterpark is a regional attraction (Destination BC 2013). The area from the old toll booth on the Coquihalla Highway south is an active recreation area, including: Trans Canada Trail, unauthorized/undesignated recreation/camping areas that are full/busy all summer; few designated trails; and gold panning (Peters pers. comm.). ATV use, motorcycling, hiking, wildlife sightseeing and berry/mushroom picking occurs on various roads and alpine areas within the Coquihalla Landscape Unit (BC ILMB 2004).

Due to the increasing demand of outdoor recreational activities within the district, the FVRD has developed a Regional Parks Plan, which established new recreational opportunities and minimizes conflict with other land uses (FVRD 2004). This plan does not specify any restrictions or considerations pertaining to pipeline construction with reference to recreational opportunities.

According to the Chilliwack Zoning Bylaw, the proposed pipeline corridor crosses an area zoned as outdoor recreation from approximately RK 1095.9 to RK 1096.6. This zone consists of land that is suitable for outdoor recreation use by tourists and local residents. The following uses are permitted within this zone: general agriculture; conditional agriculture; outdoor recreation; one family residential; temporary accessory dwelling; boarding; rural ancillary uses; incidental agriculture sales; accessory home occupation; cottage industry; and off-street parking (City of Chilliwack 2001). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as outdoor recreation.

In the City of Chilliwack, the Kinkora Golf Course is crossed by the proposed pipeline corridor from approximately RK 1095.9 to RK 1096.7. In the City of Abbotsford, the Ledgeview Golf and Country Club is crossed by the proposed pipeline corridor from approximately RK 1118.9 to RK 1119.8.

There are nine provincially designated recreation areas and trails crossed by the proposed pipeline corridor and the HORU LSA in the Fraser Valley Region. These include the Mt. Henning and 10K Area Snowmobile Trail, the Ogilvie Peak Trail, the Boston Bar Creek Recreation Reserve and the Squeah Recreation Site. Two provincial commercial recreation tenure areas are located in the proposed pipeline corridor and the HORU LSA in the region. Details are provided in the Socio-Economic Technical Report in Volume 5D.

Tourism and recreation opportunities are abundant throughout the HORU RSA of the Fraser Valley Region. The Fraser River presents many tourism and recreation opportunities including fishing, rafting and boating (World Web Technologies Inc. 2013). Experience the Fraser is a joint plan to provide land and water based recreational, cultural and heritage opportunities along the Fraser River. The Concept Plan was developed with participation from Metro Vancouver, the FVRD, the Province, First Nations, federal agencies, municipalities, non-governmental organizations and other groups (Metro Vancouver 2011a). The District of Hope noted the proposal is to build trails on both sides of the Fraser River, using the bridge in Hope as the turnaround point (Misumi pers. comm.). The region also contains provincial, regional and municipal parks that offer outdoor recreation opportunities such as hiking, boat launches and camping. The Village of Harrison Hot Springs is a tourism destination offering a range of recreational activities including boating, fishing, hiking, golf and wildlife viewing (Tourism Harrison Hot Springs 2013).

5.4.5.5 Metro Vancouver Region

Outdoor recreational pursuits, such as hiking, cycling and boating, are conducted along the proposed pipeline corridor and in the HORU LSA of the Metro Vancouver Region. There are numerous recreation areas, trails and sites within the proposed pipeline corridor and the HORU LSA. These include the Trans Canada Trail, Burnaby Mountain Conservation Area, and Surrey Bend Regional Park. The proposed pipeline corridor crosses a major trail system (used for walking and cycling) at approximately RK 1178.6 (City of Burnaby 1998). No provincial commercial recreation tenure areas are located in the proposed pipeline corridor or HORU LSA in the Metro Vancouver Region.

According to the Southwest Neighbourhood Plan, the proposed pipeline corridor crosses an area zoned as extensive recreation at approximately RK 1172.6 (Southwest Map). The Southwest Neighbourhood Plan further describes this as an area for large outdoor recreational uses and limited associated facilities (such as a golf course or sports club) (City of Coquitlam 2001). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as extensive recreation.

Various regional and municipal parks in the proposed pipeline corridor and the HORU LSA of the Metro Vancouver Region offer recreational opportunities including hiking, fishing, boating and camping. Section 5.4.1 provides a description of parks crossed by the Project. The Burnaby Mountain Golf Course and Driving Range is located in the HORU LSA approximately 800 m east of RK 1175.6.

Tourism and recreation opportunities are abundant throughout the HORU RSA of the Metro Vancouver Region; the region is an international tourism destination. Recreational opportunities are accessible in the urban scape and surrounding areas and range from skiing, golf and hiking to sailing, kayaking and fishing. Cypress and Mount Seymour provincial parks and Grouse Mountain offer winter activities such as skiing and summer activities such as hiking (Destination BC 2013). Metro Vancouver, and the municipalities it represents, has multiple regional and municipal parks with various recreational opportunities including hiking, cycling and fishing and facilities such as courts, playgrounds and shelters (Metro Vancouver 2011a). Marine recreational uses located in the Metro Vancouver Region are discussed in Section 5.4.9.

5.4.6 Other Land and Resource Uses

This subsection discusses other land and resource uses that occur in the study areas of each socio-economic region. Other land and resource uses include non-traditional hunting, trapping and fishing; managed forest areas; minerals, aggregates and oil and gas resources; and industrial and commercial use.

5.4.6.1 Non-Traditional Hunting, Trapping and Fishing

This subsection describes hunting, trapping and fishing activities in the study areas of each socio-economic region and presents information related to the applicable hunting legislation. Guide outfitters are also discussed in this subsection. Discussion of traditional use practices associated with hunting are addressed in Section 5.2 Traditional Land and Resource Use.

Hunting, fishing and trapping in Alberta is regulated by AESRD, according to legislation established in Alberta's *Wildlife Act*. The BC MFLNRO Fish, Wildlife and Habitat Management Branch regulates hunting, trapping and freshwater fishing activities in BC. For the purpose of efficient management, the *Management Unit Regulation* under the BC *Wildlife Act* and regulations divides the province into nine administrative regions, with a total of 225 management units (MU). Open season for big game, small game, game birds regional regulations are defined for each MU. Trapping occurs predominately during the winter seasons (November to March) and could overlap with Project construction.

Wildlife movement patterns in the HORU RSA are addressed in the Wildlife Technical Report (Volume 5C) and in the Biophysical ESA (Volume 5A). Refer to Section 7.6.1 of the Socio-Economic Technical Report of Volume 5D for a full discussion of non-traditional hunting, trapping and fishing.

Edmonton Region

Hunting

Alberta is divided into a series of Wildlife Management Units (WMU). Open season for big game and game birds are defined for each WMU. Within the Edmonton Region, the proposed pipeline corridor and HORU LSA are located in the Parkland WMU 248 and the Foothills WMU 336 (AESRD 2012). In general, hunting is prohibited in provincial parks and provincial recreation areas; with the exception of Cooking Lake-Blackfoot Provincial Recreation Area and Fickle Lake Provincial Park. Hunting is permitted in natural areas in Alberta, although special management and safety considerations apply in certain areas (Alberta Guide to Hunting Regulations 2012).

Most hunting occurs from early September to mid-December, though open season timing varies depending on the WMU and the species. Project construction may interact with hunting seasons in this region.

Trapping

Alberta is divided into a series of Fur Management Zones for trapping. In Alberta, trapping legislation is zone specific. Open season for small game is defined for each Fur Management Zone. Within the Edmonton Region, the proposed pipeline corridor and the HORU LSA are located in the Fur Management Zones 7 and 4 (AESRD 2012).

There are no trapping tenures crossed by the proposed pipeline corridor in the Edmonton Region.

Guide Outfitting

There are no guide outfitting tenure holders operating along the proposed pipeline corridor or in the HORU LSA of the Edmonton Region.

Fishing

In Alberta, fishing legislation is zone-specific. The proposed pipeline corridor and the HORU LSA of the Edmonton Region are located in Fish Management Zone 2, Watershed Unit Parkland Prairie 2 Zone 2. Rivers in this zone are predominately silty and warm in the summer months (Alberta Guide to Sportfishing Regulations 2012).

There is site-specific legislation for Watershed Unit Parkland Prairie that specify daily catch limits and additional legislation that may be applicable. Common game fish in this zone include yellow perch, northern pike, lake whitefish and walleye (Alberta Guide to Sportfishing Regulations 2012).

There used to be a commercial fishing industry in the Village of Wabamun, but it has declined in economic importance (Village of Wabamun 2010).

Named fish-bearing watercourses crossed by the proposed pipeline corridor include Whitemud Creek (RK 28.1) and the North Saskatchewan River (RK 33.5). The Socio-Economic Technical Report in Volume 5D provides more discussion on fishing opportunities along the proposed pipeline corridor and in the HORU LSA of the Edmonton Region.

Rural Alberta

Hunting

Within the Rural Alberta Region, the proposed pipeline corridor and the HORU LSA are located in the Foothills WMUs 336, 337, 338, 340, 342, 344, 346 and 348 and the Mountain WMU 438 (AESRD 2012). In general, hunting is prohibited in provincial parks and provincial recreation areas. Hunting is permitted in natural areas in Alberta, although special management and safety considerations apply in certain areas (Alberta Guide to Hunting Regulations 2012).

Most hunting occurs from early September to mid-December, though open season timing varies depending on the WMU and the species. Project construction may interact with hunting seasons in this region.

Trapping

Within the Rural Alberta Region, the proposed pipeline corridor and the HORU LSA are located in the Fur Management Zones 4 and 5 (AESRD 2012).

There are 18 registered trapping tenures crossed by the proposed pipeline corridor in the Rural Alberta Region. Trapping seasons vary depending on species, but generally occur from early October to late April (Alberta Guide to Trapping Regulations 2012).

Guide Outfitting

There are no guide outfitters operating along the proposed pipeline corridor or in the HORU LSA of the Rural Alberta Region.

Fishing

In Alberta, fishing legislation is zone-specific. The proposed pipeline corridor and the HORU LSA of the Rural Alberta Region are located in Fish Management Zone 1 Watershed Unit Eastern Slopes 3. Zone 1 consists of tributary creeks that flow into larger streams. Waterbodies from the mountains and foothills are typically clear and cold (Alberta Guide to Sportfishing Regulations 2012).

There is site-specific legislation for Watershed Unit Eastern Slopes 3 that specify daily catch limits and additional legislation that may be applicable. Common game fish in this zone include Arctic grayling, bull trout, rainbow trout, mountain whitefish and pike (Alberta Guide to Sportfishing Regulations 2012).

Named fish-bearing watercourses crossed by the proposed pipeline corridor include the Pembina River (RK 135.5) and McLeod River (RK 223.9). The Socio-Economic Technical Report in Volume 5D provides more discussion on the fishing opportunities along the proposed pipeline corridor and in the HORU LSA of the Rural Alberta Region.

Fraser-Fort George/Thompson- Nicola Region

The Fraser-Fort George/Thompson-Nicola Region crosses BC MU Region 7A (Omineca) from approximately RK 489.6 to RK 548.1 and Region 3 (Thompson-Nicola) from RK 548.1 to RK 991.3. The proposed pipeline corridor is located in BC MUs Upper Fraser (7-2, 7-3, 7-4), North Thompson (3-43, 3-44, 3-40, 3-41, 3-39), Bonaparte (3-28, 3-29) and Nicola (3-19, 3-12, 3-13).

Hunting and Trapping

Most hunting occurs from early September to March, though open season timing varies depending on the MU and the species. There are recreational hunting opportunities within the Blue River area (TNRD 2011). Project construction may interact with hunting seasons in this region.

There are 30 registered trapping tenures crossed by the proposed pipeline corridor a total of 50 times in the Fraser-Fort George/Thompson-Nicola Region. Trapping seasons vary depending on species, but generally occur from early October to late April (BC MFLNRO 2012b).

Guide Outfitting

The BC MFLNRO Fish, Wildlife and Habitat Management Branch regulate guide outfitters in BC. All non-residents are required to be accompanied by a licensed guide while hunting big game (*i.e.*, deer, mountain sheep, mountain goat, moose, caribou, elk, cougar, wolf, grizzly bear, black bear, lynx, bobcat and wolverine). Guides are not required while hunting small game (*i.e.*, game birds, migratory game birds, fox, raccoon, coyote, skunk and hare) (BC MOE 2010).

There is one guide outfitter operating along the proposed pipeline corridor of the Fraser-Fort George/Thompson-Nicola Region whose outfitting area is crossed twice by the proposed pipeline corridor from RK 489.7 to RK 526.9 and RK 531.3 to RK 549.2. There are no additional guide outfitters located in the HORU LSA.

Fishing

In BC, fishing legislation is region-specific with exceptions for specific waterbodies. Named fish-bearing watercourses crossed by the proposed pipeline corridor include the Fraser River (RK 499.7), the North Thompson River (RK 581.1, RK 594.3 and RK 651.6), the Clearwater River (RK 699.2), the Thompson River (RK 846.8), the Nicola River (RK 928.0) and the Coldwater River (RK 957.9, RK 970.3, RK 980.0 and RK 990.0), among others.

Common recreational fish species in watercourses crossed by the proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region include rainbow trout, bull trout, Dolly Varden, whitefish and salmon species (Backroad Mapbooks 2009). Recreational lake fishing opportunities in the HORU LSA include Dutch Lake, Lemieux Lake and Jacko Lake. Common recreational fish species are rainbow and brook trout (Backroad Mapbooks 2009).

There are recreational fishing opportunities within the Blue River area and Kamloops is known for fly-fishing (Morris pers. comm., TNRD 2011).

Fraser Valley Region

The Fraser Valley Region crosses BC MUs Region 2 (Lower Mainland) from RK 991.3 to RK 1137.4. The proposed pipeline corridor is located in BC MUs Fraser Valley (2-17, 2-2, 2-3 and 2-4).

Hunting and Trapping

Most hunting occurs from early September to March though open season timing varies depending on the MU and the species. Project construction is not expected to interact with hunting seasons in this region. The Fraser Valley Special Hunting Area is located in MU 2-4 and the portions of MU 2-8 which are located in Coquitlam, Mission, Maple Ridge and Pitt Meadows. In certain areas of the cities of Chilliwack and Abbotsford, the discharge of firearms is prohibited by municipal by-laws. The use of firearms is prohibited on Sumas Mountain (BC MFLNRO 2012c). Recreational hunting (particularly deer and bears) is popular within the Coquihalla Landscape Unit (BC ILMB 2004). It was noted that hunting does not occur on the valley floor in Chilliwack, rather in the hillside area southeast of the city (Sanderson, Stanton pers. comm.).

Hunting is prohibited near residential dwellings. The following restrictions exist in the MUs along the proposed pipeline corridor in this region:

- hunters in the Fraser Valley Special Licence Hunting Area (MUs 2-4 and portions of 2-8) must purchase a Fraser Valley Special Area Hunting Licence in addition to other licences. A $1,000,000.00 public liability and property damage insurance is required (BC MFLNRO 2012c);
- there is a No Shooting area near Hope in MUs 2-2 and 2-17 (BC MFLNRO 2012b);
- there is a No Shooting area in the Popkum area in MU 2-3 (BC MFLNRO 2012b); and
- there is a Firearms Using Shot Only area in the Chilliwack Valley in MU 2-3 (BC MFLNRO 2012b).

There are five registered trapping tenures crossed by the proposed pipeline corridor in the Fraser Valley Region. Trapping seasons vary depending on species, but generally occur from early October to late April (BC MFLNRO 2012c).

Guide Outfitting

There are two guide outfitters operating along the proposed pipeline corridor of the Fraser Valley Region whose outfitting areas are crossed multiple times by the proposed pipeline corridor from RK 991.4 to RK 1049.7, RK 1051.6 to RK 1052.7, RK 1054.4 to RK 1054.7, RK 1062.6 to RK 1063.1, RK 1067.1 to RK 1067.1, RK 1067.3 to RK 1067.7 and RK 1067.9 to RK 1068.3. There are no additional guide outfitters located in the HORU LSA.

Fishing

In BC, fishing legislation is region-specific with exceptions for specific waterbodies. Named fish-bearing watercourses crossed by the proposed pipeline corridor include the Coquihalla River (RK 1021.8, RK 1026.5, RK 1028.6, RK 1032.6 and RK 1043.2), the Chilliwack/Vedder River (RK RK 1102.3) and the Sumas River (RK 1114.6), among others.

Common recreational fish species in watercourses crossed by the proposed pipeline corridor in the Fraser Valley Region include Dolly Varden, cutthroat trout, steelhead and salmon species (Backroad Mapbooks 2009, 2010). Recreational lake fishing opportunities in the HORU LSA include Coquihalla Lakes, Kawkawa Lake and Sardis Pond. Common recreational fish species are rainbow and cutthroat trout (Backroad Mapbooks 2009, 2010). Kawkawa Lake is a popular fishing destination, particularly for Kokanee and cutthroat trout (BC ILMB 2004, Tourism Chilliwack 2013).

In the District of Hope, recreational fishers park along the shoulder of Highway 1 near exit 170 to access the sand bar on the south side of the Fraser River. This occurs during summer and is particularly busy during a sockeye year (Misumi pers. comm.).

The Chilliwack/Vedder River crossing was raised as an issue by the City of Chilliwack, particularly with reference to fisheries concerns about the presence of salmon habitat (Blain pers. comm.). The Chilliwack Vedder River Cleanup Society has been instrumental in maintaining the river and has completed environmental work (Blain pers. comm.). The Chilliwack/Vedder River is a popular fishing location in the Lower Mainland for steelhead, Chinook salmon, coho salmon, rainbow trout, cutthroat trout, Dolly Varden, char and Rocky Mountain whitefish (Tourism Chilliwack 2013). Both banks of the Chilliwack/Vedder River are busy at peak fishing season (Friesen, Stanton pers. comm.).

Lakes with recreational fishing values are present in the HORU RSA, and include, Falls Lake, Deer Lake (Sasquatch Park), Hicks Lake, Wahleach Lake, Harrison Lake, Cultus Lake and Mill Lake, among many others.

Metro Vancouver Region

The Metro Vancouver Region crosses MU Region 2 (Lower Mainland) from RK 1137.4 to RK 0.6. The proposed pipeline corridor is located in BC MUs Fraser Valley (2-4 and 2-8).

Hunting and Trapping

The Fraser Valley Special Hunting area is located in MU 2-4 and the portions of MU 2-8 which are located in Coquitlam, Mission, Maple Ridge and Pitt Meadows. The discharge of firearms is prohibited by City Bylaw in the City of Burnaby and most of the City of Coquitlam (BC MFLNRO 2012c). In the City of Coquitlam, there is an area along the banks of the Pitt River where the limited use of firearms is permitted (BC MFLNRO 2012c). The City of Surrey and the Township of Langley do not permit general discharge of firearms for hunting, however, in agriculturally zoned lands, the discharge of firearms is permitted year-round to protect crops, livestock and farm lands. During spring and summer seasons, specific permits are required (BC MFLNRO 2012c). The Langley Discharge of Firearms Bylaw prohibits the use of longbows and crossbows and the City of Coquitlam Discharge of Firearms Bylaw prohibits the use of archery (BC MFLNRO 2012c).

Most hunting occurs from early September to March, but open seasons vary depending on the MU and the species. Project construction is not expected to interact with hunting seasons in this region.

Hunting is prohibited near residential dwellings. Hunters in the Fraser Valley Special Licence Hunting Area (MUs 2-4 and portions of 2-8) must purchase a Fraser Valley Special Area Hunting Licence in addition to other licences. A $1,000,000.00 public liability and property damage insurance is required (BC MFLNRO 2012c).

There are no registered trapping tenures crossed by the proposed pipeline corridor in the Metro Vancouver Region.

Guide Outfitting

There are no registered guide outfitters located along the proposed pipeline corridor or in the HORU LSA of the Metro Vancouver Region.

Fishing

Named fish-bearing watercourses crossed by the proposed pipeline corridor include the Salmon River (RK 1147.4) and the Fraser River (RK 1168.9), among others. Common recreational fish species in watercourses crossed by the proposed pipeline corridor in the Metro Vancouver Region include Dolly Varden, cutthroat trout, steelhead, sturgeon and salmon species (Backroad Mapbooks 2010). No recreational lake fishing opportunities were identified in the HORU LSA in the Metro Vancouver Region.

In Surrey, the CN rail lines along the Fraser River keep people away from potential fishing locations, however, some fishing occurs under the Patullo Bridge (Baron pers. comm.). In the City of Burnaby, the Brunette River is located in the HORU LSA. The Brunette River has fishing opportunities for cutthroat trout and stocked steelhead (Backroad Mapbooks 2010).

5.4.6.2 Managed Forest Areas

This subsection discusses various managed forest areas that occur along the proposed pipeline corridor. This includes timber management areas, Crown tenures other forestry-related tenures, and, in BC, Old Growth Management Areas (OGMA). A total of 66 OGMAs are crossed by the proposed pipeline corridor (42 are legal OGMAs and 24 are non-legal OGMAs). Legal OGMAs have been spatially defined through a legal process, non-legal OGMAs have not been spatially defined through a legal process. Refer to the Managed Forest Areas and Forest Health Technical Report of Volume 5D for a full discussion of managed forests in each of the socio-economic regions.

Based on provincial (Alberta and BC) aerial overview survey data for the buffered proposed pipeline corridor, the most prominent forest pests are bark beetles such as mountain pine beetle, balsam bark beetle and Douglas fir beetle.

In Alberta, it is estimated there is approximately 331,530 m^3 of merchantable timber in the proposed pipeline corridor (from the City of Edmonton to the Town of Hinton, covering the Edmonton Region and the Rural Alberta Region). This is based on 283 weighted volume estimates producing an overall average volume per hectare of 179.4 m^3 and a total forested area within the proposed pipeline corridor of 1,848.2 ha.

In BC, it is estimated there is approximately 1,162,447 m^3 of merchantable timber in the proposed pipeline corridor (including the Fraser-Fort George/Thompson-Nicola, Fraser Valley, and Metro Vancouver Regions; excluding any BC portions of the reactivated pipeline segments where no new pipeline is being proposed). This is based on 2,753 unique forest cover polygons identified along the 10,076 ha within the proposed pipeline corridor in BC, and an average merchantable volume of 115 m^3/ha.

Edmonton Region

There are no timber tenure agreements crossed by the proposed pipeline corridor in the Edmonton Region. There are no records of noteworthy forest health factors within the Edmonton Region. Isolated pockets of light levels of Bruce spanworm defoliation were recorded in 2009. Most of this region is not forested.

Rural Alberta Region

There are two potentially affected timber tenure agreements in the Rural Alberta Region: West Fraser Mills (Hinton); and Weyerhaeuser Company Ltd. (Pembina Timberland). West Fraser and Weyerhaeuser also have industrial sample plots that fall within the proposed pipeline corridor. Additionally, six forest grazing leases were identified.

The most prominent forest-health factor within the Rural Alberta Region was mountain pine beetle, between 2008 and 2012. Pine beetle mortality was scattered between RK 135.0 and RK 339.4. Mountain

pine beetle mortality has been most extensive southwest of Wolf Pump Station and southeast of the Town of Edson, and south of Highway 16. Overall, 2010 mortality was greater than that observed in 2012.

Fraser-Fort George Thompson-Nicola Region

The northern section of the Fraser-Fort George/Thompson-Nicola Region falls within the northern part of the BC MFLNRO Headwaters Forest District; the central section falls within the Kamloops Forest District; and the southern section is in the Cascades Forest District.

In the region, the proposed pipeline corridor crosses 58 legal and non-legal OGMAs. OGMAs are primarily located in the Cascade Forest District which is in the southern section of this region.

There are an estimated 13 forestry licensees within the Kamloops Headwaters Forest District and the Cascades Forest District. Of these, four are woodlot operators.

This most prominent forest-health factor across this region has been mountain pine beetle which has affected over 300,000 ha over the past 5 years. Severity has generally ranged from trace to extreme and damage peaked in 2008. Other major forest-health factors include balsam bark beetle, Douglas-fir bark beetle, western spruce budworm and aspen leaf miner. In the Headwaters Forest District, Douglas-fir bark beetle populations showed a drastic decrease in extent and severity of damage as of 2011 but substantially increased in 2012. In the Kamloops Forest District, Douglas-fir bark beetle damage showed an increase from 2011 to 2012. The Kamloops Forest District and Cascades Forest District areas have historically had extensive damage associated with western spruce budworm. However, budworm induced damage in the Kamloops District has generally decreased over the past 5 years to the point where no damage was recorded in 2012. Although budworm activity has been recorded in the Cascades Forest District, there has been no increase or decrease in damage since 2008.

Fraser Valley Region

The Fraser Valley Region crosses the BC MFLNRO Kamloops Forest District, Cascades Forest District and Chilliwack Forest District. Within the Fraser Valley Region, there are eight legal and non-legal OGMAs crossed by the proposed pipeline corridor. OGMAs are located primarily in the Cascade Forest District. This region primarily includes licensees from the Chilliwack Forest District with the northern edge of the region intersecting Tolko Industries Ltd. from the Kamloops Forest District. Licensees include Bill 28, BC Timber Sales, Teal Cedar Products and Hope Community Forest.

There are no major forest-health factors of concern in the Fraser Valley Region. Mountain pine beetle is active throughout the eastern section of this region; however, populations are generally on the decline and more recent mapped incidences (2011) are small to medium-sized polygons (1–55 ha) of trace to moderate severity (1–55 ha) with no mapped damage as of 2012. The only potential issue for this region will be Douglas-fir bark beetle activity which could be a problem with accumulating dead Douglas-fir.

Metro Vancouver Region

There are no OGMAs in the Metro Vancouver Region. This region is within the BC MFLNRO Chilliwack Forest District, but within the region the Project does not encounter any potentially affected timber licensees. The only forest-health factor of importance in this region is the Douglas-fir bark beetle which was mapped in the Capilano, Seymour, Indian Arm areas between 2008 and 2012. More recent damage includes single polygons of moderate size and severity. Considering the location of these incidences there are no forest-health concerns with respect to corridor construction.

5.4.6.3 Minerals, Aggregates, and Oil and Gas Resources

This subsection discusses minerals, aggregates and oil and gas resource use areas that are within or near the proposed pipeline corridor. Overall, in Alberta the proposed pipeline corridor directly crosses three mineral tenures and four excavation pits from which gravel, sand or clay are removed. In BC the proposed pipeline corridor crosses 15 excavation pits from which gravel, sand or clay are removed. In addition, in BC, 282 mineral claims, 5 placer claims, 1 coal license, 2 coal applications and 1 mineral lease are located in the proposed pipeline corridor and HORU LSA. Refer to Section 7.6.3 of the Socio-Economic Technical Report of Volume 5D for a full discussion of minerals, aggregates and oil and gas resources, including a list of tenures and dispositions crossed by the proposed pipeline corridor.

Edmonton Region

According to the Edmonton MDP, provincial regulatory authorities and policies outline the right to protect, extract and produce resources such as oil, gas, sand and gravel, and also protect such activities from inappropriate urban activities (City of Edmonton 2010).

Minerals

Mining activities occur in the HORU RSA in the Edmonton Region, but are not as common as other areas of Alberta. One active mineral tenure, from RK 97.5 to RK 99.2, is found in the proposed pipeline corridor and the HORU LSA of the Edmonton Region. The proposed pipeline corridor crosses decommissioned TransAlta Whitewood Coal Mine from RK 104.4 to RK 105.0. Whitewood Coal Mine ceased operations in 2010 after the closure of the TransAlta Utilities Corporation Wabamun Generating Plant. Final stages of reclamation are currently underway at the mine (TransAlta 2012).

Aggregates

The proposed pipeline corridor crosses four excavation pits from which gravel, sand or clay are removed in the Edmonton Region.

Oil and Gas

There is extensive oil and gas activity in the Edmonton Region, including oil and gas production, petroleum upgrading and refining, and pipelines. Three of Canada's 19 oil refineries are located in the region; Shell, Imperial Oil and Suncor produce approximately 22% by volume of Canada's petroleum products in the region (City of Edmonton 2013). Canada's largest oil refining complex is located in Strathcona County. The Strathcona County MDP encourages expansion and diversification of existing petrochemical complexes (Strathcona County 2007).

While oil and gas production occurs in many areas throughout the region, areas of concentrated activity include areas near the Town of Devon, the Town of Drayton Valley, and rural areas of Parkland County between the City of Edmonton and the City of Spruce Grove. The Parkland County MDP states that Alberta Energy and Utilities Board (now known as AER) subdivision and setback legislation for oil and gas facilities will be adhered to when considering further development (Parkland County 2007).

The proposed pipeline corridor crosses oil and gas pipelines 161 times in the Edmonton Region. Clusters of pipelines are crossed from approximately RK 0.0 to RK 8.5, RK 21.1 to RK 25.3 and RK 40.2 to 48.9. Pipeline operators include ATCO Gas and Pipelines Ltd., Pembina Pipeline Corporation, Plains Midstream Canada ULC and Penn West Petroleum Ltd. (IHS Inc. 2013).

Rural Alberta

Minerals

The Rural Alberta Region is located in an area of high metallic and industrial mineral potential. Minerals and aggregates, including coal, clay, sand/gravel, oil and natural gas, traditionally formed the basis for economic activity in the Town of Edson and the Town of Hinton. Coal mining still plays an important role in the economy of the region (Alberta Community Profiles 2013).

Two active mineral permits are found along the proposed pipeline corridor and in the HORU LSA of the Rural Alberta Region. The proposed pipeline corridor crosses a metallic and industrial minerals permit from RK 310.5 to RK 318.9. The proposed pipeline corridor is 0.8 km from a metallic and industrial minerals permit at RK 339.4.

Current and proposed mines in the HORU RSA include the Coal Valley Resources Inc. Robb Trend Project which is a proposed extension to the existing mining and coal processing activities at Coal Valley Mine (approximately 40 km southeast of Hinton) and the proposed Coalspur Mines Ltd. Vista Coal Mine Project.

Aggregates

The proposed pipeline corridor does not cross any excavation pits from which gravel, sand or clay are removed in the Rural Alberta Region.

Oil and Gas

The proposed pipeline corridor crosses oil and gas pipelines 219 times in the Rural Alberta Region. Clusters of pipelines are crossed from approximately RK 135.6 to RK 137.2, RK 151.6 to RK 165.6, RK 192.5 to RK 203.8, RK 240.1 to RK 258.1 and RK 302.2 to RK 311.2. Pipeline operators include ATCO Gas and Pipelines Ltd., Terasen Inc., Talisman Energy Inc., Compton Petroleum Corporation and NOVA Gas Transmission Ltd. (IHS Inc. 2013).

Fraser-Fort George/Thompson-Nicola Region

Minerals

The Fraser-Fort George/Thompson-Nicola Region is located in areas of high metallic mineral and mineral potential. There are 210 active mineral tenures, 7 placer claims, 1 coal licence and 2 coal applications within the proposed pipeline corridor and the HORU LSA of the Fraser-Fort George/Thompson-Nicola Region. The highest concentrations of active mineral tenures are found at approximately RK 500.0, RK 578.0, RK 600.0, RK 700.0, RK 758.0, RK 853.4 and RK 879.6.

The Eight Peaks SRMP supports mineral exploration as long as it does not interfere with winter recreational activities/areas (BC ILMB 2003).

According to the TNRD Fringe Areas Policy, consideration will be given to extractive industries that might be located in the fringe area due to specific location requirements (TNRD 2012). The TNRD RGS states that the current resource industry must be protected and expanded through the proper consultative processes. It also encourages new economic development that adheres to social, environmental, sustainable and aesthetic objectives (TNRD 2000). This plan does not specify any restrictions or considerations pertaining to pipeline construction with regard to extractive industries.

According to the Kamloops LRMP, the proposed pipeline corridor crosses areas of high metallic mineral potential (from approximately RK 686 to RK 769). The proposed pipeline corridor also crosses an area of high industrial mineral potential (from approximately RK 686 to RK 869.6) (BC ILMB 1995). According to the Kamloops OCP, heavy industrial lands are zoned for storage and processing of minerals and petroleum products. The proposed pipeline corridor crosses two heavy industrial zones at approximately RK 845 and RK 848 (City of Kamloops 2004).

The proposed pipeline corridor is located in the vicinity of the proposed KGHM Mining Inc. Ajax Mine near RK 585 partially in the boundaries of the City of Kamloops. The proposed pipeline corridor and existing TMPL right-of-way cross the proposed mine site.

Exploratory work began in 2012 at the Shovelnose property owned by Strongbow Exploration Inc. and Westhaven Ventures Inc. The 16,412 ha area is approximately 30 km south of the City of Merritt (InfoMine 2012, Strongbow Exploration Inc. 2006). The proposed pipeline corridor appears to cross the property in the vicinity of RK 958.6.

Mining activities occur in the HORU RSA in the Fraser-Fort George/Thompson-Nicola Region. The mining industry in the region is booming (Williams pers. comm.). Current and proposed mines in the HORU RSA include the New Afton Mine and the Ladner Gold Project. The New Afton Mine is located approximately 5.5 km from RK 851 adjacent to the City of Kamloops. The New Afton Mine is operated by New Gold and is currently in production. New Gold holds 12,450 ha of mining leases and other claims (New Gold 2012). The Ladner Gold Project owned by New Carolin Gold Corporation, which encompasses the Carolin Mine, is located approximately 3.6 km from RK 1021.1 (New Carolin Gold Corp 2012).

Aggregates

The proposed pipeline corridor crosses an area that the Fraser-Fort George Regional District Robson Valley-Canoe Upstream OCP identifies as an aggregate resource area (approximately RK 498), which is

where the Rearguard Pump Station is located. Close to the Rearguard Pump Station, the proposed pipeline corridor crosses the Mount Robson Corridor Development Permit Area (approximately RK 494 to RK 500). The Fraser-Fort George Regional District Robson Valley-Canoe Upstream OCP explains that the objectives of this permit area are to protect development from natural hazards (such as avalanches and rockfalls), protect the natural environment and ensure that development is of high visual quality (to complement the scenic area) (RDFFG 2006). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as Aggregate Resource areas.

According to the Robson Valley LRMP, mining (especially quarry and aggregate resources) is encouraged within the Settlement/Agriculture Resource Management Zone (RMZ) to increase local employment (BC ILMB 1999). According to the Blue River OCP, the proposed pipeline corridor crosses an area zoned for mining of gravel deposits at approximately RK 613 (TNRD 2011). These plans do not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as Settlement/Agricultural RMZ or for mining of gravel deposits.

The proposed pipeline corridor crosses nine excavation pits from which gravel, sand or clay are removed in the Fraser-Fort George/Thompson-Nicola Region.

Oil and Gas

In BC, oil and gas tenures are concentrated in the northeastern area of the province. No oil and gas tenure areas are crossed by the proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region.

The proposed pipeline corridor crosses existing oil and gas pipelines in the Fraser-Fort George/Thompson-Nicola Region. The proposed pipeline corridor crosses the existing TMPL right-of-way on over 300 occasions. The proposed pipeline corridor also crosses existing gas pipelines operated by Duke Energy Field Services Canada Ltd. (on 22 occasions from approximately RK 950 to RK 988) and FortisBC Energy Inc. (on 4 occasions near approximately RK 850 and RK 954).

Fraser Valley Region

Minerals

There are 72 active mineral tenures, 1 mineral lease and 6 placer claims found along the proposed pipeline corridor and in the HORU LSA of the Fraser Valley Region. The highest concentrations of active mineral tenures are found at approximately RK 1024.6, RK 1072.6 and RK 1114.6. The proposed pipeline corridor and the HORU LSA in the Fraser Valley Region do not cross any proposed or existing mines. It was noted that mining in the area has grown substantially in the past 10 years (Johnsrude pers. comm.). In the vicinity of Hope, there are mineral investigations for magnesium deposits, copper potential as well as molybdenum tenures (Advantage Hope 2011).

Aggregates

In the Fraser Valley Region, extraction of aggregates is a key economic activity (FVRD 2009). The proposed pipeline corridor is located directly adjacent to and between two quarries on Sumas Mountain, namely Sumas Shale and Jamieson Quarry from approximately RK 1115.9 to RK 1117.3. Sumas Shale is operated by Clayburn Industrial Group Ltd. (Clayburn Industrial Groups Ltd. n.d.). Jamieson Quarry specializes in quarried road bases, clear crushed rock and rip rap, operated by Mainland Sand and Gravel Ltd. (Mainland Sand and Gravel Ltd. 2012). Aggregate materials are often used in road construction, construction fill and railway ballast (BC MFLNRO 2013). Other quarries operate on Sumas Mountain, located in the HORU RSA of the Fraser Valley Region.

The proposed pipeline corridor crosses six excavation pits from which gravel, sand or clay are removed in the Fraser Valley Region.

Oil and Gas

In BC, oil and gas tenures are concentrated in the northeastern area of the province. No oil and gas tenure areas are crossed by the proposed pipeline corridor.

The proposed pipeline corridor crosses existing oil and gas pipelines in the Fraser Valley Region. The proposed pipeline corridor crosses the existing TMPL right-of-way on over 100 occasions. The proposed pipeline corridor also crosses existing gas pipelines operated by Duke Energy Field Services Canada Ltd. (on 35 occasions from approximately RK 1000 to RK 1045 and at RK 1110.4).

Metro Vancouver Region

Minerals

No mineral tenures, placer claims or coal licences are crossed by the proposed pipeline corridor or are in the HORU LSA of the Metro Vancouver Region.

Aggregates

Aggregate extraction activities occur in the HORU RSA of the Metro Vancouver Region. Lafarge operates numerous aggregate production sites including Pitt River Quarries, Langley Plant, Port Kells Depot and Ward Road Aggregates (Lafarge 2012). In Coquitlam, the proposed pipeline corridor crosses the Lafarge Columbia Bitulithic Depot from approximately RK 1169.2 to RK 1169.6. In Surrey, the proposed pipeline corridor crosses an inactive sand/gravel pit at approximately RK 1156.6 (City of Surrey 2013).

The proposed pipeline corridor does not cross any excavation pits from which gravel, sand or clay are removed in the Metro Vancouver Region.

Oil and Gas

In BC, oil and gas tenures are concentrated in the northeastern area of the province. No oil and gas tenure areas are crossed by the proposed pipeline corridor.

The proposed pipeline corridor crosses existing oil and gas pipelines in the Fraser-Fort George/Thompson-Nicola Region. In terms of oil pipelines, the proposed pipeline corridor crosses the existing TMPL right-of-way on 15 occasions and oil pipelines operated by Shell Canada Limited near the Burnaby Terminal and Westridge Marine Terminal. The proposed pipeline corridor also crosses existing gas pipelines operated by FortisBC Energy Inc. (on two occasions near approximately RK 1167.9 and RK 1.1).

In the City of Burnaby, the proposed pipeline corridor crosses areas zoned as petro chemical (approximately RK 1178.6, RK 1179.6 and RK 2). Petro-chemical based industries have historically been located in the City of Burnaby, including a Chevron refinery, a Shell Oil facility and a Petro-Canada tank farm, in addition to the Trans Mountain Burnaby Terminal (City of Burnaby 1998).

The Port Metro Vancouver (PMV) Consolidated Land Use Plan notes that for Bulk Cargo (such as petro chemicals), PMV will continue to support the handling of liquid bulk cargoes while also identifying opportunities to build capacity (PMV 2010a).

5.4.6.4 Industrial and Commercial Use

This subsection discusses industrial and commercial use crossed by the proposed pipeline corridor and HORU LSA. Refer to Section 7.6.4 of the Socio-Economic Technical Report of Volume 5D for a full discussion of industrial and commercial use.

Edmonton Region

The proposed pipeline corridor in Strathcona County crosses through two industrial zones: Heavy Industrial (from approximately RK 0 to RK 1.5); and Light/Medium Industrial (from approximately RK 1.5 to RK 2.3). Some of the policies that the Strathcona County MDP upholds are: support further industrial development within Strathcona County; encourage expanded industrial tax base; provide buffers between industrial areas and other land use areas; continue setbacks for new heavy industries which could have detrimental effects such as visual, noise, odour, emissions, fire, explosive and dangerous goods; promote development of industry close to major transportation routes; ensure that issues related to recreational and trail development within (or close to) industrial areas be addressed; require that heavy industry meets minimum industrial risk standards (bylaw 42-2012) and require new pipelines be constructed to meet the standards of the Major Industrial Accidents Council of Canada (Strathcona County 2007).

According to the Edmonton MDP, the proposed pipeline corridor does not cross through any land zoned for industrial use within the municipal boundaries of the City of Edmonton. It does, however, cross an industrial area (approximately RK 49) outside of the city, within Parkland County. The proposed pipeline corridor also crosses an area zoned as a future commercial node at approximately RK 44. The Edmonton MDP explains that Future Commercial Nodes need to be designed as transit oriented commercial development in order to boost accessibility (City of Edmonton 2010). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as future commercial nodes.

The proposed pipeline corridor crosses several areas zoned as industrial/business parks (at approximately RK 57, RK 58, RK 59 and RK 60) within the City of Spruce Grove. The Spruce Grove MDP aims to provide much of the land south of Highway 16A for industrial uses, in hopes that local employment opportunities will increase and the tax base will diversify. The proposed pipeline corridor also crosses two areas zoned as vehicle-oriented commercial at approximately RK 61 and RK 62. The Spruce Grove MDP briefly describes a policy to support the development and intensification of vehicle-oriented commercial zones, and to pursue ways of conserving resources and minimizing waste in the development of these zones (City of Spruce Grove 2010). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as vehicle-oriented commercial.

Within Parkland County, the proposed pipeline corridor crosses two areas zoned as industrial/commercial at approximately RK 49 and RK 134. The Parkland County MDP notes that it would like to direct further industrial and commercial development within existing industrial and business parks, but encourages expansion and intensification (Parkland County 2007). The Parkland County Recreation Plan states that buffers within industrial/commercial zones can be used for recreational uses (such as parks, natural areas and greenways) (RC Strategies 2009). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as industrial/commercial.

Within the Town of Stony Plain, the proposed pipeline corridor crosses an area zoned for industrial use at approximately RK 63. The Stony Plain MDP states that new development within the area should review the Land Use Bylaw to avoid conflicts between industrial and non-industrial uses. The proposed pipeline corridor also crosses an area zoned for commercial use at approximately RK 63. The commercial development objective of the Stony Plain MDP is to promote and expand the development of arterial commercial and commercial recreation along Highway 16A (Armin A. Preiksaitis & Associates 2005). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as industrial use or commercial use.

According to the Wabamun MDP, the proposed pipeline corridor crosses an area zoned as vehicle-oriented commercial at approximately RK 100. The Wabamun MDP recognizes the opportunity to develop a commercial area adjacent to Highway 16. However, it also indicates that an Area Structure Plan will be developed for this area (in consultation with the Alberta Transportation and Parkland County) before any development occurs. Whitewood Coal Mine and the TransAlta Utilities Corporation Wabamun Generating Plant have been the two largest components of Wabamun's economy. The TransAlta Plant (which was the prominent local employer) shut down in 2010. The Wabamun MDP aims to convert the former TransAlta site into an industrial park, and find suitable industries for this park. The proposed pipeline corridor crosses this area (zoned as industrial) at approximately RK 100 (Village of Wabamun 2010). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as vehicle-oriented commercial or industrial.

Most of the proposed pipeline corridor in the City of Spruce Grove is located in a light industrial area. Current land uses include light industrial (north and south of RK 56.8 to RK 60.5) as well as a grandfathered private site now containing RV storage (approximately RK 58.8) (Butterfield, Irving and Mustard pers. comm.). A possible future industrial area is located south of RK 66.8 to RK 72.8 in the Town of Stony Plain (Frostad pers. comm.).

Rural Alberta

Industry (especially resource-based) is an essential component to the economy of Yellowhead County. Although most mining activity currently occurs in the Green Area of the county (under provincial jurisdiction), the county plans to develop land use policies to expand industry within the White Area. The

Yellowhead County MDP states that the county will accommodate industrial activities that require large tracts of land, while minimizing the negative impacts of resource-based industry (Yellowhead County 2006).

The proposed pipeline corridor crosses an area zoned as commercial/light industrial mix (approximately RK 235) and another zoned as Industrial (approximately RK 228) within the Edson MDP. The Edson MDP aims to ensure that land within the town is available for future industrial development. The Edson MDP also recognizes that oil and gas production is one of the largest industries in the area. As such, it requires special industrial services and relies heavily on the transportation systems in the area (Town of Edson 2006).

Fraser-Fort George/Thompson-Nicola Region

According to the Fraser-Fort George Regional District Robson Valley-Canoe Upstream OCP, the proposed pipeline corridor crosses an area zoned as resort commercial (approximately RK 522), which the OCP defines as an area suitable for large-scale resort use (RDFFG 2006). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as Resort Commercial.

Industrial and commercial development (except for extractive industry) is discouraged in the TNRD fringe area (TNRD 2012).

According to the Blue River OCP, much of the commercial development in the Community of Blue River is along Highway 5. The proposed pipeline corridor crosses this commercial area (and areas designated for future commercial development) at approximately RK 615. Trans Mountain has many facilities in the community and is one of the dominant users of the industrial area. Industrial areas are located primarily north of Blue River and have largely been based on transportation ventures, but the Blue River OCP states that future industrial growth will likely be tied to the forestry industry. The proposed pipeline corridor crosses this area at approximately RK 613 (TNRD 2011). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas designated for future industrial growth.

According to the Kamloops Airport Area Land Use and Development Plan, the proposed pipeline corridor crosses existing industrial and commercial zones. The industrial zone permits lighter industry to heavy industry, and business parks. The Kamloops Airport Area Land Use and Development Plan recognizes development restrictions to industrial and commercial activities due to the existing TMPL right-of-way (Urban Systems 2000). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as industrial.

The proposed pipeline corridor crosses an airport commercial land-use area at approximately RK 926.6 (City of Merritt 2010). Section 8.1.4.2 of the Socio-Economic Technical Report of Volume 5D discusses airports in the Fraser-Fort George/Thompson-Nicola Region.

Fraser Valley Region

The proposed pipeline corridor crosses some areas zoned by the Hope OCP as highway commercial (at approximately RK 1043.6, RK 1046.6, RK 1048.6 and RK 1050.6). The Hope OCP defines this area as land used to service highway traffic (District of Hope 2004). In Hope, the proposed pipeline corridor also crosses areas zoned as general and heavy industrial at approximately RK 1043.6. The Hope OCP describes heavy industrial as outdoor land uses which create high impacts such as noise, smoke, fumes, vibration and electrical interference (District of Hope 2004). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as general and heavy industrial.

Metro Vancouver Region

The proposed pipeline corridor crosses an area that the Langley OCP has zoned as an industrial growth zone (at approximately RK 1155.6). The Langley OCP promotes industrial development within the municipality and states that all industrial development must occur within the designated industrial growth zones (Township of Langley 1979). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as industrial growth.

In Surrey, the proposed pipeline corridor does not cross major commercial areas (Luymes pers. comm.). However, the proposed pipeline corridor does cross a large area that is zoned for industrial use (approximately RK 1156.6 to RK 1160.6 and RK 1163.6 to RK 1168.6) (City of Surrey 2013). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned for industrial use.

According to the Lougheed Neighbourhood Plan in Coquitlam, the proposed pipeline corridor crosses areas zoned as urban quarter and transit village commercial (both zones are a mix of commercial, office and residential) and service commercial within this neighbourhood (approximately RK 1174.6). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as urban quarter, transit village commercial or service commercial. The proposed pipeline corridor also crosses an area that was historically the home to the Fraser Mills Sawmill. However, currently there are new plans to convert the area into a residential and commercial area called Waterfront Village Centre. The proposed pipeline corridor crosses this centre (approximately RK 1171.6) and specifically crosses areas zoned for industrial and commercial uses within this centre. According to the Southwest Coquitlam Neighbourhood Plan, the proposed pipeline corridor crosses areas zoned as industrial and highway retail industrial (approximately RK 1169.6 to RK 1171.6) and general commercial (approximately RK 1170.6) (City of Coquitlam 2001). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as highway retail industrial.

In the City of Burnaby, the proposed pipeline corridor crosses areas zoned as business centres (approximately RK 1177.6 and RK 1178.6) and petro chemical (approximately RK 1178.6, RK 1179.6 and RK 2). Some of these petro chemical areas are Trans Mountain facilities (RK 1179.6 and RK 2). The OCP describes business centres as areas with a variety of businesses orientations including as research, sales and service, light manufacturing and management and administration (City of Burnaby 1998). This plan does not specify any restrictions or considerations pertaining to pipeline construction within areas zoned as business centres.

According to the PMV Consolidated Land Use Plan, the proposed pipeline corridor crosses an area zoned as industrial transition area (approximately RK 1.7 to RK 2.4) and an area zoned petro chemical (approximately RK 3.7) (Westridge Marine Terminal). The proposed pipeline corridor also crosses areas zoned as industrial from approximately RK 1156.1 to RK 1160.6 and RK 1162.6 to RK 1168.6 (PMV 2010a).

5.4.7 Water Supply and Use

Water supply and use is discussed in the context of numerous environmental and socio-economic elements of the ESA, as follows.

- Navigable waters are discussed in Section 5.6 Navigation and Navigation Safety.
- Municipal water supply is discussed in Section 5.5 Infrastructure and Services (waste and water infrastructure).
- Non-traditional fishing areas are discussed in Section 5.4.6.1 in HORU (non-traditional hunting, trapping and fishing).
- Fish-bearing watercourses are discussed in the Fisheries (Alberta) and Fisheries (British Columbia) Technical Reports (Volume 5C) and the ESA – Biophysical (Volume 5A).
- Aquifers and water wells are discussed in the Groundwater Technical Report in Volume 5C and the ESA – Biophysical (Volume 5A).
- Points of diversion are discussed in the Groundwater Technical Report in Volume 5C and the ESA – Biophysical (Volume 5A).
- Watersheds are discussed in the Fisheries (Alberta) and Fisheries (British Columbia) Technical Reports (Volume 5C) and the ESA – Biophysical (Volume 5A).

- Irrigation and agricultural water use is discussed in the Agricultural Assessment Technical Report (Volume 5D).

Refer to the above sections of the application for details of water use and supply along the proposed pipeline corridor and surrounding areas.

The following subsection will focus on objectives and guidance pertaining to water supply and use in land use and development plans reviewed by the Project. Issues related to water supply and use identified during socio-economic technical discussions and other Project-related engagement for each socio-economic Region are discussed in the Socio-Economic Technical Report in Volume 5D.

5.4.7.1 Edmonton Region

Many of the land use and development plans pertinent to the region outline objectives pertaining and specifications pertaining to water supply and use, as noted below.

- The Strathcona County MDP requires adequate setbacks from North Saskatchewan River Valley as well as lakes and drainage courses (Strathcona County 2007).

- The Edmonton MDP outlines policies relating to water supply and use, such as requiring new development to create designs which reduce storm water run-off (City of Edmonton 2010).

- The Spruce Grove MDP outlines policies to conserve water use and protect water quality, which includes restricting development in wetlands, riparian zones and flood-prone areas, and prohibiting the release of hazardous waste/contaminants into groundwater or surface water (City of Spruce Grove 2010).

The Town of Stony Plain requires a minimum setback of 10 m from watercourse and wetlands (Armin A. Preiksaitis & Associates 2005).

5.4.7.2 Rural Alberta Region

The Edson MDP identifies that the main water supply from aquifers has been in slow decline; therefore, the town is looking for ways to increase their supply. They are currently looking into two options: 1) artificially recharging the aquifers; and/or 2) building a water treatment plant that will take water from the McLeod River (Town of Edson 2006).

The Yellowhead County MDP identifies that poor quantity and/or quality of drinking water has been identified in some areas of Yellowhead County. The county is using the provincial Water for Life Strategy, as a guideline for the development of water-related policies (Yellowhead County 2006).

5.4.7.3 Fraser-Fort George/Thompson-Nicola Region

The Fraser-Fort George/Thompson-Nicola Region is located in the Fraser River, Canoe River, North Thompson River, Thompson River, South Thompson River and Thompson River watersheds.

One of the TNRD RGS goals is to protect and enhance the quality and quantity of the region's water sources (TNRD 2000). The City of Merritt is actively pursuing water conservation methods (such as the summer water conservation program) to manage demand for water (City of Merritt 2011b).

The proposed pipeline corridor crosses the following Community Watershed Zones identified in the Kamloops LRMP: White River (approximately RK 613), Avola Creek (approximately RK 656) and Gill Creek (approximately RK 731). The management objectives for these zones are to maintain the quantity and quality of the water and timing of flow (BC ILMB 1995).

5.4.7.4 Fraser Valley Region

In order to protect the water quality in the region, the Fraser Valley Regional Growth Strategy encourages adopting Best Management Practices (FVRD 2004).

The Abbotsford-Sumas aquifer is an important source of water for the City of Abbotsford and therefore the OCP states that development must be done in a way that protects the aquifer from contamination (City of Abbotsford 2005).

The Chilliwack OCP states that the primary water source in Chilliwack is its large aquifers, which have been awarded the title of Canada's best drinking water. As a result of increased exposure to surface contamination, the City has created the *Aquifer Protection Act* and asks that future development address the risks of water contamination (City of Chilliwack 1998). The City of Chilliwack is currently in the process of developing the East Chilliwack Aquifer for its future groundwater supply and plan to commission groundwater wells in the next ten years (Sanderson pers. comm.).

5.4.7.5 Metro Vancouver Region

The Metro Vancouver Region is located entirely in the Fraser River watershed, with the exception of a short segment in Surrey and Burnaby located in the South Coast Rivers Watershed, which is defined by smaller watercourses draining directly into the Pacific Ocean.

Metro Vancouver developed the Drinking Water Management Plan in 2011 to ensure a sustainable and affordable supply of water to the region. Metro Vancouver works with member municipalities to ensure access to drinking water and the Health Authorities of the BC Ministry of Health provides oversight (Metro Vancouver 2011b).

According to the Township of Langley Water Management Plan, approximately 80% of the community's water supply is provided from the area's aquifers, which are accessed by municipal and private wells. However, due to overuse, the water levels in these aquifers are declining, especially in intensively used aquifers such as Hopington and Aldergrove. The Hopington aquifer (over which the proposed pipeline corridor crosses) is considered to be one of the most vulnerable aquifers (in terms of groundwater contamination) in the Fraser Valley (Compass Resource Management 2009). In order to protect the quantity and quality of the water supply in Langley, the Water Management Plan indicates the following:

- new development should not negatively affect aquifers from being replenished;
- the goal of developing an integrated system for issuing drilling authorizations; and
- restricts the use of high-risk contaminants in areas above vulnerable aquifers (Compass Resource Management 2009).

5.4.8 Aesthetic Attributes

Aesthetic attributes include changes in viewsheds, as well as sensory disturbance related to nuisance visual disturbance (*i.e.*, lighting), air emissions, noise and odour. Construction of the Project will result in the presence and operation of equipment, vehicles, and the activity of construction workers. Air and noise emissions will include emissions and sound from construction equipment and dust from vehicles.

A Viewshed Modelling Analysis (VMA) was conducted to provide information related to the potential visual effects of new or notably altered above ground facilities to be constructed as part of the Project. The VMA assists in determining the visibility of selected Project facilities from a set of locations, using GIS software that determines the visibility, or the view, of one location to and from another location. For this Project, VMA was conducted for five key Project locations with proposed new or changed above ground facilities. These Project facilities are the Edmonton Terminal, Black Pines Pump Station, Sumas Terminal, Burnaby Terminal and Westridge Marine Terminal. Existing information regarding visual conditions in the vicinity of the five facility sites was collected and viewshed modelling was conducted from a select number of observer viewpoints (OVs) to assess potential effects to existing visual conditions. Additional information is found in the Viewshed Modelling Analysis Technical Report of Volume 5D.

Ambient conditions to be used in assessments are defined under the Alberta Energy Regulator (AER) *Directive 038: Noise Control Directive* (Alberta Energy Resources Conservation Board [ERCB] 2007) and BC Oil and Gas Commission (BC OGC) *Noise Control Best Practices Guideline* (BC OGC 2009) for each respective province (ERCB 2007, (BC OGC 2009). Refer to the setting discussion of the Acoustic Environment in Section 5.6 of Volume 5A.

The *BC Forest Planning and Practices Regulation* categorizes visual quality objectives (VQOs) in the following management categories from important public viewpoints: preservation; retention; partial retention; modification; and maximum modification. Preservation denotes very small-scale alteration to a forest landscape; retention denotes alteration that is small in scale and difficult to see; partial retention is small to medium scale and easy to see; modification is large in scale and easy to see; and maximum modification denotes an alteration that is very large in scale and very easy to see (Forest Planning and Practices Regulation BC Reg. 269/2010).

Refer to Section 7.8 of the Socio-Economic Technical Report of Volume 5D for a full discussion of aesthetic attributes.

5.4.8.1 Edmonton Region

The Edmonton Region is a predominantly urban and suburban landscape. The proposed pipeline corridor in the Edmonton Region encounters six areas with noise bylaws in effect. Noise bylaws for the Edmonton Region are outlined in Section 7.8.1 of the Socio-Economic Technical Report of Volume 5D.

The Edmonton MDP states the residential areas should be protected from effects such as noise and dust (City of Edmonton 2010). The Edmonton Transportation Master Plan notes the Urban Traffic Noise Policy, which ensures that land is developed in a way that noise effects are mitigated (City of Edmonton 2009). Parkland County has aesthetic standards for development, especially along the Highway 16 corridor, and asks that certain designs and landscaping be applied in this area. The Parkland County MDP also suggests that buffering and/or landscaping techniques may be required to mitigate noise effects caused by roadway, railway or airport operations (Parkland County 2007). The Stony Plain MDP recognizes that industrial uses could have nuisance effects (such as noise, smell, dust, smoke, vibration) especially near residential areas, so requires adherence to buffering and separation distance requirements to minimize these effects (Armin A. Preiksaitis & Associates 2005). The Village of Wabamun is trying to redefine itself as a tourist town, therefore, aesthetics are very important (especially at entrance ways into the village). The Council asks that any future development complements or improves the aesthetic qualities of Wabamun (Village of Wabamun 2010).

In the Edmonton Region, viewshed modeling was conducted of the proposed expansions of the Edmonton Terminal from two observation viewpoints (OVs). From all OVs, almost the entire viewshed is dominated by anthropogenic disturbance given the existing industrial setting. Visual attributes of the existing landscape include the existing Edmonton Terminal, as well as dirt roads, cement blockades, fencing, vehicles, lighting and transmission lines. There are some narrow green areas, including grass and some trees, visible from some locations. Given the existing industrial landscape, the site is considered to have a high visual absorption capacity (VAC). This refers to the relative capacity of a landscape to absorb human-made alterations. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D.

5.4.8.2 Rural Alberta Region

The Rural Alberta Region crosses a predominantly rural and suburban landscape. The proposed pipeline corridor in the Rural Alberta Region encounters three areas with noise bylaws in effect. Noise bylaws for the Rural Alberta Region are outlined in Section 7.8.2 of the Socio-Economic Technical Report of Volume 5D.

The Yellowhead County MDP discourages any development that would interfere with views of natural features (Yellowhead County 2006). The Edson MDP explains the importance of the Town of Edson's visual character (especially in regards to its parks and recreational facilities), and states that future development must protect or improve this visual character (Town of Edson 2006). Aesthetics are important for the Town of Hinton as the town is described as the Gateway to the Rockies. The town has created an initiative called Hinton Proud, which promotes cleanliness and beautification initiatives. The Hinton MDP requires that future development be of high visual quality, that existing vegetation should be used to screen development, and that municipal bylaws be enforced to minimize nuisance and unsightly premises (Town of Hinton 1998). Beautification is one of the key strategic goals in the Hinton Community Development and Enhancement Plan, stating that the town has aesthetically pleasing developed areas, which is a component of the town's success and community pride (ISL Infrastructure Systems 2003).

No new or notably altered above ground facilities are proposed in this region. While some pump stations will be expanded, expansions will take place in the context of an existing industrial facility and will be designed to be consistent with the existing look at each facility. As such, viewshed modeling was not undertaken of any facilities in this region.

5.4.8.3 Fraser-Fort George/Thompson-Nicola Region

The Robson Valley LRMP identifies an overall visual quality goal of maintaining and/or enhancing the scenic beauty and visual quality of the planning area with particular attention to the Robson Valley Settlement Corridor. Numerous parks within the Robson Valley LRMP area identify areas of visual importance. The Rocky Mountain Trench RMZ (approximately RK 492) identifies maintaining and/or restoring the natural scenic beauty of the Rocky Mountain Trench as a primary resource for the benefit of residents and visitors alike as a management objective. The Settlement/Agriculture RMZ A does not specifically identify visual quality as an objective, but it does mention that visual concerns are of importance within this heavily travelled corridor. A defined strategy of the Robson Valley LRMP to achieve visual quality goals is that development (such as pipelines) must have a visual management plan made available for public input (BC ILMB 1999).

The TNRD RGS encourages the adoption of policies that will reduce or prevent air pollution (TNRD 2000).

Residents of the Community of Blue River are in the process of developing VQOs due to the disruption of forested areas (TNRD 2011).

The Kamloops LRMP identifies visually sensitive areas, which are viewpoints identified through planning processes and viewsheds or viewscapes visible from public use areas, travel corridors and communities (BC ILMB 1995). VQOs comprise four management categories: preservation; retention; partial retention; and modification. The proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region crosses retention, partial retention and modification VQO areas. The proposed pipeline corridor also crosses scenic areas designated under the *Forest Range and Practices Act*.

The Kamloops Airshed Management Plan recognizes activities such as road dust and open burning as contributors to haze, which can decrease visibility. The Kamloops Airshed Management Plan also indicates that the City of Kamloops has a Fire Prevention By-law, which generally restricts open burning (City of Kamloops 2004).

The Coquihalla Highway is a tourism travel corridor, offering scenic views and connecting the Lower Mainland with the Okanagan and interior BC (BC Ministry of Transportation and Infrastructure 2012a).

Noise bylaws for the Fraser-Fort George/Thompson-Nicola Region are outlined in Section 7.8.4 of the Socio-Economic Technical Report of Volume 5D.

In the Fraser-Fort George/Thompson-Nicola Region, viewshed modeling was conducted of the proposed new Black Pines Pump Station. This pump station is the only greenfield facility proposed as part of the Project. Viewshed modeling was done from three OVs of the proposed pump station site. The proposed Black Pines Pump Station is located approximately 30 km north of the City of Kamloops, on Westsyde Road. The area is currently forested and will be cleared and graded for the pump station. From the three OVs, the viewscape of the proposed site generally has a low level of existing anthropogenic disturbance, and consists of cleared, grassy areas, visible flora, with Westsyde Road cutting through the view in some locations, is land. Certain OVs also includes views of rural residential properties. Given the low level of existing disturbance, the site is considered to have a relatively low VAC. The area has a partial retention VQO. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D.

5.4.8.4 Fraser Valley Region

The proposed pipeline corridor is located in forested, urban, suburban and agricultural landscape in the Fraser Valley Region. The proposed pipeline corridor in the Fraser Valley Region encounters three areas with noise bylaws in effect. Noise bylaws for the Fraser Valley Region are outlined in Section 7.8.5 of the Socio-Economic Technical Report of Volume 5D.

The Fraser Valley RGS encourages the implementation of the FVRD Air Quality Management Plan (FVRD 2004).

Open burning is restricted in the City of Chilliwack to improve air quality (City of Chilliwack 1998). According to the Chilliwack Zoning Bylaw, uses that produce the following are prohibited in all zones unless specifically permitted:

- unreasonable noise, heat or glare;
- unsafe levels of dust, fumes, ash or odour; and
- ground vibration (City of Chilliwack 2001).

The Abbotsford OCP states that development adjacent to agricultural lands must consider ways to minimize noise and visual effects. Furthermore, prominent landscape features within the Straiton area (approximately RK 1117.6 to RK 1118.6) are to be protected to maintain the "visual and aesthetic characteristics of the area" (City of Abbotsford 2005).

The proposed pipeline corridor in the Fraser Valley Region crosses retention, partial retention, and modification VQOs. A cluster of retention VQOs are crossed from RK 1005 to RK 1011. Clusters of partial retention VQOs are crossed from RK 1013 and RK 1021, RK 1031 to RK 1072 and RK 1104 to RK 1115. A modification VQO is crossed from RK 1025.81 to RK 1026.7. No preservation VQOs are crossed by the proposed pipeline corridor in the Fraser Valley Region (BC MOF 2008). In the Fraser Valley Region, viewshed modeling was conducted of the proposed expansion of the Sumas Terminal from 1 OV. For the existing viewshed from this OV, the foreground is covered with low-lying bushes and shrubs. The middle ground consists almost entirely of anthropogenic disturbance due to the tanks, buildings, roads and cleared area of the existing Sumas Terminal. The background, behind the terminal area, is forested. Further analysis indicates that approximately 12% of the existing viewshed is comprised of anthropogenic disturbance, most of which is associated with the existing Sumas Terminal. Given the existing industrial disturbance, the area is considered to have a relatively high VAC. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D.

5.4.8.5 Metro Vancouver Region

The Metro Vancouver Region is a predominantly urban and suburban landscape. The proposed pipeline corridor does not cross any VQO areas. The proposed pipeline corridor in the Metro Vancouver Region encounters four areas with noise bylaws in effect. Noise bylaws for the Metro Vancouver Region are outlined in Section 7.8.6 of the Socio-Economic Technical Report of Volume 5D.

The Surrey OCP states that in areas of high visibility (such as along the Fraser River, where the proposed pipeline corridor is adjacent), development must follow guidelines to improve the visual environment (City of Surrey 2012). The Coquitlam OCP addresses noise control issues and suggests finding ways to mitigate noise effects of heavier industry and other activities in future land use changes (City of Coquitlam 2001). The Burnaby OCP indicates that for the petro-chemical industrial areas it aims to reduce operational noise (City of Burnaby 1998). According to the PMV Consolidated Land Use Plan, PMV will examine mitigation measures for noise, odour, light and dust produced within industrial areas (PMV 2010a).

The proposed pipeline corridor and the HORU LSA in the Metro Vancouver Region encounter partial retention VQO areas. The proposed pipeline corridor in the Metro Vancouver Region does not cross any VQOs (BC MOF 2008). In the Metro Vancouver Region, viewshed modeling was conducted of the proposed expansion of the Burnaby Terminal and the Westridge Marine Terminal. For the Burnaby Terminal, three OVs were chosen from various locations in the City of Burnaby. For the Westridge Marine Terminal, from a range of preliminary sites three OVs were chosen reflecting various views of the terminal site from both the south and northern shore of the Burrard Inlet. There are varying levels of existing anthropogenic disturbance from these viewsheds, related to the urban/suburban landscape and existing industrial setting within which both facilities are located. The Burnaby Terminal and the Westridge Marine Terminal are not situated in areas with a VQO designation. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D for further details.

5.4.9 Marine Commercial, Recreational and Tourism Use

The discussion of marine commercial, recreational and tourism use (MCRTU) is relevant only to the Metro Vancouver Region. Marine commercial, recreational and tourism in the Marine HORU RSA, which includes the area of Burrard Inlet east of the First Narrows Bridge, is diverse, both from a biophysical and socio-economic point of view. Many areas are subject to intense and competing uses. The Marine HORU RSA is shown on Figure 5.4-9. While the proposed pipeline will not interact directly with the marine waters of the Burrard Inlet, some equipment deliveries pertinent to the pipeline construction may occur via marine barge. The setting of each Project facility is summarized in Section 6.0, however, this subsection provides a more detailed discussion the MCRTU setting as context for the evaluation of potential effects on MCRTU related to the construction and operations of the Westridge Marine Terminal.

Burrard Inlet is a tidal saltwater inlet of approximately 11.3 km² located in the Metro Vancouver Area (Burrard Inlet Environmental Action Program [BIEAP] 2011). Burrard Inlet has several distinct marine sections, including the Outer Harbour, the Inner Harbour bounded by the First and Second Narrows, the Central Harbour, Port Moody Inlet and Indian Arm. The First Narrows is between the Outer Harbour and the Inner Harbour and is crossed by a vehicle bridge, and the Second Narrows is between the Inner Harbour and the Central Harbour and is crossed by a vehicle bridge and a rail bridge. The Second Narrows rail bridge can be raised to accommodate large marine vessels (PMV 2010b).

The City of Vancouver, which bounds most of the southern shore of Burrard Inlet, is Canada's third largest city and its busiest port (PMV 2013). Eight municipalities surround the inlet, namely: the Cities of Vancouver, Burnaby, and Port Moody on the south shore; the Villages of Belcarra and Anmore on the east shore of Indian Arm and Port Moody Inlet; and the City of North Vancouver; the District of North Vancouver; and the District of West Vancouver on the north shore (BIEAP 2011).

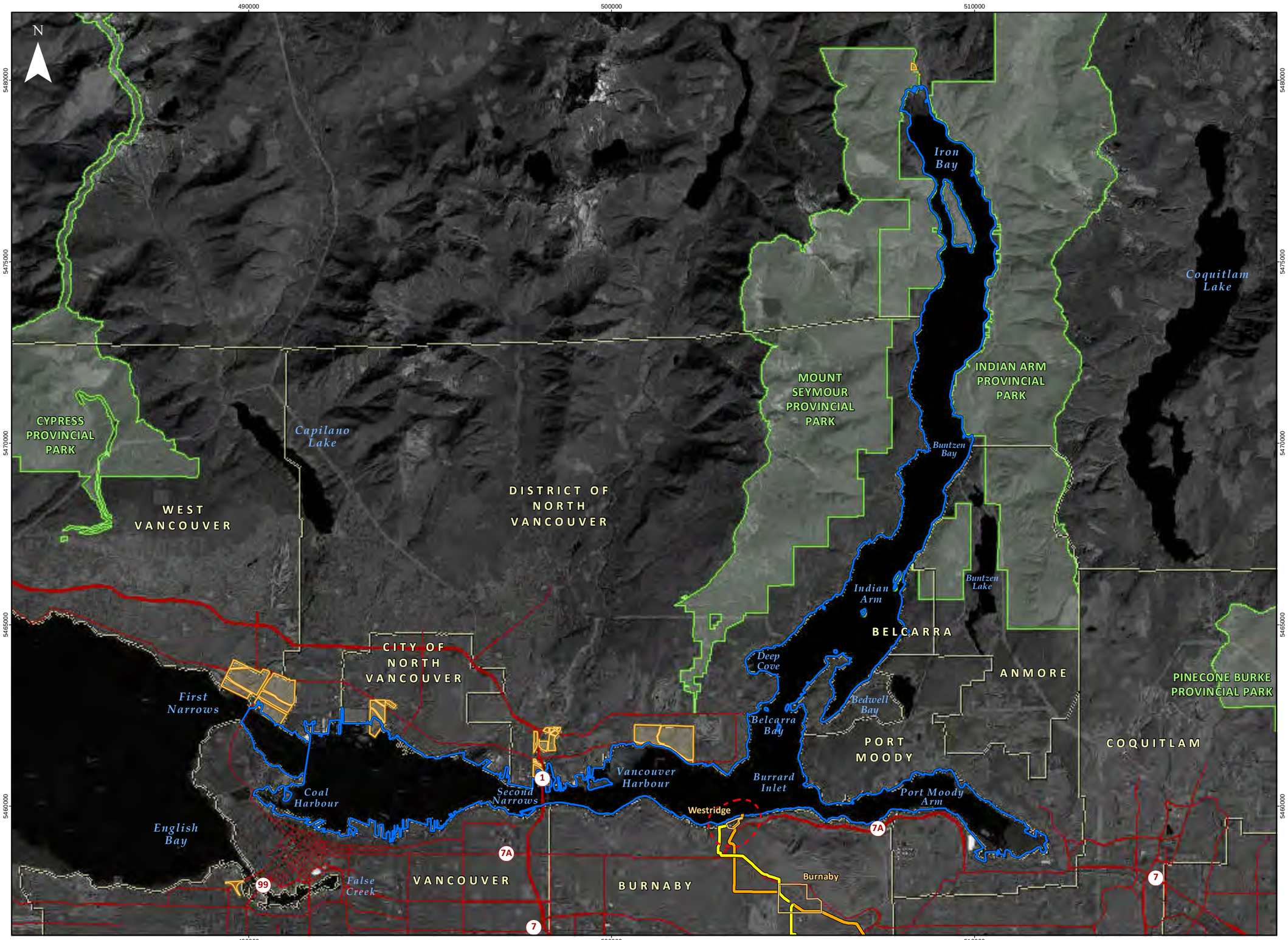
A summary discussion of commercial fisheries, marine transportation, marine recreation and marine tourism in the Marine HORU RSA is provided below. See the Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report of Volume 8B for a more detailed discussion of MCRTU in Burrard Inlet.

TRANS MOUNTAIN

FIGURE 5.4-9

MARINE HUMAN OCCUPANCY AND RESOURCE USE LOCAL AND REGIONAL STUDY AREA

TRANS MOUNTAIN EXPANSION PROJECT



Trans Mountain Pipeline (TMPL)

Trans Mountain Expansion Project Proposed Pipeline Corridor

Facility Footprint

Local Study Area (LSA)

Regional Study Area (RSA)

Highway

Railway

Indian Reserve / Métis Settlement

Provincial Park

City / Town

Projection: UTM Zone 10N.
Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI Aug. 23, 2013; Transportation: BC Crown Registry and Geographic Base Branch, 2010, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003; Hydrology: Natural Resources Canada, 2007, BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, BC FLNRO, 2008; LANDSAT 7 (1996 - 2003): NASA Geospatial Interoperability Program, 2005.

tera ENVIRONMENTAL CONSULTANTS

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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ALL LOCATIONS APPROXIMATE

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Commercial Fishing

Fishing vessels use Burrard Inlet to berth, fuel, and to access fishing grounds. Commercial fishers in Burrard Inlet mainly target Dungeness crab, prawn and shrimp. A small commercial fishery for surf smelt takes place in Burrard Inlet, mostly off spawning beaches in English Bay (DFO 2012). Surf smelt are an important prey item for many marine species. The fishery is closed from June 15 to August 15 to protect spawning populations (DFO 2012).

The Dungeness crab fishery takes place mostly in English Bay and areas off Stanley Park around the First Narrows, but also in the central harbour near the Westridge Marine Terminal, and throughout Indian Arm. Dungeness crab are fished by a trap fishery, where fishing vessels set multiple crab traps on a line. The traps are left to "soak" for a specified time period and then hauled in (DFO 2013a). In Burrard Inlet, the fishery is typically open from early summer to November or December (DFO 2013a).

Shrimp are fished commercially by trap and trawl fisheries. Spot prawns are the largest species of shrimp in BC waters, and are targeted by a lucrative commercial trap fishery (DFO 2013b). The prawn trap fishery is usually active over a short period from late spring to early summer, subject to fishery openings that are based on evaluation of the stock status by DFO (DFO 2013b). The shrimp trawl fishery opens in mid to late summer and often extends into the winter months. Shrimp beam trawlers are active in the approach to Vancouver outer harbour (DFO 2013c).

Permanent navigational closures for all fishing activities are in place in the inner harbour between the First and Second Narrows, and in part of English Bay near False Creek to allow for the safe passage of marine vessels.

The Eastern Burrard Inlet Rockfish Conservation Area is located around the Westridge Marine Terminal in the east harbour, and another Rockfish Conservation Area is designated in Indian Arm. Rockfish Conservation Areas permit certain types of fishing that are unlikely to harm rockfish populations. Permitted fishing activities include: fishing by seine or gillnet; trap fisheries for prawn or crab; diving for or hand-picking of invertebrates; and mid-water trawl fisheries (DFO 2013d).

Marine Transportation

Burrard Inlet is the location of Canada's busiest port, PMV (PMV 2013). PMV is the port authority mandated under the *Canada Marine Act* to be responsible for the safe and efficient movement of marine vessel traffic in Burrard Inlet (PMV 2013). PMV is responsible for oversight of all marine traffic within Burrard Inlet, and operates harbour patrol vessels and services including emergency response, harbour monitoring and support services (PMV 2013). The PMV provides oversight for operations of 28 major cargo and container terminals, 23 of which are in Burrard Inlet (PMV 2013).

The Outer Harbour and eastern area of the harbour contain multiple commercial anchorages for large, deep draft marine vessels. The Inner Harbour is heavily industrialized, containing several major marine cargo, container and cruise ship terminals. The Second Narrows is crossed by a vehicle bridge and a rail bridge operated by CN. The rail bridge may be raised to allow passage of marine vessels. The coordination of operations of the CN Rail Bridge at the Second Narrows is essential for passage of Project-related tankers and ships from other terminals east of the Second Narrows. Bridge operations are the responsibility of the CN bridge operator, and vessels requiring a bridge opening must contact the bridge operator. Safe passage is indicated by the bridge operator with navigational lights displayed on the lift span (PMV 2010b).

The SeaBus commuter ferry travels between Vancouver and North Vancouver in the Inner Harbour, from Coal Harbour to Lonsdale Quay. In 2011, an average of 23,020 passengers used the SeaBus weekly (TransLink 2013). In addition, a seaplane base is located in Coal Harbour. The area has one of the highest levels of seaplane activity in the world and is rated as one of the busiest aerodromes in Canada, with a total of 8 destinations serviced by a fleet of 30 planes (Global Aviation Resource 2010).

The Inner Harbour between the First Narrows and Second Narrows is subject to the *Second Narrows Movement Restriction Area (MRA) Regulations*. The area around the Second Narrows is relatively shallow, and is a natural bottleneck area with strong currents (Canadian Coast Guard [CCG] 2013). In the MRA, marine vessels are not permitted to meet or overtake each other, and must be in communications

with Marine Communications and Traffic Services (MCTS) at all times. MRA procedures stipulate that all piloted vessels must transit only at high slack tide (*i.e.*, when the tide is high and not flowing) to ensure adequate bottom clearance and minimal stress from tidal currents (PMV 2010b).

The Central Harbour continues east of the Second Narrows and contains marine terminals including the Westridge Marine Terminal and the Chevron oil refinery (PMV 2013). Marine terminals are also present in Port Moody Inlet, east of the Westridge Marine Terminal.

Tug and barge operators transport materials to various marine terminals and assist vessel transits. A large fleet of tugboats and barges based in PMV operates throughout BC coastal waters, including Burrard Inlet, Haro Strait and the Juan de Fuca Strait. There are approximately 4,500 instances annually in Burrard Inlet when a tug assists another vessel (Eckford pers. comm.).

Log handling occurs in Burrard Inlet and along the Fraser River. Mill & Timber Products in Port Moody handles and stores logs in Port Moody Inlet (Natland pers. comm.). Logs are also stored in numerous locations along the Fraser River. A log pond area is active in nearshore areas south of Point Grey in Vancouver. Many of these logs stored on the river are processed at the remaining mill sites along the river (Natland pers. comm.).

Commercial anchorages are located in the central harbour around the Westridge Marine Terminal, in the Inner Harbour, and the Outer Harbour. Some anchorages are designated for different purposes, such as short-term use, emergency use, or for outbound vessels only. Anchorages designated as short-term require that a pilot remain on board (PMV 2012).

Marine Recreational Use

Marine recreation in Burrard Inlet is both intense and diverse, including fishing, boating, kayaking, paddle boarding, windsurfing and kite boarding, swimming, and scuba diving. Recreational users also access major destinations through Burrard Inlet, notably Indian Arm and the provincial and regional parks that line much of the shoreline.

Fishing is highly popular in many areas of Burrard Inlet. The area is known for high-quality saltwater fishing opportunities for Chinook and other species of salmon, crab and other shellfish, halibut and rockfish near to the downtown area (Destination BC 2013). Fishers target salmon at the mouth of the Capilano River and nearshore areas around Stanley Park, and recreational fishing for crab, prawn and shrimp is popular in the Outer Harbour and English Bay (Bird pers. comm.). A large run of pink salmon migrates every two years through Indian Arm in the fall, and a run of chum salmon migrates into the Inlet in late summer (BC Parks 2013c). The recreational fishery for surf smelt in Burrard Inlet is active in the summer months and is expanding, raising concerns that the fishery may not be sustainable (DFO 2012).

Recreational fisheries in BC tidal waters are regulated by DFO, and legislation includes area closures, minimum size restrictions, and possession limits (DFO 2013a). Recreational fishing areas have been identified by DFO as encompassing most of Burrard Inlet, extending from the southern portion of Indian Arm and the entrance to Port Moody Inlet west, excluding the Inner Harbour between the First and Second Narrows. The recreational fishing areas do not have a regulatory element, but do indicate use by recreational fishers. No fishing is permitted between the First and Second Narrows (PMV 2010b).

Recreational boating (*i.e.*, power boats and sail boats) takes place throughout Burrard Inlet. Sailing is permitted in English Bay and the Outer Harbour, west of the First Narrows, in part of the Inner Harbour and east of the Second Narrows (PMV 2010b). No sailing or channel crossing is permitted in the First and Second Narrows, for navigation and safety reasons (PMV 2010b). The Coal Harbour area is restricted to sea cadet sail training. Several yacht clubs are active in Burrard Inlet, with races, individual sailing and lessons taking place in English Bay when wind conditions are favourable (City of Vancouver 2013). Marinas are concentrated in False Creek and Coal Harbour, and are also present in Indian Arm, Port Moody Inlet, at the Second Narrows, and on the north shore of the Inner Harbour.

In English Bay, windsurfing is a popular activity (City of Vancouver 2013). Paddle boarders use Deep Cove in Indian Arm, English Bay and False Creek. Sea kayakers tend to use False Creek and nearshore areas of North Vancouver, into Indian Arm (Greater Vancouver Visitors and Convention Bureau 2013). Kite boarders are also present in English Bay but are not permitted in the summer months (City of

Vancouver 2013). Parks around the shoreline of Burrard Inlet are used for swimming, fishing from piers, kayaking, boating and scuba diving.

Marine Tourism Use

Tourism is a large contributor to the provincial economy. In 2011, the BC tourism sector generated $13.4 billion in total revenue and contributed $6.5 billion to the provincial economy, measured in Gross Domestic Product (GDP) (BC Ministry of Jobs, Tourism and Skills Training 2012). Marine tourism is an important part of the tourism industry in the Lower Mainland. Marine tourism activities in the Vancouver area include cruise ships, boat charters, sport fishing, kayak tours, and whale-watching tours.

Vancouver is the homeport for the Vancouver-Alaska cruise ship industry, with two cruise ship terminals in the Inner Harbour that provide berthing facilities for 14 cruise ship companies (PMV 2013). Over 800,000 passengers are expected to pass through one of the two cruise terminals in Vancouver Inner Harbour in 2013 (Cruise Lines International Association 2013).

Local charter companies based in the Vancouver area offer boat tours and corporate and private cruises on large yachts in Vancouver Harbour, including the Inner Harbour and Indian Arm (Destination BC 2013, Harbour Cruises 2013).

A small number of commercial sport fishing guides are based in Burrard Inlet in the Inner Harbour, with many more located in the False Creek area. The sport fishing season for various salmon species generally runs from January until the end of October, when most runs have returned to natal rivers for spawning. Fishing charter operators often employ traps for crabs or prawns as well as offering fishing for salmon and other finfish (Ocean Adventure Centre 2013).

Sea kayaks can be rented for day trips at locations in Deep Cove in Indian Arm, Port Moody Inlet, Coal Harbour and Spanish Banks in Vancouver, and near Ambleside Park in North Vancouver. Many operators also offer guided tours locally or into Howe Sound and other areas (Kayak Rental Vancouver 2013). For local scuba diving, dive centres in Vancouver and Burnaby offer courses and trips and arrange dive charters into Howe Sound and other areas (Destination BC 2013). Charter companies in the Vancouver area also offer boat rentals for sail and power boat cruising (Destination BC 2013).

Whale-watching tour operators in Burrard Inlet are based at Granville Island in False Creek and in Coal Harbour in Vancouver Inner Harbour. The whale-watching season generally begins in April and finishes in October, in order to view killer whales in areas of the Strait of Georgia. Grey whales, humpback whales and other marine mammals and birds are also observed on whale-watching tours (Greater Vancouver Visitors and Convention Bureau 2013).

5.5 Infrastructure and Services

This subsection discusses physical infrastructure and community infrastructure and services in the Socio-Economic RSA, including transportation infrastructure (*e.g.*, roads, rail, air and, where applicable, ports); linear infrastructure (*e.g.*, power lines, pipelines) and power supply; waste and water infrastructure; housing; educational services; emergency, protective and social services; and recreational amenities. Health infrastructure and services are discussed in Section 5.8 Community Health. Navigable waterways are discussed in Section 5.6. Potential Project-related effects and mitigation pertaining to infrastructure and services are discussed in Section 7.2.5.

5.5.1 Transportation Infrastructure

This subsection discusses existing transportation infrastructure (*e.g.*, roads and traffic, airports, railways and ports) located in the vicinity of the Project. Refer to Section 8.1 of the Socio-Economic Technical Report of Volume 5D for a full discussion of transportation infrastructure. Generally, from east to west, the existing TMPL right-of-way runs west paralleling Highway 16 (Yellowhead Highway) through Yellowhead County and Jasper National Park. In BC, it then turns southwest and closely parallels Highway 5 through Kamloops and toward the Fraser Valley Region. From Hope to the Metro Vancouver Region, the existing TMPL right-of-way runs west paralleling Highway 1 (Trans-Canada Highway).

5.5.1.1 Edmonton Region

Roads

In the Edmonton Region, most of the proposed pipeline corridor loosely parallels Highway 216 (Anthony Henday Drive) and Highway 16 (Yellowhead Highway). Anthony Henday Drive is a four-lane (two lanes in each direction) hard surface secondary expressway and is located within the TUC, commonly referred to as the Edmonton Ring Road. The responsibility of the Province of Alberta, the TUC was planned in the late 1970s and land was purchased in the 1980s and 1990s. Anthony Henday Drive circles the City of Edmonton, is part of the North/South Trade Corridor and was planned to alleviate heavy goods and service traffic from the city's highway network (Alberta Transportation 2013).

Communities in the Edmonton Region are serviced by Highway 16, which is part of Canada's National Highway System and forms the Yellowhead branch of the Trans-Canada Highway. Highway 16 is crossed by the proposed pipeline corridor at several locations. Highway 16 is a two-lane, extending to four lanes in some areas, hard surface primary expressway. Highway 16 is anticipated to be the main highway utilized for the movement of equipment and materials to various pipeline spread locations in the Edmonton Region. Highways are supported by a comprehensive county-grid system so in the event of delays on these highways, alternate routes are available (Hanlan pers. comm.).

Highways 14, 2 and 60 may also be utilized by the Project for the purposes of moving equipment and materials to pipeline spreads and construction staging areas.

There are approximately five permanent traffic measurement sites located on Highway 16 within the Edmonton Region. Overall Monthly Average Daily Traffic (MADT) (Annual Average Daily Traffic [AADT] and Average Annual Daily Traffic by Month [AADTM]) volumes have increased from 2009 to 2011 with larger volumes occurring close to the City of Edmonton, likely due to commuters from the City of Spruce Grove and the Town of Stony Plain. Throughout the Edmonton Region, MADT volumes are highest during the summer months. For example, in the Town of Stony Plain 2012 MADT volumes ranged from a low of 19,891 in January to a high of 30,713 in August (Alberta Transportation 2012). Refer to Section 8.1.1 of the Socio-Economic Technical Report of Volume 5D for a map of key traffic measurement sites in the Edmonton Region.

According to the Edmonton MDP, the proposed pipeline corridor crosses in close proximity (less than 200 m) to a city bus depot (approximately RK 5.3). Beginning in Strathcona County, the proposed pipeline corridor lies within the TUC from approximately RK 2.4 to RK 41.8 and also crosses three provincial highways: Highway 216 (approximately RK 2.5, RK 12, RK 14.5, RK 17.5, RK 21, RK 21.5, RK 27.5, RK 34.7, RK 38); Wye Road (Highway 630) (approximately RK 5.4); Calgary Trail (Highway 2 Queen Elizabeth II (approximately RK 22.9) as well as Whitemud Drive NW (approximately RK 8.7 and RK 43.5).

On average, 2.5 million daily trips are made by City of Edmonton residents, 77% of which are made by car and 9% by public transit. There are also many daily goods and services trips made within Edmonton. The Edmonton Transportation Master Plan indicates routes of goods and services trips. The proposed pipeline corridor crosses one of these routes (Highway 216 at approximately RK 3) where an estimated 2,400 - 3,600 vehicles use this on a daily basis. The Edmonton Transportation Master Plan also states the predicted volume increase from 2006-2040 (City of Edmonton 2009).

The proposed pipeline corridor also crosses through an area for a proposed collector road at approximately RK 58. According to the Spruce Grove MDP, the proposed pipeline corridor crosses through an area zoned for institutional uses (a potential bus yard) at approximately RK 58.

The proposed pipeline corridor crosses over a route for a proposed arterial road along the northern boundary of the Town of Stony Plain (approximately RK 64 to RK 69), and crosses over a future collector route (approximately RK 62) (Armin A. Preiksaitis & Associates 2005).

Airports

There are numerous airports, private airfields and heliports in the Edmonton Region. The largest airport in the Edmonton Region is the Edmonton International Airport, located approximately 11 km south of RK 27.5. Edmonton Airport also manages three additional airports: Edmonton City Airport; Cooking Lake

Airport; and Villeneuve Airport. Edmonton City Airport is located 11 km from RK 0.0 and is home to training, military, industrial and medevac flights as well as small charters, private and corporate aircraft. Cooking Lake Airport is located 14 km from RK 11.1. Primarily functioning as a recreational flying facility for small aircraft and floatplanes, Cooking Lake Airport is the only facility in Alberta with both a conventional runway and a floatplane base. Villeneuve Airport is located 13 km from RK 53.8 and functions as the primary flight-training facility for the Edmonton Capital Region (Edmonton International Airport 2012).

Rail

The CPR runs north to south through the City of Edmonton. There are two CPR stations along the proposed pipeline corridor in the Edmonton Region (CPR 2012). The CN railway parallels the proposed pipeline corridor from approximately RK 0.0 to RK 12 and from approximately RK 60 to RK 135.0. There are 12 stations along the proposed pipeline corridor in the Edmonton Region (CN 2012). There are five rail crossings along the proposed pipeline corridor within this region.

Sherwood Park Urban Service Area, the City of Edmonton, the City of Spruce Grove, the Town of Stony Plain and the Village of Wabamun all have railway stations.

The proposed pipeline corridor crosses an existing Light Rail Transit route in the City of Edmonton (approximately RK 25) and a potential Light Rail Transit extension route (approximately RK 16). The existing route transports people from the northeast of the city, through downtown and to university campuses. The proposed routes would allow for a city-wide transit system, which could alleviate traffic congestion on the roads (City of Edmonton 2009).

Ports

There are no ports located in the Edmonton Region.

5.5.1.2 Rural Alberta Region

Roads

In the Rural Alberta Region, the proposed pipeline corridor loosely parallels Highway 16. Communities in the Rural Alberta Region are serviced by Highway 16, which is crossed by the proposed pipeline corridor at several points (RK 187.1, RK 248.2, RK 259.8, RK 278.2, RK 292.5, RK 312.4 and RK 328.9). Highway 16 is anticipated to be the main highway utilized for the movement of equipment and materials to various pipeline spread locations along this portion of the proposed pipeline corridor.

The Town of Edson is serviced by Highway 16 which passes through the town along the twinned alignments of 2nd and 4th Avenues. There are early plans to relocate Highway 16 so that it bypasses the town. Secondary Highway 748 defines the northern boundary of the Town of Edson and provides access to rural areas north and east of the town (Town of Edson 2006).

There are four permanent traffic measurement sites located on Highway 16 in the Rural Alberta Region. Overall MADT volumes have increased from 2009 to 2011 with larger volumes occurring close to the Town of Edson and the Town of Hinton, likely due to commuters. Throughout the Rural Alberta Region, MADT volumes are highest during the summer months. For example, in the Town of Hinton, 2012 MADT volumes ranged from a low of 4,697 in January to a high of 8,295 in August (Alberta Transportation 2012). Refer to Section 8.1.2 of the Socio-Economic Technical Report of Volume 5D for a map of key traffic measurement sites in the Rural Alberta Region.

The Yellowhead County MDP notes that the maintenance of transport routes is essential for the economic success and quality of life of communities within Yellowhead County. It is the objective of the Yellowhead County MDP to maintain and expand existing routes (especially Highways 40 and 47) to ensure the movement of goods and people.

The Edson MDP encourages buffers, increased setbacks, landscaping and traffic management to reduce the negative effects on major transportation routes within the town (Town of Edson 2006).

The Hinton MDP describes rural highways as principal routes for through traffic, and urban arterials as major links of large volume traffic. The Hinton MDP describes Robb Road (approximately RK 322) as a high truck traffic route; expansion to Robb Road will be needed in the future. The proposed pipeline corridor crosses a route designated for a future Highway 16 bypass (along the southern boundary of Hinton). The need for this bypass is dependent on the maintenance of Highway 16 as a through traffic route (Town of Hinton 1998).

Airports

There are numerous airports, private airfields and heliports in the vicinity of the Rural Alberta Region. Two airports are close to the proposed pipeline corridor. The Edson Airport is located approximately 1.5 km from RK 235.8. Edson Airport is classified as a medium-sized airport and has one paved runway (1,829 m) with no scheduled airline service (Edson Airport 2012). Maintained by Yellowhead County, the Jasper-Hinton Airport is located 2.9 km from RK 335.2. The Jasper-Hinton Airport is unmanned with maintenance staff keeping the runways safe and clear of debris, ice and snow (Town of Hinton 2013).

Rail

CN Railway parallels the entire proposed pipeline corridor in the Rural Alberta Region from RK 135.0 to RK 339.4. There are approximately 31 stations along the proposed pipeline corridor in the Rural Alberta Region (CN 2012). There are six rail crossings along the proposed pipeline corridor within this region.

Ports

There are no ports located in the Rural Alberta Region.

5.5.1.3 Fraser-Fort George/Thompson-Nicola Region

Roads

In the Fraser-Fort George/Thompson-Nicola Region, the Project generally parallels Highway 16 from approximately RK 489.6 to RK 505, Highway 5 (Southern Yellowhead Highway) from approximately RK 507 to RK 842 and Highway 5 (Coquihalla Highway) from approximately RK 911.6 to RK 991.1. Highways 5 is crossed by the proposed pipeline corridor at several points (RK 521.9, RK 529.6, RK 545.6, RK 552.3, RK 582.6, RK 608, RK 625.6, RK 626.9, RK 651, RK 655.5, RK 660.9, RK 686.5, RK 688.2, RK 689, RK 692.5, RK 695, RK 704.1, RK 708.1, RK 710, RK 710.7, RK 714.1, RK 717.1, RK 718.9, RK 726.4, RK 727.6, RK 737, RK 758, RK 760.1, RK 761, RK 762, RK 762.8, RK 763.6, RK 767.7, RK 926.5, RK 929.7, RK 938.7, RK 940.1, RK 966.5, RK 980.5). Trans-Canada Highway 97 is crossed by the proposed pipeline corridor at RK 850.5.

Both the Southern Yellowhead and Coquihalla sections of Highway 5 are the main vehicle route located along the proposed pipeline corridor. Highway 5 is a north-south two lane route with numerous portions expanded to four lanes for passing. Highway 5 provides the shortest land route from Vancouver to Edmonton and connects the northern Highway 16 with the southern Trans-Canada route. The Coquihalla Highway is a tourism travel corridor, offering scenic views and connecting the Lower Mainland with the Okanagan and interior BC (BC Ministry of Transportation and Infrastructure 2012a).

Highway 5 is anticipated to be the main highway utilized for the movement of equipment and materials to various pipeline spread locations in this region, Highways 16 and 1 in this region may also be utilized by the Project to move equipment and materials to pipeline spread construction hubs.

There are four permanent traffic measurement sites located on Highway 16 within the Fraser-Fort George/Thompson-Nicola Region. Traffic count data are available for 2010, 2011 and 2012 for these sites. Overall MADT volumes have slightly increased from 2010 to 2012 with larger volumes occurring close to the City of Kamloops, likely due to commuters from the region as Kamloops is the largest city in the Fraser-Fort George/Thompson-Nicola Region. Throughout the Fraser-Fort George/Thompson-Nicola Region, MADT volumes are highest during the summer months. For example, west of the City of Kamloops, 2012 MADT volumes ranged from a low of 5,412 in January to a high of 13,537 in August (BC Ministry of Transportation and Infrastructure 2012b).

There is one permanent traffic measurement site located on Highway 5 within the Fraser-Fort George/Thompson-Nicola Region. Traffic count data are available for 2010, 2011 and 2012 for the site. Overall MADT volumes have remained consistent with a slight decrease from 2010 to 2012. The 2012 MADT volumes range from a volume of 5,412 in January to 10,830 in June. The permanent traffic measurement site on Highway 5 is considered highly seasonal, as evidenced by the difference in monthly average daily traffic between winter and summer months. Increased traffic during summer months is likely due to travel associated with tourism, recreation and construction.

Refer to Section 8.1.4 of the Socio-Economic Technical Report of Volume 5D for a map of key traffic measurement sites in the Fraser-Fort George/Thompson-Nicola Region.

The TNRD RGS notes that major transportation and utility corridors must be protected for their existing function and potential expansion. The TNRD RGS also states that provincial, regional and local transportation goals must be recognized in order to ensure effective transportation of people and goods (TNRD 2000).

Airports

There are four airports, a number of private airfields and a number of heliports in the Fraser-Fort George/Thompson-Nicola Region. The proposed pipeline corridor crosses the Merritt Airport (Saunders Field) at RK 926.9. The proposed pipeline corridor is also near the Kamloops Airport, located approximately 0.1 km from RK 846.3.

Kamloops Airport Ltd. operates the Kamloops Airport, the largest airport in the region. The airport offers regular air service to Vancouver and Prince George, BC, and Calgary, Alberta. The airport has two runways and serves passenger travel, air cargo traffic and houses aviation-related industrial operations (Kamloops Airport Ltd. 2012). The proposed pipeline corridor crosses the airport zone designated by the Kamloops Airport Area Land Use and Development Plan. Compatible use in the airport zone includes runways, terminal buildings, charter businesses, aircraft sales and repairs and training schools, although none of which are crossed by the proposed pipeline corridor. Public access roads to the main terminal and sea plane base area are crossed by the proposed pipeline corridor. The proposed pipeline corridor also crosses a railway which can be utilized to transport goods to the airport.

The Merritt Zoning Bylaw states that the only uses permitted in the airport commercial areas are aircraft and helicopter sales, rental, storage and repair facility; bulk petroleum product sales; delivery and express facility; offices required for the operation of airport; public transportation depot including bus terminal, airport and heliport; public use; warehouse and accessory building. The Zoning Bylaw also notes that no development of any kind shall be permitted between the eastern end of the airport and the City boundary to preserve the take-off approach surface (City of Merritt 2011a).

Other communities in the Fraser-Fort George/Thompson-Nicola Region with paved airports or airstrips are Merritt, Valemount, Blue River and Princeton.

Rail

The CN Railway loosely parallels the proposed pipeline corridor from the Alberta-BC border to the City of Kamloops. There are 45 CN stations and 6 CPR stations in the vicinity of the proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region (CN 2012, CPR 2012). There are 19 rail crossings along the proposed pipeline corridor within this region. South of Kamloops, there is no railway in the vicinity of the proposed pipeline corridor. The City of Kamloops is a hub for freight and passenger rail carriers. The CN rail system includes a mainline and a feeder line, the CPR rail system consists of a mainline and VIA Rail Canada operates a passenger route (Natural Resources Canada 2008). The Kamloops North Station is utilized by VIA Rail Canada for passenger service (VIA Rail Canada 2012).

Ports

There are no known ports located in the Fraser-Fort George/Thompson-Nicola Region.

5.5.1.4 Fraser Valley Region

Roads

In the Fraser Valley Region, the Project parallels Highway 5 (Coquihalla Highway) from approximately RK 991.1 to RK 1035.1 and Highway 1 (Trans-Canada Highway) from approximately RK 1045 to RK 1088.6. Highway 5 and Highway 1 are the main vehicle routes located in the area. Highway 5 continues to be a north-south two lane route with numerous portions expanded to four lanes for passing within this region. The Trans-Canada Highway, Canada's longest national road, connects provincial highways to the Pacific coast and is a four-lane route within this region (Transport Canada 2012). Highway 5 and Highway 1 are crossed by the proposed pipeline corridor at several locations. Highway 11 is crossed by the proposed pipeline corridor at RK 1123.8. Highway 5 and Highway 1 are anticipated to be the main highways utilized for the movement of equipment and materials to various pipeline spread locations in this region.

In the Project area, Highway 5 services Hope and Highway 1 services Hope, Chilliwack, Abbotsford and rural areas. The District of Hope is located at the convergence of Highways 1, 3, 5 and 7, with access to the Fraser Canyon, Metro Vancouver, the Okanagan and the Kootenays (Advantage Hope 2011). Any vehicle leaving or entering the Lower Mainland from the interior of the province must travel through Hope; therefore, the community is familiar with large volumes of vehicle traffic (Davidsen, Wilson pers. comm.). The Upper Fraser Valley Regional RCMP Detachment noted that on long weekends, Highway 1 between Chilliwack and Hope is bumper-to-bumper (Burleigh, Simmill pers. comm.). It was noted that the BC Ministry of Transportation and Infrastructure is interested in the continual flow of goods along highways (Simmill pers. comm.). The presence of large equipment vehicles on highways does not pose any issues because they are required to obtain necessary BC Ministry of Transportation and Infrastructure permits if they are oversized (Simmill pers. comm.). In the Fraser Valley Region, the Fraser Valley Traffic Services based in Chilliwack enforce traffic laws on arterial highways (Davidsen, Wilson pers. comm.).

In the District of Hope, the proposed pipeline corridor crosses, and is in close proximity to, Othello Road (crossed at approximately RK 1035.2) which currently requires upgrading to handle large equipment (Misumi pers. comm.). In the City of Chilliwack, the proposed pipeline corridor is located near traffic corridors of concern. Vedder Road currently has congestion issues, while Tyson Road, Watson Road and Lickman Road are projected to become areas of traffic concern within the next 10 - 20 years. Vedder Road and Tyson Road are major arterial roads (ISL Engineering 2007).

There are three key transport corridors within the City of Abbotsford: Highway 1 corridor connecting the Fraser Valley and interior BC with Metro Vancouver; Highway 1A corridor connecting Abbotsford to Langley and Surrey; and Highway 11 corridor that connects the north of Fraser Valley to the USA border via Washington State. The proposed pipeline corridor crosses two of these three corridors: Highway 1 (approximately RK 1113.6); and Highway 11 (approximately RK 1123.6) (City of Abbotsford 2007).

There is one permanent traffic measurement site located on Highway 5 within the Fraser Valley Region. Traffic count data are available for 2010, 2011 and 2012 for the site. Overall MADT volumes have remained consistent from 2010 to 2012. The permanent traffic measurement site is considered highly seasonal, as evidenced by the large difference in monthly average daily traffic between winter and summer months. Increased traffic during summer months is likely due to travel associated with tourism and recreation. For example, in the District of Hope, 2012 MADT volumes ranged from a low of 5,456 in January to a high of 18,476 in August (BC Ministry of Transportation and Infrastructure 2012b).

Three permanent traffic measurement sites are located on Highway 1 within the Fraser Valley Region. Traffic count data are available for 2012 as well as 2010 and 2011 for most sites. Overall MADT volumes have remained consistent from 2010 to 2012 with larger volumes occurring in the cities of Chilliwack and Abbotsford, likely due to commuters moving between communities in the Fraser Valley Region. The permanent traffic measurement sites on Highway 1 near Hope and in Chilliwack are considered seasonal, as evidenced by the difference in monthly average daily traffic between winter and summer months. Increased traffic during summer months is likely due to travel associated with tourism and recreation. The permanent traffic measurement site on Highway 1 in Abbotsford is considered consistent, without large variations in monthly average daily traffic between winter and summer months.

Refer to Section 8.1.5 of the Socio-Economic Technical Report of Volume 5D for a map of key traffic measurement sites in the Fraser Valley Region.

Airports

There are two airports, a number of private airfields and a number of heliports in the vicinity of the Fraser Valley Region.

The Abbotsford International Airport is the largest airport in the Fraser Valley Region. The airport is owned and operated by the Abbotsford Airport Authority on behalf of the City of Abbotsford. The airport has two runways and offers regularly scheduled flights to Victoria and Nanaimo, BC and Calgary and Edmonton, Alberta (Abbotsford International Airport 2012). The Abbotsford International Airport is located approximately 7.6 km from the proposed pipeline corridor at RK 1127.1.

Other communities in the Fraser Valley Region with paved airports or airstrips are Chilliwack and Hope.

Rail

The CN Railway loosely parallels the proposed pipeline corridor from Hope to Chilliwack. There are 14 CN stations, 7 CPR stations, 8 Southern Railway of BC (SRY) stations and 1 Burlington Northern Santa Fe Corp. (BNSF) station in the vicinity of the proposed pipeline corridor in the Fraser Valley Region (CN 2012, CPR 2012, Southern Railway of BC 2012). There are six rail crossings along the proposed pipeline corridor within this region.

The District of Hope, City of Chilliwack and City of Abbotsford all have railway stations. CN Rail systems includes a mainline and VIA Rail Canada operates a passenger route in the vicinity of the Project (Natural Resources Canada 2008). Hope, Abbotsford and Chilliwack are serviced by VIA Rail Canada for passenger service (VIA Rail Canada 2012). According to the Abbotsford Transportation Master Plan, Abbotsford is served by three rail services: CN; CPR; and SRY. The proposed pipeline corridor crosses two of these railways: CPR (approximately RK 1123.6); and the SRY (approximately RK 1126.6 and RK 1131.6) (City of Abbotsford 2007).

Ports

There are no known ports located in the Fraser Valley Region.

5.5.1.5 Metro Vancouver Region

Roads

In the Metro Vancouver Region, Highway 1 (Trans-Canada Highway) is the main vehicle route located in the Socio-Economic RSA. In the Project area, Highway 1 services the Township of Langley, and the cities of Surrey, Coquitlam and Burnaby. Highway 1 is crossed by the proposed pipeline corridor at two locations (approximately RK 1166.9 and RK 1173.1). Highway 1 is anticipated to be the main highway utilized for the movement of equipment and materials to various pipeline spread locations in this region.

There are four permanent traffic measurement sites located on Highway 1 in the vicinity of the proposed pipeline corridor within the Metro Vancouver Region. Traffic count data are available for 2010 and in some cases 2011 and 2012 as well for these sites. Overall MADT volumes have remained consistent from 2010 to 2012 with larger volumes occurring at the Port Mann Bridge crossing, likely due to commuters driving between communities in Metro Vancouver. There is little difference in monthly average daily traffic between winter and summer months. This is likely due to the urban nature of the Metro Vancouver Region. Refer to Section 8.1.6 of the Socio-Economic Technical Report of Volume 5D for a map of key traffic measurement sites in the Metro Vancouver Region.

The proposed pipeline corridor follows the alignment of the recently constructed South Fraser Perimeter Road (SFPR) in Surrey. The City of Surrey currently has substantial infrastructure in the corridor, and various projects are planned for the corridor in advance of the Project, for example a twinning of the Metro Vancouver sanitation line. The city noted a lack of opportunities for land compensation in the area due to commitments from previous projects (Luymes, Baron pers. comm.). The proposed pipeline corridor

follows Daly Road which is currently under construction to be the Golden Ears Bridge connector for the SFPR (Baron pers. comm.).

In Burnaby, the proposed pipeline corridor crosses several transit routes such as the West Coast Express (approximately RK 2), a Rapid Bus Service route (approximately RK 2), the Express Bus Service to Simon Fraser University (approximately RK 1180) and the Light Rail Transit Route and Stations (approximately RK 1175.6 and RK 1176.6) (City of Burnaby 1998). The proposed pipeline corridor also crosses Lougheed Town Centre area, which is one of Metro Vancouver's priority areas for rapid transit expansion (both railway and buses) (Metro Vancouver 2010a).

Airports

There are four airports, a number of private airfields and a number of heliports in the vicinity of the Metro Vancouver Region. The Vancouver International Airport (YVR) is the largest airport in the Metro Vancouver Region, the province and is the second busiest airport in Canada. Annually, the airport transports approximately 17 million passengers per year with regularly scheduled flights to provincial, national and international destinations (Vancouver International Airport [YVR] 2012). YVR is located in Richmond and is managed by the Vancouver Airport Authority. The airport is located 19.4 km west of RK 1178.5. Other communities in the Metro Vancouver Region with paved airports or airstrips are Langley, Pitt Meadows and Delta.

Rail

The CN Railway parallels the proposed pipeline corridor in parts of Langley and in Surrey. There are 25 CN stations, 10 CPR stations, 7 BNSF stations, 6 SRY stations, 1 Union Pacific station and 1 Amtrak station in the vicinity of the Project in the Metro Vancouver Region (CN 2012, CPR 2012, Southern Railway of BC 2012). There are 25 rail track crossings along the proposed pipeline corridor within this region.

The Township of Langley, City of Surrey, City of Coquitlam and City of Burnaby all have railway stations. CN, CPR and West Coast Express operate mainlines in the Socio-Economic RSA, while BNSF, CN and Amtrack operate collectors and primary feeders in the Socio-Economic RSA. VIA Rail Canada, Amtrak and West Coast Express operate passenger routes in the Socio-Economic RSA (Natural Resources Canada 2008). The Vancouver International Terminal is located in the City of Surrey.

Ports

Burrard Inlet is the location of Canada's busiest port, PMV (BIEAP 2011). Refer to Section 5.4.9 for a full discussion of marine use within Burrard Inlet.

PMV has jurisdiction over commercial port operations and management in the Lower Mainland, including within Burrard Inlet. PMV is responsible for oversight of all marine traffic within Burrard Inlet, and operates harbour patrol vessels and services including emergency response, harbour monitoring and support services (PMV 2013). The port contains 28 major cargo terminals, 23 of which are in Burrard Inlet. Vancouver is the homeport for the Vancouver-Alaska cruise ship industry, with two cruise ship terminals in the Inner Harbour which provide berthing facilities for cruise ship companies (PMV 2013). Commercial vessel traffic in Burrard Inlet is comprised of vessels accessing the various marine terminals within Burrard Inlet, including:

- cargo ships (forest products, steel products, machinery, grains, coal, chemicals, potash and sulphur);
- oil tankers (petroleum products);
- cruise ships; and
- container ships (household goods) (PMV 2013).

In 2012, the PMV handled approximately 123 million tonnes of cargo and over 3,000 calls by foreign vessels (PMV 2012).

5.5.2 Linear Infrastructure and Power Supply

5.5.2.1 Power Supply

In Alberta, the electricity generation system is private, allowing the market to respond to increasing demand and allowing any participant to build new generation capacity. Over 6,800 MW of new electricity generating capacity has been added to the Alberta system since 1998. As of December 31, 2011, the overall generation capacity of the Alberta electricity market was 13,659 MW. Of this, 46% was generated from coal, 39% from natural gas (cogeneration, combined-cycle, and simple cycle), 6% from hydro-electric, 6% from wind generation, and 2% from other types of generation (Alberta Electric System Operator [AESO] 2012). The AESO is responsible for the planning and operation of the Alberta Interconnected Electric System, or the transmission grid. AESO plans the transmission system to connect generation capacity required to serve the growing demand for electricity. AESO's long-term outlook anticipates that generation capacity will be over 20,663 MW by 2022 (AESO 2012). AESO considers a range of factors when forecasting Alberta's electricity and transmission requirements, including population growth and industrial production growth, and it is the AESO's role to ensure that transmission infrastructure is in place ahead of increased demand to ensure reliability to existing and new customers (AESO 2013). Electricity is distributed in the Alberta socio-economic regions via transmission or distribution companies (*e.g.*, AltaLink, Fortis).

Trans Mountain has identified that the Project will require an additional 37.5 MW of power in Alberta related to the proposed changes at pump stations. This need was brought forward to the AESO, and Trans Mountain supported AESO studies to determine how best to meet this new industrial need at the required level of reliability. In order to meet the power needs of the Project in Alberta, new transmission and/or distribution upgrades are being explored, including new 138 kV power lines related to the Edmonton Terminal and the Edson Pump Station. In Alberta, a third party distribution company will apply to the appropriate provincial regulatory authority for electrical facilities necessary to connect with the provincial power lines.

In BC, BC Hydro and Power Authority (BC Hydro), a Crown corporation, is responsible for the generation, purchasing, distributing and selling electricity. BC Hydro's primary source of generating capacity is from hydroelectric facilities (90.7% of generation in 2012). Other sources are thermal (8.9% in 2012) and diesel generation (0.4% in 2012) (BC Hydro 2012). BC Hydro also acquires power from Independent Power Producers. Independent Power Producers generate power from sources such as water (run-of-river facilities), wind, biomass and waste heat (BC Hydro 2013a). BC Hydro's transmission system consists of 292 substations and over 18,000 km of power lines and underwater submarine cables. The Lower Mainland and Vancouver Island are the primary consumers of electricity in the province (70% to 80%) (BC Hydro 2013b). In 2012, the peak demand load of the BC electricity system was approximately 12,000 MW. BC Hydro's load forecast indicates that peak demand will grow to almost 16,000 MW by 2022 (before conservation measures) (BC Hydro 2013c). Load forecasting considers the anticipated needs of residential, commercial, and industrial customers.

BC Hydro distributes electricity to most communities in the BC socio-economic regions. North from Kamloops, BC Hydro operates a 138 kV circuit to Rearguard, north of Valemount. Between Kamloops and Rearguard, there are 16 substations (BC Hydro 2013b). Feedback during the Kamloops Open House indicated that there is concern regarding the capacity of this distribution line to serve the North Thompson region. BC Hydro operates a 138 kV circuit power line, followed by a 69 kV circuit power line south of Kamloops to Merritt. BC Hydro is planning the Merritt Area Transmission Project to meet increased demand for power in the Merritt area, independent of the Project. The project includes a power line and substation in Merritt (BC Hydro 2013d). Between Hope and Abbotsford, there are various substations and 69 kV, 230 kV, 360 kV and 500 kV power line circuits (BC Hydro 2013b). Between Langley and Burnaby, there are various substations and 69 kV, 230 kV and 500 kV power line circuits (BC Hydro 2013b). BC Hydro is planning the Interior to Lower Mainland Project to meet domestic load growth in the Lower Mainland. The project includes a power line between the Nicola Substation near Merritt and Coquitlam (BC Hydro 2013d).

Trans Mountain has identified that the Project will require an additional 16.9 MW of power in the BC North Thompson Region, 10.8 MW of additional power in the BC Kamloops Nicola Valley Region, and a reduction of 26.3 MW of power in the BC Lower Mainland Region, related to the proposed changes in

pump stations. This need was brought forward to BC Hydro, and Trans Mountain supported studies to determine how best to meet this new industrial need at the required level of reliability. To meet the power needs of the Project in BC, new transmission and/or distribution upgrades are proposed including new 138 kV lines related to the needs of the Kingsvale Pump Station and the Black Pines Pump Station.

In BC, Trans Mountain will apply to the appropriate provincial regulatory authority for electrical facilities necessary to connect with the provincial power lines. Once developed, any new transmission or distribution infrastructure will be transferred to BC Hydro.

The existing electrical substation and electricity supply line within the Westridge Marine Terminal will be upgraded as required. Electrical upgrades will be determined through a study to be conducted by BC Hydro. At this time, it is anticipated that an additional 3 MW of power will be required at this facility.

5.5.2.2 Linear Infrastructure

The proposed pipeline corridor crosses approximately 13 power lines in the Edmonton Region, 21 in the Rural Alberta Region, 17 in the Fraser-Fort George/Thompson-Nicola Region, 39 in the Fraser Valley Region and 17 in the Metro Vancouver Region.

There are numerous pipeline and subsurface linear right-of-ways (*i.e.*, communications infrastructure) in areas along the proposed pipeline corridor. Depending on right-of-way finalization, there may be multiple right-of-way or easement crossings for which use will need to be negotiated by the Project. An inventory of potential sub-surface linear infrastructure crossings will be developed for land-access and acquisition purposes upon right-of-way finalization. At that time, Trans Mountain will engage in a notification and consultation process with stakeholders to ensure appropriate and mutually-agreeable crossing and use agreements are in place.

Many of the municipalities crossed by the proposed pipeline corridor in Alberta acknowledge and plan for pipeline corridors in their planning documents. The Strathcona County MDP promotes the use of pipeline/utility corridors for multi-use purposes (such as including municipal utilities, electrical power lines and communications infrastructure within these corridors) (Strathcona County 2007). The Edmonton MDP outlines municipal policies related to pipeline corridors, such as: develop a risk management approach; collaborate with the Edmonton Area Pipeline and Utility Operators' Committee ERCB; ensure development setbacks from pipelines; if possible, plan pipelines within other utility corridors. Within Edmonton, the proposed pipeline corridor mainly crosses through the TUC (City of Edmonton 2010). The Spruce Grove MDP plans for pipeline corridors within the context of the Capital Regional Growth Plan, and supports the protection of these corridors from incompatible development (City of Spruce Grove 2010). The Parkland County MDP states that AER subdivision and setback legislation respecting pipelines will be adhered to when considering further development (Parkland County 2007). The Stony Plain MDP recognizes the requirement of setbacks from pipeline and utility rights-of-way, in accordance with the AER legislation. The Stony Plain MDP also states that Area Structure Plans are required for new development and must address the environmental effects and mitigation measures for incompatible land uses such as pipelines. The Stony Plain MDP encourages the joint-use utility and transportation corridors in order to minimize effects and fragmentation of other land uses.

5.5.3 Waste and Water Infrastructure

This subsection discusses existing waste and water infrastructure located in the vicinity of the proposed pipeline corridor. Refer to Section 8.3 of the Socio-Economic Technical Report of Volume 5D for a full discussion of waste and water infrastructure.

The Project's plans to meet water supply and waste management needs are discussed in Project Design and Execution of Volume 4. Trans Mountain has established relationships with landfills in Alberta and BC, some of which are within the Socio-Economic RSA, as noted in Table 5.5-1.

TABLE 5.5-1

LANDFILLS IN ALBERTA AND BC APPROVED FOR TRANS MOUNTAIN USE

Full Facility Name	Location	Facility Type
Edmonton Waste Management Centre (Cloverbar)	Edmonton, AB	Recycling, Landfill
Waste Management West Edmonton Landfill	Edmonton, AB	Landfill - Class II
Beaver Regional Waste Management Services Commission	Ryley, AB	Landfill - Class II, recyclables
West Dried Meat Lake Landfill	Ferintosh, AB	Landfill - Class II
Secure Energy Services South Grande Prairie Landfill	Grovedale, AB	Landfill - Class II
Tervita Tower Road Landfill (formerly CCS)	Carrot Creek, AB	Landfill - Class II
Ecowaste Richmond Landfill	Richmond, BC	Landfill; hazardous soil
Kamloops Municipal Landfill - Mission Flats	Kamloops, BC	Landfill; non-hazardous solid waste, recyclables
Kamloops Municipal Landfill - Barnhartvale	Kamloops, BC	Landfill; non-hazardous solid waste, recyclables
Tervita Silverberry	Fort St. John, BC	Landfill, landfarm
Newalta Fairview	Fairview, AB	Landfill

5.5.3.1 Edmonton Region

A range of waste and water infrastructure exists in communities along the proposed pipeline corridor in the Edmonton Region. The nearest solid waste facility to the Edmonton Region is the Edmonton Waste Management Centre (EWMC), owned and operated by the City of Edmonton. The EWMC is located in the northeast of Edmonton. Facilities located at the EWMC include the Integrated Processing and Transfer Facility, the Materials Recovery Facility, the Edmonton Composting Facility, the Global Electric and Electronic Processing Inc. Electrical and Electronic Waste Recycling Facility, a residential waste drop-off station, the Construction and Demolition Recycling Operation, Clover Bar landfill and a leachate treatment plant. The Construction and Demolition Recycling Operation accepts mixed and segregated drywall, metals, wood, brush/trees, asphalt shingles and concrete (City of Edmonton 2013a).

Raw sewage from the City of Spruce Grove and the Town of Stony Plain is piped to Fort Saskatchewan where it is treated (Mustard, Frostad pers. comm.). Capacity is not high for waste management since waste management systems were designed for residents. Construction and demolition waste goes to Edmonton, asphalt and concrete recycling goes to public works (Nicol pers. comm.). According to the Spruce Grove MDP, the proposed pipeline corridor crosses one existing sanitary trunk main (approximately RK 60) and one future sanitary trunk main (approximately RK 61) (City of Spruce Grove 2010). According to the Stony Plain MDP, the proposed pipeline corridor crosses an existing trunk sanitary sewer (approximately RK 63) and a proposed trunk sanitary sewer (approximately RK 64) (Armin A. Preiksaitis & Associates 2005).

The North Saskatchewan River watershed supplies all water to the City of Edmonton. Twelve sub-basins make up the river which is subject to the 1969 Prairie Provinces Water Board Master Agreement, stating that 50% of the natural flow of east-flowing rivers must flow into Saskatchewan. Municipal water use is expected to increase by 16% by 2025, with most growth occurring in the Edmonton Capital Region. Water quantity as a result of increased consumption is not a concern (EPCOR Water Services Inc. 2010).

According to the Spruce Grove MDP, the proposed pipeline corridor crosses three water mains (approximately RK 58, RK 59 and RK 60) and one regional water line at approximately RK 61 (City of Spruce Grove 2010). Parkland County is a member of the Capital Region Parkland Water Services Commission, which recognizes that new storage reservoirs, pumping facilities and distribution mains may be needed. The Parkland County MDP also encourages new measures be explored to conserve water within the county (Parkland County 2007). According to the Stony Plain MDP, the proposed pipeline corridor crosses an area planned for a proposed water main route (approximately RK 64) (Armin A. Preiksaitis & Associates 2005).

The Village of Wabamun has switched to using groundwater from Wabamun Lake Provincial Park. The water supply wells are located approximately 1 km south of the proposed pipeline corridor. A pipeline to supply water to the village was in construction as of October 2013 (During pers. comm.). In 2008, the

Village of Wabamun (and 15 other municipalities) formed the West Inter Lake District Regional Service Commission, which provides and operates the regional water supply system (Village of Wabamun 2010).

Within the Edmonton Region, Swan Hills Treatment Centre accepts hazardous waste (Table 5.5-2).

A summary of solid waste, liquid waste and water infrastructure for communities within the proposed pipeline corridor of the Edmonton Region are presented in Table 5.5-2.

TABLE 5.5-2

SOLID WASTE, LIQUID WASTE AND WATER INFRASTRUCTURE FOR CORRIDOR COMMUNITIES IN THE EDMONTON REGION

Community	Solid Waste Infrastructure (Operator)	Information on Solid Waste Materials	Liquid Waste Sewage Treatment System	Water Source and Delivery System
City of Edmonton	West Edmonton Landfill (Waste Management Inc.)	• Accepts range of waste streams including industrial, commercial, institutional, and construction/debris	• Gold Bar Wastewater Treatment Plant	• The North Saskatchewan River supplies all of the water to the City of Edmonton
	Edmonton Waste Management Centre	• Construction and Demolition Recycling Operation accepts mixed and segregated drywall, metals, wood, brush/trees, asphalt shingles and concrete		
	Swan Hills Treatment Centre	• Accepts hazardous commercial waste		
City of Spruce Grove	Spruce Grove Eco-Centre	• Accepts recyclables, household hazardous waste, metals, and organic waste	• Raw sewage is piped to a facility in Fort Saskatchewan	• City water is piped from Edmonton and is stored in the reservoir
Town of Stony Plain	Waste collection services provided by Ever Green Ecological Services Inc.	• Household waste, blue bag recycling and organics	• Raw sewage is piped to a facility in Fort Saskatchewan	• Town water is piped directly from Edmonton
Village of Wabamun	Waste collection services provided by Ever Green Ecological Services Inc.	• Household waste, blue bag recycling and organics	• Raw sewage is treated in a lagoon	• Currently water is from groundwater wells located approximately 1 km south of the proposed pipeline corridor • A water supply pipeline is under construction as of October 2013

Sources: Alberta Community Profiles 2013, City of Edmonton 2013, City of Spruce Grove 2013, Town of Stony Plain 2013, During, Frostad, Mustard pers. comm., Waste Management Inc. 2013

5.5.3.2 Rural Alberta Region

A range of waste and water infrastructure exists in communities along the proposed pipeline corridor of the Rural Alberta Region. The Town of Edson identified that there is a sanitary lagoon in the east end of town (approximately 500 m south of RK 228). Improvements to the Town of Edson sanitary lagoon are planned within the next 5 years. The Edson Landfill is a Class III, meaning it cannot accept wet waste. Residential waste is transported to the West Yellowhead Regional Landfill. The Town of Edson has a large recycling depot and is very keen on recycling. The Edson Town Council recently instigated a two bag limit and mandatory recycling. Town of Edson identified the need for a sewer to the west, if development is to continue. The community is interested in improvements to existing waste infrastructure and services but is not interested in increased development within the town (Lemieux pers. comm.).

There are 16 transfer stations located in Yellowhead County. Waste in Yellowhead County is hauled to the West Yellowhead Regional Landfill in the Town of Hinton (Ramme, Lyons pers. comm.). Water to hamlets is piped from the water treatment plant in the Hamlet of Peers. Each hamlet in Yellowhead County has its own water treatment facility, but not necessarily a distribution system (Ramme, Lyons pers. comm.).

Moose Creek Disposal Well, a saltwater disposal facility, is located east of the Town of Edson. The facility is operated by Tervita and accepts produced and waste water (Tervita 2012). According to the Yellowhead County MDP, poor quantity and/or quality of drinking water have been identified in some areas of Yellowhead County (Yellowhead County 2006). Potable water for the Town of Edson comes from aquifers. Water from the aquifers is pumped into storage tanks located adjacent to Grande Prairie Trail. Natural elevation creates water pressure to provide service to most homes and businesses. Capacity is sufficient for approximately 10,500 people (Town of Edson 2006), in 2011 the population of the town was 8,475 (Statistics Canada 2013a). The Edson MDP recommends that future development be in line with the extension of municipal utility services (Town of Edson 2006).

Within the Rural Alberta Region, the Tervita Tower Road Landfill accepts hazardous materials (Table 5.5-3).

A summary of solid waste, liquid waste and water infrastructure for communities within the proposed pipeline corridor of the Rural Alberta Region are presented in Table 5.5-3.

TABLE 5.5-3

SOLID WASTE, LIQUID WASTE AND WATER INFRASTRUCTURE FOR CORRIDOR COMMUNITIES IN THE RURAL ALBERTA REGION

Community	Solid Waste Infrastructure (Operator)	Information on Solid Waste Materials	Liquid Waste Sewage Treatment System	Water Source and Delivery System
Town of Edson	Edson Landfill	• Capacity approximately 25 years • Class III Landfill	• Most sewage runs south to a main trunk on the south side of the CN tracks or to the north side of the tracks and on to the sanitary lagoon site	• Groundwater in aquifers pumped into storage tanks adjacent to Grande Prairie Trail
	Tervita - Tower Road Landfill	• Class II Landfill		
Town of Hinton	West Yellowhead Regional Landfill	• Appliances, computers and electronics, grass clippings, leaves and garden refuse, used oil and paint aerosol and cans • Toxic round-up storage containers are provided for residents • Services the West Yellowhead Region, including the Municipality of Jasper • Capacity is good, approximately 100 years	• Sewage treatment is provided by Hinton Pulp (a division of West Fraser Mills Ltd.). A sewer flushing program is provided. There are no provisions for the disposal of chemicals	• The Athabasca River provides water to the town. Reservoir design capacity is 13,636 m^3

Sources: Lemieux, Lyons, Ramme pers. comm., Tervita 2012, Town of Edson 2006, Town of Hinton 2013

5.5.3.3 Fraser-Fort George/Thompson-Nicola Region

A range of waste and water infrastructure exists in communities along the proposed pipeline corridor within the Fraser-Fort George/Thompson-Nicola Region. TNRD provides solid waste services to all unincorporated and incorporated communities except the City of Kamloops. New landfills are being built by TNRD in the District of Clearwater and the District of Barriere. The existing Clearwater Landfill and Barriere Landfill began progressive closure in November 2012 (Gill pers. comm.). There is a contaminated soils facility in the City of Kamloops operated by HAZCO, and another near the City of Merritt that has sufficient capacity (Gill pers. comm.).

The Village of Valemount has sufficient sewer capacity. The Village of Valemount has a licence to discharge 1,500 m^3 per day, but currently discharges up to 600 m^3 per day. Power outages are an issue for lift stations (there are generators on only one lift station). The Village of Valemount has nine lift stations to move sewage (LaBoucane pers. comm.). Valemount has a transfer station, and that waste is then hauled to Prince George (McCracken pers. comm.). RDFFG Landfill services the Village of Valemount.

In the Community of Blue River, only a portion of the community is on the water system (Madden pers. comm.). Blue River has five principal water resources, including the Blue River and the North Thompson River (TNRD 2011). The proposed pipeline corridor crosses the Blue River at approximately RK 614. Residents in the Community of Blue River are on septic systems (Madden pers. comm.).

In the District of Clearwater, water supply is from several sources, including two groundwater well sources and a surface water source. Most of the community's drinking water is obtained from the surface water source, which consists of three sub-basins: Russell; Hascheak; and McDougall creeks. The two groundwater sources are the Clearwater River Water Supply Well No. 1 and the Dutch Lake Water Supply Well No. 2 (District of Clearwater 2012). The sewage infrastructure in the District of Clearwater is close to capacity and it can only handle approximately 100-130 new houses (Groulx pers. comm.).

In the City of Kamloops, the proposed pipeline corridor crosses an area adjacent to the Solid Waste Landfill site (Mission Flats, approximately RK 848) (Fretz pers. comm.). No capacity issues regarding sewage treatment and solid waste were identified by the City of Kamloops (Fretz pers. comm.); the City of Kamloops has plans to upgrade sewage treatment. The city disposes wastewater primarily via a system of collection pipes; wastewater is treated at the Wastewater Treatment Plant located on Mission Flats Road. Missions Flats Road is the only access to the plant (Fretz pers. comm.). The proposed pipeline corridor crosses Mission Flats Road at RK 847.5. The Waste Treatment Plant system serves over 95% of the city's population (City of Kamloops 2011a). The remaining city population is served by septic tanks and disposal fields (City of Kamloops 2011a).

According to the Kamloops OCP, the proposed pipeline corridor crosses an area adjacent to the Kamloops Wastewater Treatment Plant located on Mission Flats Road (approximately RK 848), which has an extensive network of pipelines leading to the city. Water supply for the City of Kamloops is from the South Thompson River (Fretz pers. comm.). The city relies on two public and two private water utilities. Most of the city's population (97%) is served by the public Main City system, the source of which is the South Thompson River. Water from the Main City system undergoes filtration and disinfection (City of Kamloops 2011b). The plant is currently close to maximum capacity, particularly in summer months (Fretz pers. comm.). The city is implementing a metering program to offset the need for additional infrastructure, however, emergency intakes exist (Fretz pers. comm.). The Campbell Creek system is the second public water utility, serving less than 1% of the city's population from wells. The two private water utilities are the Rayleigh and Heffley systems. The Rayleigh system serves 2% of the city's population and is sourced from the North Thompson River while the Heffley system serves less than 1% of the city's population from wells (City of Kamloops 2011b).

In the City of Merritt, sewage treatment infrastructure has the capacity for 12,000 people (Merritt's current population is approximately 7,000). Sewer capacity is also sufficient (O'Flaherty pers. comm.). According to the Merritt OCP, the proposed pipeline corridor crosses a potential sewage extension at approximately RK 930.6 (within the Joeyaska Indian Reserve No. 2) (City of Merritt 2011a). The landfill for the community is located in Lower Nicola and is operated by the TNRD. There is no transfer station in Merritt (O'Flaherty pers. comm.). The City of Merritt has one deep well and two shallow wells. Two of the wells are running and one is for reserve.

A summary of solid waste, liquid waste and water infrastructure for communities along the proposed pipeline corridor of the Fraser-Fort George/Thompson-Nicola Region are presented in Table 5.5-4.

TABLE 5.5-4

SOLID WASTE, LIQUID WASTE AND WATER INFRASTRUCTURE FOR CORRIDOR COMMUNITIES IN THE FRASER-FORT GEORGE/THOMPSON-NICOLA REGION

Community	Solid Waste Infrastructure (Operator)	Information on Solid Waste Materials	Liquid Waste Sewage Treatment System	Water Source and Delivery System
RDFFG	Legrand Demolition and Construction Waste Landfill (RDFFG)	• Land clearing debris as well as demolition and construction waste	• Three community sewer systems in operation; two in construction phase. Includes gravity feed or low-pressure collection mains, control values and lagoons for storage and treatment	• Two groundwater source drinking water supply systems, established as local service areas
Village of Valemount	Valemount Regional Transfer Station	• Tire recycling • Yard and garden waste • Small loads of demolition and construction waste; large loads can be arranged at the Legrand Landfill	• Sewers • Nine lift stations to move sewage	• Supply of water comes from Swift Creek
District of Clearwater	Clearwater Landfill	• Residential collection • Commercial collection • Solid waste special services	• Sewers • Sewage infrastructure is close to capacity	• Two groundwater well sources and a surface water source
City of Kamloops	Kamloops Municipal Landfill	• All residential solid waste occurs at the Mission Flats, Barnhartvale, or Heffley Creek landfills • Mission Flats landfill has a wide range of diversion programs on-site • Most Industrial, Commercial, and Institutional (ICI) waste disposal occurs at the Owl Road landfill	• Wastewater Treatment Plant (sewered) • Septic tanks and disposal fields (unsewered, on-site)	• South Thompson River (97% of city population) • Wells • North Thompson River • Two public and two private water utilities
	Kamloops Facility, Industrial Waste Services (Sumas Environmental Services, Inc.)	• Oils and solvents • Contaminated material • Metal and non-metal bearing sludge		
	Kamloops Bioremediation Facility (Tervita)	• Accepts various types of contaminated soils including hydrocarbon, gasoline and diesel and heating oil		
	Big Valley Waste Treatment Facility (Sumas Environmental Services Inc.)	• Accepts heavily contaminated solids and sludges. Storage tanks are used for fuel recycling		
City of Merritt	Lower Nicola Landfill (TNRD)	Unknown	• Treatment infrastructure, sewers	• Groundwater via one deep and two shallow wells • One well is for reserve

Sources: City of Kamloops 2011a,b,c, City of Kamloops 2013, District of Clearwater 2012, Groulx pers. comm., LaBoucane pers. comm., RDFFG 2012, RDFFG 2013, Sumas Environmental Services Inc. n.d., Tervita 2012

5.5.3.4 Fraser Valley Region

A range of waste and water infrastructure exists in communities along the proposed pipeline corridor in the Fraser Valley Region.

In the District of Hope, water supply is all groundwater aquifer. The district uses septic tanks and septic fields in certain developments. Certain areas of Hope need infrastructure upgrades, which will likely be expensive due to the geographical constraints (Fortoloczky pers. comm.). There are several municipal wells located in the vicinity of the existing TMPL right-of-way. Hope's treatment plant is designed for a population of 8,000 (Misumi pers. comm.) and thus has capacity as the population is approximately 6,000.

The Bailey Sanitary Landfill operated by the City of Chilliwack serves the City of Chilliwack, District of Kent, Village of Harrison Hot Springs and FVRD Electoral Areas D and E (City of Chilliwack 2013). In Chilliwack, the proposed pipeline corridor crosses the existing sanitary sewer system at approximately RK 1090.6 and RK 1097.6 and crosses a proposed sanitary system route at approximately RK 1098.6 (City of Chilliwack 1998). The City of Chilliwack does not accept commercial hazardous waste for disposal (City of Chilliwack 2013). In Chilliwack, the proposed pipeline corridor crosses the existing community water system at several points (City of Chilliwack 1998).

In the City of Abbotsford, the JAMES (Joint Abbotsford Mission Environmental Systems) Wastewater Treatment Plant services the City of Abbotsford, the District of Mission, East Langley (Aldergrove and Gloucester Industrial park) and the City of Sumas, Washington (City of Abbotsford 2013). The Abbotsford Mission Water and Sewer Commission is responsible for the water supply to the City of Abbotsford and the District of Mission (Abbotsford Mission Water and Sewer Services 2011). According to the Abbotsford OCP, the proposed pipeline corridor crosses over major city water supply lines (approximately RK 1118.6, RK 1129.6 and RK 1131.6), a proposed city water supply line (approximately RK 1118.6), joint utilities lines (approximately RK 1121.6 and RK 1126.6) and two reservoirs (approximately RK 1117.6 and RK 1134.6) (City of Abbotsford 2005). Waste collected at the Matsqui Transfer Station is trucked to Cache Creek, as per agreements with Metro Vancouver (City of Abbotsford 2013). The proposed pipeline corridor also crosses waste infrastructure in Abbotsford, specifically over sewer trunk mains (approximately RK 1119.6, RK 1122.6 and RK 1126.6) and a trunk sewer upgrade (approximately RK 1122.6) (City of Abbotsford 2005).

A summary of solid waste, liquid waste and water infrastructure for communities along the proposed pipeline corridor of the Fraser Valley Region is presented in Table 5.5-5.

TABLE 5.5-5

SOLID WASTE, LIQUID WASTE AND WATER INFRASTRUCTURE FOR CORRIDOR COMMUNITIES IN THE FRASER VALLEY REGION

Community	Solid Waste Infrastructure (Operator)	Information on Materials	Liquid Waste Sewage Treatment System	Water Source and Delivery System
District of Hope	District of Hope Landfill (District of Hope)	Unknown	• Septic tanks and septic fields	• Groundwater aquifer
City of Chilliwack	Bailey Sanitary Landfill (City of Chilliwack)	• Hazardous waste, special waste, biomedical waste, waste oil and others are not accepted	• Sanitary sewer	• Sardis-Vedder Aquifer • Yarrow Waterworks District is a private water system that serves the Yarrow community
City of Abbotsford	Matsqui Transfer Station (Wastech Services Ltd., on behalf of Metro Vancouver)	• Solid waste disposal legislation prohibits materials such as tight-head barrels, dangerous goods/hazardous waste, liquids and sludges, radioactive materials • Some materials accepted with restrictions include: construction and demolition waste, fill materials, compressed gas cylinders, paint, resin and chemical containers	• Sanitary sewer system • JAMES Wastewater Treatment Plant (owned and operated by City of Abbotsford and District of Mission)	• Primary: Norrish Creek (north-east of Mission). Secondary: Cannell Lake (north of Mission) and 12 groundwater wells in Abbotsford-Sumas aquifer • Abbotsford/Mission water supply-transmission mains deliver water to Abbotsford which operates a water distribution system

Sources: City of Abbotsford 2013, City of Chilliwack 2013, Dayton and Knight Ltd. 2006, Sanderson pers. comm., Vaughan pers. comm., Wastech n.d.

5.5.3.5 Metro Vancouver Region

A range of waste and water infrastructure exists in communities along the proposed pipeline corridor in the Metro Vancouver Region. Metro Vancouver is responsible for operating the GVRD's waste management system which includes transfer stations, an incinerator and landfills. Metro Vancouver is also responsible for coordinating recycling and solid waste planning for the regional district (Metro Vancouver 2011a). Solid waste disposal legislation prohibits materials such as inert fill material, solvents and flammable liquids, hazardous waste and sludges, among others (City of Burnaby 2013, Metro Vancouver 2011a). The Township of Langley is a part of the new Metro Vancouver material disposal ban

and Zero Waste Challenge both intended to aid in the reduction of disposed waste (Township of Langley 2013). In Metro Vancouver, the transfer stations store solid waste and screen the waste for hazardous and recyclable materials (City of Surrey 2013, Metro Vancouver 2011a). The solid waste garbage is then loaded into large trucks and hauled to the Cache Creek Landfill, Vancouver Landfill or the Burnaby Waste-to-Energy Facility (City of Surrey 2013, Metro Vancouver 2011a). At the Coquitlam Transfer Station, the Coquitlam Resource Recovery Plant recycles wood waste and green waste and accepts reclaimable wood (Wastech n.d.). The Integrated Solid Waste and Resource Management, a Solid Waste Management Plan outlines goals and strategies for the regional district to develop their waste management system following Metro Vancouver's Sustainability Framework (Metro Vancouver 2010b). The Waste-to-Energy Facility in Burnaby receives waste from Burnaby, New Westminster and the North Shore and disposes 25% of Metro Vancouver's waste (Metro Vancouver 2012).

The Greater Vancouver Sewerage and Drainage District (GVSDD) is a corporate entity that operates under the Metro Vancouver name (Metro Vancouver 2011a). GVSDD operates and maintains the regional network of trunk sewers, pump stations, wastewater treatment plants and as part of regular annual operations, conducts routine scheduled maintenance of the collection system (City of Surrey 2011b, Metro Vancouver 2011a). Wastewater treatment plants operated by Metro Vancouver and used by communities within the proposed pipeline corridor include the following.

- The Annacis Island Wastewater Treatment Plant is located in Delta, BC. It is Metro Vancouver's largest plant and provides secondary wastewater treatment to 12 municipalities in the regional district. It discharges into the Fraser River (City of Coquitlam 2013, Metro Vancouver 2011a).

- The Iona Island Wastewater Treatment Plant is located in Richmond, BC and provides primary wastewater treatment to three municipalities in the regional district (Metro Vancouver 2011a).

- The Northwest Langley Wastewater Treatment Plant provides secondary wastewater treatment to the Walnut Grove area of the Township of Langley (Metro Vancouver 2011a).

Municipal members of the GVSDD own and maintain collector sewers, implement municipal actions set out in the regional liquid waste management plan, manage storm water systems, report on the progress of municipal actions from the regional liquid waste management plan and set local land use plans and community development standards (City of Surrey 2011b). The City of Burnaby is working towards eliminating the combined storm and sanitary sewer system since overflows during wet periods exceed the capacity of the current combined system and excess volumes flow to the Burrard Inlet and Fraser River (City of Burnaby 2013). The Township of Langley's website indicates it is currently seeking to improve their sewer system infrastructure and maintenance (Township of Langley 2013). According to the Langley OCP, the proposed pipeline corridor crosses both the existing sewer system (approximately RK 1154.6) and areas zoned for expansion of the sewer system (approximately RK 1151.6) (Township of Langley 1979). The Integrated Liquid Waste and Resource Management, A Liquid Waste Management Plan outlines goals and strategies for Metro Vancouver regarding liquid waste management (Metro Vancouver 2010a).

The Greater Vancouver Water District (GVWD) is a corporate entity that operates under the Metro Vancouver name (Metro Vancouver 2011b). The GVWD is responsible for acquiring and maintaining water supply, water treatment and delivery to municipalities, while municipalities are responsible for distributing the water to residences and other buildings (Metro Vancouver 2011b). Water connections between the Township of Langley, Langley City, the City of Abbotsford, and the City of Surrey exist for emergency purposes. Groundwater is supplied by municipal water wells in the Township of Langley (Township of Langley 2011). According to the Langley OCP, the proposed pipeline corridor crosses the existing water system (approximately RK 1149.6) and areas zoned for the expansion of the water system (approximately RK 1151.6) (Township of Langley 1979). To provide reliable water supply to Surrey users, the City of Surrey operates pump stations to maintain adequate pressure under peak demand conditions and for emergency purposes (City of Surrey 2011b).

The City of Surrey has no current issues regarding water or waste capacity. It was noted that past projects have used the Fraser River water for construction work and that a waste discharge permit would be required through Metro Vancouver (Baron pers. comm.).

Within the Metro Vancouver Region, the following hazardous materials facilities are located in communities crossed by the proposed pipeline corridor: Newalta Surrey facility; and Sumas Environmental Services Inc. Burnaby Waste Treatment Facility (Table 5.5-6).

A summary of solid waste, liquid waste and water infrastructure for communities in the proposed pipeline corridor of the Metro Vancouver Region are presented in Table 5.5-6.

TABLE 5.5-6

SOLID WASTE, LIQUID WASTE AND WATER INFRASTRUCTURE FOR CORRIDOR COMMUNITIES IN THE METRO VANCOUVER REGION

Community	Solid Waste Infrastructure (Operator)	Information on Materials	Liquid Waste Sewage Treatment System	Water Source and Delivery System
Township of Langley	Langley Residential Transfer Station (SSG Holdings Ltd. on behalf of Metro Vancouver)	• Solid waste disposal legislation prohibits materials such as inert fill material, solvents and flammable liquids, hazardous waste and sludges, among others	• GVSDD, Fraser sewerage area • Annacis Island Wastewater Treatment Plant and Northwest Langley Wastewater Treatment Plant	• Coquitlam Lake and municipal wells
City of Surrey	Surrey Transfer Station (Wastech Services Ltd., on behalf of Metro Vancouver)	• Solid waste disposal legislation prohibits materials such as tight-head barrels, dangerous goods/hazardous waste, liquids and sludges, radioactive materials • Some materials accepted with restrictions include: construction and demolition waste, fill materials, compressed gas cylinders, paint, resin and chemical containers	• GVSDD, Fraser sewerage area • Annacis Island Wastewater Treatment Plant	• Reservoirs operated by the GVWD • A system of transmission mains and reservoir structures operated by the GVWD. Water delivery programs include supply works and feeder mains and distribution mains. Supply works and feeder mains are essential facilities to store, pump, and transfer water from the supply points to the local distribution and distribution mains are smaller lines along Surrey's grid roads
	Surrey facility (Newalta)	• Services include wastewater treatment, waste fuel recovery and processing, sludge and slop oil processing, spill waste treatment and waste solids management		
City of Coquitlam	Coquitlam Transfer Station (Wastech Services Ltd., on behalf of Metro Vancouver)	• Solid waste disposal legislation prohibits materials such as tight-head barrels, dangerous goods/hazardous waste, liquids and sludges, radioactive materials • Some materials accepted with restrictions include: construction and demolition waste, fill materials, compressed gas cylinders, paint, resin and chemical containers	• GVSDD, Fraser sewerage area • Annacis Island Wastewater Treatment Plant	• Capilano, Seymour and Coquitlam mountain reservoirs • Pipes, pump stations and water tanks
City of Burnaby	Waste-to-Energy Facility (Covanta Burnaby Renewable Energy, ULC on behalf of Metro Vancouver)	• Solid waste disposal legislation prohibits materials such as inert fill material, solvents and flammable liquids, hazardous waste and sludges, among others	• GVSDD, Fraser and Vancouver sewerage areas • Annacis Island Wastewater Treatment Plant and Iona Island Wastewater Treatment Plant	• Majority from Capilano and Seymour reservoirs • Largely gravity fed, with 4 water reservoirs, 4 water pump stations, and 21 pressure-reducing valve stations to control and regulate water pressures for users and for emergency use
	Burnaby Waste Treatment Facility (Sumas Environmental Services Inc.)	• Accepts special waste (Transportation of Dangerous Goods Classes 2 to 9), hydrocarbon contaminated soil, waste water and waste oil		

Sources: City of Burnaby 2013, City of Coquitlam 2013, City of Surrey 2011b, 2013, Metro Vancouver 2011a, Newalta 2012, Sumas Environmental Services Inc. n.d., Township of Langley 2011, Wastech n.d.

5.5.4 Housing

This subsection describes the housing capacity and characteristics in communities in the Socio-Economic RSA. Information is focused on anticipated hub communities that are likely to be a base for construction spreads and the housing of direct Project workers during the construction phase. The discussion of

housing includes the private housing market, rental accommodations and temporary commercial accommodations (*e.g.*, hotels, motels, inns, campgrounds). When discussing the private housing market, housing starts refer to the number of residential units for which construction has begun, and housing completion refers to the stage at which all proposed construction work on a residential unit has been completed.

Refer to Section 8.4 of the Socio-Economic Technical Report of Volume 5D for a full discussion of housing.

5.5.4.1 Edmonton Region

The Edmonton Region has experienced rapid population growth over the past 5 years, and as a result, residential development within the region has also increased. The private housing market in the Edmonton Region is large in certain areas (City of Edmonton) and small in others (City of Spruce Grove). Local municipal officials and real estate professionals indicate that there is a housing crunch in the region with limited rental accommodation available in some areas (Berry pers. comm.). Data indicate that, as of 2012, there was a rental vacancy rate of 1.7% in the City of Edmonton, 1.5% in the City of Spruce Grove and 3.9% in the Town of Stony Plain (Canadian Mortgage and Housing Corporation [CMHC] 2012a). There is a large temporary housing market in the Edmonton Region; there are approximately 15,000 hotel rooms and over 10 campgrounds with over 1,100 sites in the surrounding area.

City of Edmonton

The City of Edmonton has a large private housing market. In the City of Edmonton, there were approximately 324,756 occupied private dwellings in 2011, approximately 64.9% of which were owned (Statistics Canada 2013a). In 2012, there were 1,538 new residential listings in the City of Edmonton (Edmonton Real Estate Board 2013). In the City of Edmonton, there were 9,488 housing starts in 2012, which represented a 54.7% increase from 2011 and 6,723 completions, which represented a 23.8% increase from 2011 (CMHC 2013a). The city issued building permits for 9,533 residential units in 2012 and 7,460 residential units in 2011 (City of Edmonton 2013a). In 2012, the average price of a residential dwelling in the city was $225,525 for a single family detached residence and $213,037 for a condominium (Edmonton Real Estate Board 2013). Average rent for accommodations marginally increased (3.1%) from 2011 to 2012 (CMHC 2012a).

There is a wide range of commercial accommodation available in the City of Edmonton. There are over 13,000 units in more than 50 hotels, motels and inns (City of Edmonton 2013a, Edmonton Tourism 2013). There are approximately 5 campgrounds and RV parks with approximately 700 sites in the Edmonton area (Reid pers. comm.).

City of Spruce Grove

In City of Spruce Grove, there were 553 housing starts in 2012, a 27.7% increase from 2011 (CMHC 2013a). In 2012, the City of Spruce Grove saw 369 completions, the same number as 2011 (CMHC 2013a). There were 40 residential (includes single family detached, condominiums, duplexes, row houses, vacant lots, parking spaces, mobile homes) sales in 2012. In 2012, the average price of residential dwellings was $330,213 (Edmonton Real Estate Board 2013). Average rent for accommodations marginally increased (1.7%) from 2011 to 2012 (CMHC 2012a).

The City of Spruce Grove has two hotels, motels or inns and an additional hotel is being constructed (Berry pers. comm.). The new Diamond Grove RV Campground is scheduled to open in mid-2013 offers 247 fully serviced stalls, a sani-dump facility, washrooms, showers and a common amenity area (City of Spruce Grove 2013). The city identified that there is limited temporary accommodation available and that the vacancy rate is approximately 3%. Once the Diamond Grove RV Campground is built, the City of Spruce Grove will have some long-term sites available (Butterfield, Irving pers. comm.). Another RV park is located just north of Stony Plain IR 135 and may be an option for construction crews but is generally full (Berry pers. comm.).

Most of the growth within the City of Spruce Grove is occurring in the northwest and northeast sections (Irving pers. comm.). Growth in Spruce Grove is a result of inexpensive land as well as an updated transportation system, resulting in decreased driving times to Edmonton (Irving pers. comm.). Due to the

fact that the proposed pipeline corridor will not be located in the existing residential centre of the city, concerns related to existing housing infrastructure are not anticipated (Butterfield, Irving, Mustard pers. comm.). However, the city identified that there are residential and industrial plans to develop the southern portion of the city (Irving pers. comm.).

During consultation, it was noted that the City of Spruce Grove is experiencing a housing shortage, and there is very limited rental accommodation (Berry pers. comm.). Worker camps established in Parkland County are not favourably viewed by some residents of the city. It is perceived by some that the county would receive the economic benefit of such a camp while the community would experience social consequences (Berry pers. comm.). However, an increased population due to construction workers in the city could result in increased rents, thereby reducing the availability of low income housing (Berry pers. comm.).

The Spruce Grove MDP aims to increase and diversify housing within residential areas (City of Spruce Grove 2010).

Town of Stony Plain

The Town of Stony Plain identified that there was a population growth trend in 2006/2007, but it has slowed since 2008. Population growth within the Town of Stony Plain is occurring mainly in the east and south toward the City of Spruce Grove (Frostad pers. comm.). A modular home development is located approximately 1 km south of existing RK 66.2, and a sewer trunk was put through existing RK 67 to RK 68 so there is potential in that area for increased development (Frostad pers. comm.).

In the Town of Stony Plain, there were 5,820 occupied private dwellings in 2011, 77% of which were owned (Statistics Canada 2013a). In 2012, the average price of residential dwellings in the Town of Stony Plain was $256,423 (Edmonton Real Estate Board 2013). There were 20 residential (includes single family detached, condominiums, duplexes, row houses, vacant lots, parking spaces, mobile homes) sales in 2012. There were 177 housing starts in 2012, a 71.8% increase from 2011 (CMHC 2013a). In 2012, the town saw 127 completions, a 54.5% decrease from 2011 (CMHC 2013a). The town issued building permits for the construction of 177 residential units in 2012 and 124 residential units in 2011 (Town of Stony Plain 2013). Average rent for accommodations increased (4.9%) from 2011 to 2012 (CMHC 2012a).

Through technical discussions with the Town of Stony Plain, it was identified that many residents commute to Edmonton, with only approximately 40% staying in the town to work. Many residents also travel west to work at coal and power plants. The Town of Stony Plain is aiming to build a light industrial area in the north of town to keep residents working in the town. Many residents also work in Fort McMurray and bus back and forth (Frostad pers. comm.).

The Town of Stony Plain noted that there is generally low vacancy with respect to local commercial accommodations. The town has two campgrounds/RV parks, the Camp'N'Class RV Park has 77 sites available, and the Lions' RV Park and Campground has 53 sites. These campgrounds/RV parks are well used and both provide some sites that are used in all four seasons (Clause pers. comm.). There is a demand for RV park developments in the region because of the number of people working in and around the Town of Stony Plain (Frostad pers. comm.). The town has six known hotels, motels or inns (Town of Stony Plain 2013). There have been four hotels/motels built within the last 8 years, and there are currently approximately 800 rooms available at hotels/motels. Most hotels/motels are at capacity because of utilization by transient workers. Since hotels/motels are far enough from residential areas, no issues related to transient workers staying in the Town of Stony Plain were identified; in the past issues have been noted by residents regarding parked large trucks and equipment (Frostad pers. comm.).

Village of Wabamun

According to the Wabamun MDP, there were 245 housing units within Wabamun, 69.4% of which were owner occupied in 2010 (Village of Wabamun 2010).

The Village of Wabamun identified that there are currently 4.5 ha of Trans Alta's housing land that is vacant (Hannah pers. comm.). No additional issues related to the private housing market were identified by the Village of Wabamun. The Village of Wabamun has three hotels, motels or inns, one bed and

breakfast and camping amenities at the Wabamun Lake Provincial Park (Village of Wabamun 2011). Wabamun Lake Provincial Park camping facilities are open yearly from May 1 to October 31 and offer 166 unserviced and 109 power campsites (ATPR 2012).

Hamlet of Entwistle

The Hamlet of Entwistle has three hotels, motels or inns. Camping facilities at Pembina River Provincial Park, located 1.5 km from RK 134.0, cater to both Entwistle and Evansburg. Pembina River Provincial Park offers 132 individual campsites, 32 power sites, a modern shower house and a large group-use area (Evansburg and Entwistle 2012).

The Parkland County MDP encourages a diversity of housing within Entwistle to meet the different lifestyle and income requirements of its residents (Parkland County 2007).

5.5.4.2 Rural Alberta Region

The Rural Alberta Region experienced rapid growth in 2007/2008. Since that time, growth has declined, and as a result, residential development within the Rural Alberta Region has also declined. Local municipal officials and real estate professionals indicate that there is capacity to accommodate workers in communities within the Rural Alberta Region and that the region has experience with temporary workers. The rental housing market in Rural Alberta Region has some vacant capacity. Data indicate that, as of 2012, there was a rental vacancy rate of 9.4% in the Town of Edson and 7.7% in the Town of Hinton (Alberta Municipal Affairs 2011). There is a large temporary housing market in the Rural Alberta Region; there are approximately 2,000 hotel rooms and over 20 campgrounds in the surrounding area.

Yellowhead County

In Yellowhead County, there were 57 housing starts in 2012, a 39% increase from 2011 (CMHC 2013b). In 2012, Yellowhead County saw 54 completions, a 25.6% increase from 2011 (CMHC 2013b).

According to the Yellowhead County MDP, the county supports the development of manufactured homes within the Foothills Policy Area, the Mountain View Policy Area, and the Rural Policy Area (Yellowhead County 2006).

Hamlet of Evansburg

The Hamlet of Evansburg has two hotels/motels. The Pembina River Provincial Park with 132 sites caters to both Entwistle and Evansburg (Evansburg and Entwistle 2012).

Town of Edson

In the Town of Edson, there were 3,390 occupied private dwellings in 2011, 68% of which were owned (Statistics Canada 2013a), and 92 new residential listings in 2012. In 2012, the average price of a single family dwelling was $310,731 (Atfield pers. comm.). Through technical discussions with the West Central Alberta Real Estate Board, it was noted that inventory for residential listings is low in the Town of Edson, which puts a strain on the market. The Town of Edson is an older community with older homes and a few new subdivisions. The demand for private housing has been increasing in recent years (Atfield pers. comm.).

During the last boom (2007/2008), there were a number of temporary camps in the area because of a lack of availability at hotels/motels. As of 2012, there was some hotel capacity available to house workers (Ramme pers. comm.). In order to ensure a benefit to local hotels/motels, the preference is to ensure that local hotels and other accommodation options are at capacity before a camp is considered (Butler, Lemieux pers. comm.). There is a wide range of commercial accommodation available. There are over 1,000 units in approximately 20 hotels, motels or inns. There are also over 20 campgrounds with more than 300 outdoor camping and full hook-up sites in or close to the Town of Edson (Town of Edson 2013). There are no plans for any further hotel development within the town. Hotels in the Town of Edson are busy over the winter months (approximately 90% capacity), due to industrial activity (Lemieux pers. comm.).

The Town of Edson identified that it has a sizeable rental housing market, and it is growing due to an increasing number of residents renting out rooms and basements. The renting of rooms has changed neighbourhoods in the town (*e.g.*, parking issues, aesthetics and dynamics); a growing number of temporary foreign workers has resulted in some crowding issues (six to eight people per house) (Lemieux pers. comm.). The average rent in Edson increased slightly (0.8%) from 2010 to 2011 (Alberta Municipal Affairs 2011). The Edson MDP acknowledges that there are many young single workers within Edson who work for the town's resource industries, and as such, recognizes the importance of providing affordable housing to meet future demands (Town of Edson 2006).

Town of Hinton

In the Town of Hinton, there were 3,780 occupied private dwellings in 2011, 75.9% of which were owned (Statistics Canada 2013a). There were 70 new residential listings in 2012, and the average price of a single family dwelling was $388,731 (Atfield pers. comm.). In addition, there were 22 housing starts in 2012, the same as 2011 (Town of Hinton 2013). The town issued 156 development permits in 2012 and 205 in 2011 (Town of Hinton 2013). As of 2013, the town presently had approximately 160 subdivision applications under review. These applications include a mix of residential, single and multiple family uses (Lukasiewich pers. comm.). Apartment vacancy is at approximately 2%, and there have been no new apartments built in the last 15 years (Kreiner pers. comm.). The average rent for accommodations in the town increased by 3.7% from 2010 to 2011 (Alberta Municipal Affairs 2011). There is limited affordable housing in the community, and demand for housing continues to grow (Atfield pers. comm.).

Within the Town of Hinton, high-rises are located directly south of the existing TMPL right-of-way, approximately 1 km from the eastern limit of the town (Kreiner pers. comm.).

The Town of Hinton has a wide range of commercial accommodation available. During and after the boom in 2007/2008, many hotels/motels were built and are now operating at a high vacancy rate (60-70%); therefore, there is capacity available for workers (Atfield pers. comm.). There are approximately 800 rooms and 1,200 beds available in hotels/motels in the Town of Hinton (Kreiner pers. comm.). If Project construction occurs at the same time as the construction of the Coalspur Mine, there could be capacity issues (Kreiner pers. comm.). During the 2007/2008 boom, it was noted that a number of temporary camps were built, due to the lack of hotels/motels at the time. In order to benefit local hotels/motels, temporary camps are currently discouraged in the Town of Hinton (Kreiner pers. comm.).

5.5.4.3 Fraser-Fort George/Thompson-Nicola Region

The Fraser-Fort George/Thompson-Nicola Region, has experienced average population growth over the period from 2006 to 2011. As a result, residential development within the Fraser-Fort George/Thompson-Nicola Region has also remained consistent. The rental housing market in the Fraser-Fort George/Thompson-Nicola Region is generally limited, with little to no vacancy in most communities. The TNRD RGS aims to provide an adequate range of housing options to people within the region (TNRD 2000). There is a large temporary housing market in the Fraser-Fort George/Thompson-Nicola Region; with approximately 5,000 hotel rooms and over 30 campgrounds with over 800 sites in the surrounding area.

Village of Valemount

In the Village of Valemount, there were 475 occupied private dwellings in 2011, 73.7% of which were owned (Statistics Canada 2013a). There are approximately 20-25% absentee owners in the Village of Valemount who return in the summer or winter (Latimer pers. comm.).

There is very limited rental housing available in the Village of Valemount. In some instances, residents congregate into one house and rent theirs out. In 2007, during the TMX Anchor Loop Project, housing was an issue in the Village of Valemount; there was an increase in hotel/motel revenue, but there was a shortage of low income housing caused by an increase in rents.

The Village of Valemount caters to a large tourism base and has a wide range of commercial accommodation available. There are over 25 hotels, motels, inns and bed and breakfasts as well as a range of cabins, vacation homes and rentals available in the village. There are over 10 campgrounds with outdoor and full hook-up sites available, in or close to the Village of Valemount (Village of

Valemount 2013). Summer (late June to mid-September) is peak season for tourism; during this period commercial accommodation is at approximately 75-100% capacity (Latimer pers. comm.). Through technical discussions, it was noted that the Village of Valemount currently does not have a position on temporary camps (Yanciw pers. comm.).

Community of Blue River

There are 5 hotels and motels and 1 campground with 42 sites located in the Community of Blue River (Blue River Campground 2011, Blue River 2013). Through technical discussions, the Community of Blue River noted that there are approximately 150 seasonal workers and that winter is the busy season when recreationalists occupy much of the hotel capacity (Macdonald pers. comm.). According to the TNRD, the Community of Blue River has the capacity to house additional workers, and residents would not be opposed to housing workers; it would likely be seen as an economic opportunity for the community (Gill pers. comm.). There is land is available in the Community of Blue River to establish a camp, if one were required (Groulx pers. comm.).

Through technical discussions, it was identified that the average value of a dwelling in the Blue River area is approximately $235,000 (Macdonald pers. comm.). Rental units in the community range from approximately $700 to $1,200/month (Macdonald pers. comm.).

Community of Vavenby

In the Community of Vavenby (Thompson-Nicola A Regional District electoral area), there were 1,666 occupied private dwellings in 2007, 81.4% of which were owned (Statistics Canada 2007). Through consultation, it was identified that there is housing availability in the Community of Vavenby (Groulx pers. comm.). There is no known commercial accommodation (*i.e.*, hotels, motels or campgrounds) in the community.

District of Clearwater

In the District of Clearwater, there were 1,015 occupied private dwellings in 2011, 85.2% of which were owned (Statistics Canada 2013a). There is little to no rental housing available in the District of Clearwater (Groulx pers. comm.). New residential developments are being planned; approximately 300 ha of land in the district has been designated residential. As of March 2013, there were 80 new subdivision lots proposed (Groulx pers. comm.).

The District of Clearwater indicated that worker integration would be preferred. There is sufficient land designated to handle projected growth as well as room for subdivision within larger existing lands. There are also vacant residential lands that can be built on in the short-term, should the demand increase (Groulx pers. comm.).

During technical discussions with the BC MFLNRO, it was identified that Spahats Creek Correctional Facility, located approximately 15 km north of the District of Clearwater, and Clearwater Camp 2 abandoned mill site, directly west of the District of Clearwater, were potential camp work sites (Williams pers. comm.).

Some hotels and motels in the District of Clearwater function on a seasonal basis. In the summer months (May to October), there are approximately 231 units available in 10 hotels and motels. In the winter months (November to April), there are approximately 175 units available, as some hotels and motels close during the winter (Groulx pers. comm.). There are four known campgrounds with a total of 330 sites operating in the summer months (Destination BC 2013).

City of Kamloops

The City of Kamloops has a fairly large private housing market. In 2011, there were 35,025 occupied private dwellings, 73.7% of which were owned (Statistics Canada 2013a). In 2012, there were over 5,000 new residential listings in the Kamloops and District area (Kamloops and District Real Estate Association 2013). In the Kamloops area (Census agglomeration), there were 481 housing starts in 2012, a 5.7% decrease from 2011 and 645 completions, an 11% increase from 2011 (CMHC 2013b). The City of Kamloops issued building permits for the construction of 354 residential units in 2012 and 400 residential units in 2011 (City of Kamloops 2012). In December 2012, the median residential price was

$348,000 in the Kamloops area (Census agglomeration) and $359,000 in the City of Kamloops (Venture Kamloops 2012).

Through technical discussions with the city, it was noted that there is low vacancy in rental units (Fretz, Lambright pers. comm.). In Kamloops (Census agglomeration), the average rent for accommodations increased by 2.2% from 2011 to 2012 (CMHC 2012b). Temporary housing is occurring in hotels because there are not many rentals available (Lambright pers. comm.). The City of Kamloops expressed concern that low-income housing was being taken up by temporary construction workers, potentially displacing residents (Fretz pers. comm.). It was noted that this leads to an increase in illegal suites which puts pressure on the city (Kwiatkowski, Lambright pers. comm.).

The City of Kamloops is familiar with temporary work crews (Morris pers. comm.). The city noted that local businesses, including hotels and motels, would not support a temporary camp and would prefer temporary workers to live in the city (Lambright, Morris pers. comm.).

There is a wide range of commercial accommodation available in the City of Kamloops. There are over 3,000 rooms in more than 50 hotels, motels and inns (City of Kamloops 2012, Morris pers. comm.). There is a high occupancy rate in summer months; the season peak is May to October (Morris pers. comm.). There is generally greater available capacity in the winter unless there is a major event (Morris pers. comm.). It was noted that the Tournament Capital Program and tourism use a lot of hotel spaces (Lambright pers. comm.). Tourism Kamloops stated there are bids out for major events for 2016-2018 (Morris pers. comm.). Another commercial accommodation option is the residence of Thompson Rivers University, which was built in 2006, provides 300-500 rooms in the summer (Morris pers. comm.). Tourism Kamloops estimates approximately $55 million to $60 million annually in overnight hotel stays/revenue. Tourism Kamloops cannot quantify the number of campers, fishermen or private planes, but there are 95,000 passengers a year on the Rocky Mountaineer and Sun Peaks Mountain Resort nearby also attracts many visitors (Morris pers. comm.). In Kamloops, there are 50 hotels and motels with approximately 5,000 units, as well as 4 campground and RV parks with over 180 of units (City of Kamloops 2013, Destination BC 2013).

City of Merritt

In the City of Merritt, there were 2,905 occupied private dwellings in 2011, 74.2% of which were owned (Statistics Canada 2013a). The cost of a high-end residence in Merritt ranges from $200,000 to $350,000 and the cost of a low-end residence ranges from $75,000 to $200,000 (McDonagh pers. comm.).

There is a wide range of commercial accommodation available in the City of Merritt. There are over 300 rooms in approximately 16 hotels, motels and inns (Umpherson pers. comm.). Hotels are at capacity during special events (busier during summer with road tourists). There are also 3 RV parks in the city, with approximately 75 to 80 sites per RV park (Umpherson pers. comm.). The RV parks were noted to have capacity (Roline pers. comm.). For example, the Moon Shadow RV Park recently doubled in size and is full of BC Hydro workers. Through technical discussions with the City of Merritt, it was noted that there are many transient workers who stay in hotels. There are also some developers considering building housing for temporary workers (Umpherson pers. comm.). The city noted the need for additional hotels and some developers have been looking at possibilities (Umpherson pers. comm.).

The City of Merritt has had previous experience with construction crews with the development of the Coquihalla Highway, and is open to future work crews and temporary workers (Roline pers. comm.). Temporary workers are typically viewed as a benefit to local businesses (Umpherson pers. comm.).

5.5.4.4 Fraser Valley Region

In the Fraser Valley Region, the demand for housing has expanded with population and economic growth. Proximity to Metro Vancouver is a factor in the region's increased demand for housing, although the Fraser Valley Region generally has more affordable housing than Metro Vancouver (FVRD 2011). In 2012, real estate sales in the Fraser Valley were at their lowest levels since 2003 (Fraser Valley Real Estate Board [FVREB] 2012). Affordability and accessibility of housing is a goal of the FVRD's RGS (FVRD 2011).

District of Hope

In Hope, there were 2,630 occupied private dwellings in 2011, most of which are single or double occupancy dwellings, supporting a mature age demographic in the community (Advantage Hope 2011, Statistics Canada 2013a). Owned dwellings represent 76.6% of the total occupied dwellings (Statistics Canada 2013a). In 2012, the average residential price was $228,719 for a detached house in the District of Hope (Lerigny pers. comm.). From January to March 2013, there have been 17 residential sales in the Hope area (Tepasse pers. comm.).

There are no major new housing developments planned for 2013 (Mattheis pers. comm.). In 2011, Hope had 95 units available for construction or under construction (Advantage Hope 2011). In recent years, Hope has seen two residential developments with a total of 56 properties, and is anticipating the New Hope Developments Residential Project, which is in the early planning stages (Advantage Hope 2011, Mattheis pers. comm.). In 2011 and 2012, 36 single family building permits were issued, while no multi-family building permits were issued (Mattheis pers. comm.).

Anecdotal feedback on rental housing is that rent for a 2 or 3-bedroom home in Hope ranges from $900 to $1,500 per month (Mattheis pers. comm.). In 2006, the average gross rent in Hope was $656, compared to $828 for BC (BC Stats 2006).

Regarding temporary accommodations, the District of Hope indicated they do not have enough hotel/motel capacity for workers (Misumi, Frotoloczky pers. comm.). The District of Hope and area has over 400 hotel/motel rooms and over 450 camping and RV sites (Mattheis, Wilson pers. comm.). Summer construction would pose an issue for the district as the timing would conflict with the primary tourist season (Misumi pers. comm.). Through technical discussions, it was ascertained that worker integration is preferred to worker camps (Mattheis pers. comm.). There are a number of campgrounds in the area as well as First Nations property immediately adjacent to Hope that may work for a camp location, if one were required (Mattheis pers. comm.). In Hope, the proposed pipeline corridor crosses an area zoned as a campground and holiday park at approximately RK 1050.6.

City of Chilliwack

In the City of Chilliwack, there were 30,460 occupied private dwellings in 2011, 74.7% of which were owned (Statistics Canada 2013a). In Chilliwack, there were 4,423 residential listings and 2,007 total sales in 2012. In 2012, the average prices of residential dwellings were $357,240, $237,087 and $143,062, for detached houses, townhouses and apartments, respectively (Lerigny pers. comm.). In Chilliwack (Census agglomeration), there were 452 housing starts in 2012, a 27.7% increase from 2011 and 360 housing completions, a 23.9% decrease from 2011 (CMHC 2013b). In terms of proposed developments, 442 building permits were issued for 436 residential units in 2012, an increase from 2011 which saw 354 building permits issued for 303 residential units (City of Chilliwack 2013).

During technical discussions, concerns regarding impacts on properties were raised (Blain pers. comm.). It was noted that the City of Chilliwack's development is restricted by the Agricultural Land Reserve (ALR) and the urban containment boundary (Sanderson pers. comm.). Near RK 1096.6 the proposed pipeline corridor crosses a property currently in the ALR that is slated for mixed residential development (Stanton pers. comm.).

The City of Chilliwack has expressed concern that if construction crews made use of rental accommodations, it could impact housing affordability for current residents (Stanton pers. comm.). In Chilliwack (Census agglomeration), the average rent for accommodations increased by 1.5% from 2011 to 2012 (CMHC 2012c).

In Chilliwack, there are 9 hotels and motels with over 400 units and 15 campgrounds and RV parks with over 320 units (Destination BC 2013, Tourism Chilliwack 2013). In the summer, Chilliwack gets an influx of seasonal migrant workers for agricultural work. Generally, the lower-end hotels are booked up by farm owners (Stanton, Wilson pers. comm.). It was noted that the Agricultural Land Commission oversees the housing provisions for seasonal farm workers (Stanton pers. comm.).

City of Abbotsford

In the City of Abbotsford, there were 46,455 occupied private dwellings in 2011, 74.2% of which were owned (Statistics Canada 2013a). In Abbotsford, there were 3,744 new residential listings in 2012. In 2012, the average prices of residential dwellings were $444,252, $262,568 and $159,813, for detached residences, townhouses and apartments, respectively (FVREB 2012). In Abbotsford, there are new developments anticipated near the existing TMPL right-of-way (Teichroeb pers. comm.). The Auguston area is anticipating about 1,500 new homes, and there is also an application called Vicarro Ranch (residential development application) (Teichroeb pers. comm.). Further development is anticipated on 'top of the mountain', although there has been no indication of other major developments (Teichroeb, Koole pers. comm.). In the City of Abbotsford, there were 306 housing starts in 2012, a 30.8% decrease from 2011 and 520 completions, a 18.4% increase from 2011 (CMHC 2013c). The City of Abbotsford implemented a secondary suite policy that has since increased density within urban residential neighbourhoods. Approximately 68% of Abbotsford's housing units are multi-family (townhouses, apartments, duplexes and suites) (City of Abbotsford 2005).

In the City of Abbotsford, the average rent for accommodations increased by 1.1% from 2011 to 2012 (CMHC 2012d) and the average rental vacancy rate decreased, driven by population growth and low growth in rental stock (CMHC 2012d). CMHC forecasts that the vacancy rates will increase in 2013 (CMHC 2012d).

The city is familiar with temporary workers; it is common in the agricultural sector for seasonal farm workers to live in the city temporarily, particularly during summer months (Koole, Teichroeb pers. comm.). It is estimated that there are approximately 3,500 to 4,000 seasonal workers annually in Abbotsford. Approximately 2,000 of those are from the federal Seasonal Agricultural Worker Program where temporary housing is provided by farm properties. The remaining workers are informal seasonal workers and would rely on housing in the community (Koole pers. comm.).

There are 9 hotels and motels in the City of Abbotsford with over 500 units (Tourism Abbotsford 2012, Destination BC 2013). The Abbotsford Airshow occurs annually in the second week of August. During this time, every hotel in Abbotsford, Surrey, Langley and Chilliwack is fully booked (Teichroeb pers. comm.). It was noted during technical discussions that the city would be amenable to some form of temporary camp if that were required (Teichroeb pers. comm.).

5.5.4.5 Metro Vancouver Region

The private housing market in the Greater Vancouver area has seen low sales activities in 2012, below historical averages (Real Estate Board of Greater Vancouver [REBGV] 2013). In the region, home prices have declined 2.8% since January 2012 (REBGV 2013). In the Vancouver Census Metropolitan Area (CMA), there were 19,027 housing starts in 2012, a 6.5% increase from 2011, mostly due to multiple-family residential construction (CMHC 2013c). Most of the 2012 housing starts occurred in the cities of Surrey, Coquitlam and Vancouver (CMHC 2013c). In 2012, the private housing market in the Vancouver CMA saw below average sales, with average resale market prices down 3.8% in the fourth quarter of 2012 (CMHC 2013c). The average prices for single-detached home and condominium apartment prices decreased by 3.7% and 3.3%, respectively in the fourth quarter of 2012. The average prices for townhouses increased 1.6% over the same period (CMHC 2013c).

Regarding the rental market, the Vancouver CMA has one of the lowest vacancy rates in BC, even with a 1.8% increase in average vacancy rates (CMHC 2012d). Contributing to the increased vacancy rates is an increase in rental supply, particularly from the secondary rental market (condominium apartments and secondary suites) (CMHC 2012d). Near urban centres, vacancy rates are generally lower due to homeownership costs and employment and education locations (CMHC 2012d). The average rent in the Vancouver CMA increased by 2.3% from 2011 to 2012 (CMHC 2012d). The average rent is generally higher in areas with low vacancy rates (CMHC 2012d). Generally, communities that are close to the City of Vancouver have higher average rents. CMHC has forecasted that the Vancouver CMA will have a stable rental market in 2013 (CMHC 2012d). There is a large temporary housing market in the Metro Vancouver Region; with over 3,300 hotel rooms and approximately 15 campgrounds with over 650 sites in the surrounding area.

Township of Langley

In the Township of Langley, there were 37,235 occupied private dwellings in 2011, 84.7% of which were owned (Statistics Canada 2013a). In the City and Township of Langley, there were 4,276 new residential listings in 2012 (FVREB 2012). The number of new listings has been consistently decreasing since 2007 (Dawson pers. comm.). In 2012, the average prices of residential dwellings were $565,045, $325,249 and $213,788, for detached residences, townhouses and apartments, respectively (FVREB 2012). In the Township of Langley, there were 1,050 housing starts in 2012, a 18.7% decrease from 2011 and 1,183 completions, a 19.7% increase from 2011 (CMHC 2013c). In the City and Township of Langley, the average rent for accommodations remained approximately the same from 2011 to 2012 (not statistically different than zero) (CMHC 2012d).

Regarding commercial accommodations in both the City and Township of Langley, there are 16 hotels and motels with over 800 units and 5 campgrounds with over 50 units (Destination BC 2013, Tourism Langley 2013).

City of Surrey

The City of Surrey has a large private housing market. In 2011, there were 152,845 occupied private dwellings, 73.1% of which were owned (Statistics Canada 2013a). In Surrey, there may be areas of new townhouses and homes (Joe Dhaliwal Development) planned in the vicinity of the existing TMPL right-of-way (Baron pers. comm.). The Fraser Heights area may also see some additional residential development (Baron pers. comm.).

In Central Surrey, Cloverdale and North Surrey, there were 5,144 new residential listings in 2012 (FVREB 2012). The number of new listings has been consistently decreasing since 2007 (Dawson pers. comm.). In 2012, the average prices of residential dwellings were $567,970, $322,822 and $212,137, for detached residences, townhouses and apartments, respectively (FVREB 2012). In Surrey, there were 3,275 housing starts in 2012, a 14% decrease from 2011 (CMHC 2013c). In 2012, Surrey saw 3,189 completions, a 17.3% decrease from 2011 (CMHC 2013c). Average rent for accommodations marginally increased (0.3%) from 2011 to 2012 (CMHC 2012b).

Feedback from technical discussions indicated that thousands of temporary workers have been brought in for past and current major highway/road construction projects and have been absorbed into the community without issue. Generally, rental vacancy rates are good (approximately 5%) and there are numerous secondary suites that are not captured in those numbers. The city would not encourage the use of temporary construction camps. It was noted that the city is still dealing with issues related to temporary camps from Expo ‘86 (Baron, Luymes pers. comm.).

There are 34 hotels and motels with over 1,000 units and 9 campgrounds and RV parks with over 380 units (Destination BC 2013, Tourism Surrey 2013).

City of Coquitlam

The City of Coquitlam has a fairly large private housing market. In 2011, there were 45,555 occupied private dwellings, 74.4% of which were owned (Statistics Canada 2013a). In January 2013, the benchmark price for a residential property in the City of Coquitlam was approximately $495,000, a 1.1% increase from January 2012 (REBGV 2013). Since 2008, the benchmark residential property price has increased 2.5% (REBGV 2013). In the City of Coquitlam, there were 1,802 housing starts in 2012, a 25% increase from 2011 (CMHC 2013c). In 2012, Coquitlam saw 1,656 completions, a 117.3% increase from 2011 (CMHC 2013c). In January 2013, there were 452 new residential listings, compared to 387 in January 2012 (REBGV 2013).

The CMHC presents rental data for the Tri-Cities (the cities of Coquitlam, Port Coquitlam and Port Moody). In the Tri-Cities, the average rent for accommodations marginally increased (0.6%) from 2011 to 2012 (CMHC 2012d).

The City of Coquitlam has 5 hotels/motels with a total of over 300 units (City of Coquitlam 2013, Destination BC 2013). No campgrounds or RV parks were identified in the City of Coquitlam.

City of Burnaby

The City of Burnaby has a fairly large private housing market. In 2011, there were 86,840 occupied private dwellings, 63.5% of which were owned (Statistics Canada 2013a).

There were 1,528 housing starts in 2012, a 5.2% decrease from 2011 (CMHC 2013c). In 2012, Burnaby saw 1,640 completions, a 121.6% increase from 2011 (CMHC 2013c). In January 2013, there were 548 new residential listings, compared to 608 in January 2012 (REBGV 2013). Average rent for accommodations increased by 1.9% from 2011 to 2012 (CMHC 2012d). In January 2013, the benchmark price for a residential property in the City of Burnaby was approximately $530,000, a 2.5% decrease from January 2012 (REBGV 2013). However, over the past 5 years, the benchmark residential property price has increased 5.5% (REBGV 2013).

The city has increased densities through zoning bylaws in its town centres (Te pers. comm.). Since the implementation of the zoning bylaws, development applications and building permit revenues have increased substantially (Te pers. comm.). The housing supply in the City of Burnaby is currently good and has been growing (Te pers. comm.). In January 2013, there were 86 developments proposed with over 6,300 residential units that had applied for rezoning and are in various forms of development (City of Burnaby 2013).

No issues related to the capacity of housing were identified by the City of Burnaby. If any construction workers were to stay in Burnaby, it is expected that they would be absorbed into the community (Te pers. comm.).

In Burnaby, there are 10 hotels/motels with approximately 1,200 units (Te pers. comm.). Simon Fraser University's Burnaby Mountain campus also provides seasonal dormitory accommodations, with approximately 800 dormitory units (Destination BC 2013, Tourism Burnaby 2013). There is at least one hotel in each of Burnaby's town centres (Te pers. comm.). There are no events that occur annually in Burnaby that would take up hotel spaces (Te pers. comm.). There is one campground/RV park in Burnaby, with 217 full hook-up sites (Destination BC 2013).

5.5.5 Educational Services

This subsection discusses key educational services in the Socio-Economic RSA, including public school services and post-secondary services.

There are numerous elementary, middle and secondary schools, in both public and private school systems, in the communities and socio-economic regions across the Socio-Economic RSA. All schools across the Socio-Economic RSA are not inventoried as they are numerous particularly in the densely populated Edmonton Region and Metro Vancouver Region. Edmonton Public Schools is the largest school district in Alberta, with enrollment of approximately 79,000 students from Kindergarten to Grade 12, 197 schools, almost 10,000 staff, and an estimated 20,000 students enrolled in continuing education programs (Edmonton Public School Board 2013). There are 11 public school districts in the Metro Vancouver Region (School Districts of Langley, Surrey, Delta, Richmond, Vancouver, New Westminster, Burnaby, Maple Ridge/Pitt Meadows, Coquitlam, North Vancouver and West Vancouver). The Burnaby School District alone has 41 elementary schools, 8 secondary schools and enrolls approximately 24,000 students (Kindergarten to Grade 12) and has about 4,000 employees (Burnaby School District 2013). There are also numerous schools across the Socio-Economic RSA in the private and Catholic school systems.

As noted in Section 5.3, there are several schools whose property is crossed by the proposed pipeline corridor. These are:

- Raft River Elementary School in Clearwater from approximately RK 720.2 to RK 720.5 (Fraser-Fort George/Thompson-Nicola Region);
- Clearwater Secondary School in Clearwater from approximately RK 722.0 to RK 722.4 (Fraser-Fort George/Thompson-Nicola Region);

- Vedder Middle School in Chilliwack from approximately RK 1097.5 to RK 1097.8 (Fraser Valley Region); and
- Watson Elementary School in Chilliwack from approximately RK 1098.1 to RK 1098.3 (Fraser Valley Region).

There are also several schools that are close to, but not crossed by, the proposed pipeline corridor. These are:

- Menisa Elementary School in City of Edmonton, approximately 500 m from RK 20 (Edmonton Region);
- Parkland Composite High School in the Town of Edson, approximately 300 m from RK 231.8 (Rural Alberta Region);
- Holy Redeemer Catholic Junior/High School in the Town of Edson, approximately 500 m from RK 232.5 (Rural Alberta Region);
- Alderson Elementary School in Coquitlam, approximately 100 m from approximately RK 1173.7 (Metro Vancouver Region); and
- Forest Grove Elementary School in Burnaby, approximately 100 m from the Burnaby Terminal (Metro Vancouver Region).

There is a range of post-secondary and training institutions across the Socio-Economic RSA. In the Edmonton Region, key post-secondary institutions include the University of Alberta, Concordia University College of Alberta, Grant McEwan College and Northern Alberta Institute of Technology. In the Fraser-Fort George/Thompson-Nicola Region key institutions include the Thompson Rivers University and the Nicola Valley Institute of Technology. The University of the Fraser Valley is a key organization in the Fraser Valley Region. Key post-secondary and training institutions in the Metro Vancouver Region include the University of British Columbia, Simon Fraser University, BC Institute of Technology, Kwantlen College University, Langara College, Trinity Western University and Capilano College.

Refer to Section 8.5 of the Socio-Economic Technical Report of Volume 5D for a full discussion of educational services.

Trans Mountain has engaged with numerous post-secondary institutions, as well as training, industry, and community organizations to-date in the context of developing its employment and training approach related to the Project, particularly to explore opportunities to provide training for Aboriginal communities. These institutions and organizations include:

- Northern Alberta Institute of Technology (Edmonton, Alberta);
- Enform (The Safety Association for Canada's Upstream Oil and Gas Industry) (Calgary, Alberta);
- Aboriginal Skills and Employment Training Strategy (Enoch, Alberta);
- Samson Cree Nation (Hobbema, Alberta);
- Pipeline Contractors Association of Canada (Nisku, Alberta);
- British Columbia Institute of Technology (Vancouver, BC);
- College of the Rockies (locations in Cranbrook, Creston, Fernie, Golden, Invermere, and Kimberley, BC);
- College of New Caledonia (locations in Prince George, Burns Lake, Fort St. James, Mackenzie, Quesnel, and Vanderhoof, BC);
- Camosun College (Victoria, BC);

- Okanagan College (locations in Kelowna, Penticton, Vernon, Salmon Arm, BC);
- Nicola Valley Institute of Technology (Merritt, BC);
- Northern Lights College (Dawson Creek, BC);
- Thompson Rivers University (locations in Kamloops, Lillooet, Williams Lake, BC);
- Vancouver Community College (Vancouver, BC);
- University of the Fraser Valley (locations in Abbotsford, Mission and Chilliwack, BC);
- BC Construction Association Skilled Trades Employment Program (locations in Abbottsford, Kamloops, Nanaimo, Vancouver and Victoria, BC);
- UA Piping Industry College of BC (Delta, BC);
- Construction and Specialized Workers' Training Society (Vancouver, BC);
- Kwantlen College (Cloverdale, BC);
- Interior Salish Employment and Training Society (Quilchena, BC);
- Shuswap Training and Employment Program (Kamloops, BC);
- First Nations Emergency Services Society (Kamloops, BC);
- Whispering Pines (Clinton Indian Band) (Kamloops, BC);
- Native Education College (Vancouver, BC);
- Aboriginal Training and Employment Cooperative (Surrey, BC);
- Squamish Nation Trades Centre (North Vancouver, BC); and
- Independent Contractors and Business Association of BC (Burnaby, BC).

5.5.6 Emergency, Protective and Social Services

This subsection describes emergency, protective and social services in key communities in the Socio-Economic RSA. Healthcare and emergency medical services that are not discussed here are discussed in Section 5.8.6 and in the Community Heath Technical Report of Volume 5D.

There are numerous emergency, protective and social services located in community locations along the proposed pipeline corridor and across the Socio-Economic RSA. This includes policing, firefighting, community and family support services, employment services, and other social services.

The discussion of emergency services has direct implications for Trans Mountain's construction and operational needs, as local responders have played, and will continue to play, a role in Trans Mountain's emergency response protocol. Emergency, protective and social services may be indirectly affected by construction phase activity, such as traffic, the presence of workers placing increased demands on such services, and social issues arising due to the presence of temporary workers in some regions that may increase the likelihood of a service response.

Refer to Section 8.6 of the Socio-Economic Technical Report of Volume 5D for a full discussion of emergency, protective and social services.

5.5.6.1 Emergency and Protective Services

Through its long operating history, Trans Mountain has established emergency response protocols, programs, and protocols at the community and regional level. Trans Mountain delivers its Community

Awareness and Emergency Response (CAER) program to emergency services organizations and regulatory authorities along the TMPL system. The objectives of the program are to familiarize first responders with the pipeline location, explain the properties of the pipeline's contents, and promote information exchange and coordination of response efforts in the event of an incident. As part of the response management system, Trans Mountain employees are trained in the emergency response procedures and conduct regular emergency exercises, some of which include local first responders. Trans Mountain also has standing agreements for contract resources to provide response equipment and labour, air and human health monitoring, environmental assessment and emergency management.

Trans Mountain has adopted the incident command system (ICS) as the basic response for its emergency response teams. The ICS, developed in the US almost 30 years ago, is now the system preferred by emergency response organizations around the world to handle a wide variety of emergency situations, including oil spills. ICS is the recommended best practice for industry by provincial and federal regulatory authorities. Regularly scheduled ICS training is used to ensure that Trans Mountain employees, government personnel and first responders (*e.g.*, local fire departments and police detachments) are trained to fulfill the key ICS roles. A combination of tabletop and field deployment exercises are used to simulate an emergency and to ensure that employees are fully trained in activation of the emergency response plans and are familiar with the deployment and capability of the equipment used.

Trans Mountain has in place a comprehensive emergency preparedness and response program in accordance with its Environment, Health and Safety policy. The emergency preparedness and response program consists of:

- an Emergency Response Plan (ERP);
- a response management system;
- training and spill response exercises; and
- spill response resources for the pipeline and for the Westridge Marine Terminal.

Trans Mountain maintains a geographically based ERP that includes:

- information pertaining to notification requirements;
- emergency checklists and contacts;
- response team organization;
- facilities and pipeline information;
- material safety data sheets;
- health and safety plans; and
- route maps depicting control points and environmentally sensitive areas.

The ERP, including field guides containing route maps and critical initial response procedures, has been provided to key field operations and maintenance employees. A Project-specific ERP will be prepared for construction and commissioning activities. All facilities (*e.g.*, terminals, pipeline, pump stations, Westridge Marine Terminal) have a specific ERP and Fire Plan. Existing operations ERPs will be revised to reflect the response requirements of the expanded system before starting operations.

Trans Mountain owns, maintains and operates dedicated spill response equipment at strategic points along the TMPL system corridor. Oil spill containment and recovery (OSCAR) units are located at Trans Mountain's facilities in Alberta (Edmonton and Jasper) and BC (Blue River, Kamloops, Hope and Burnaby). Each OSCAR unit contains about 300 m of oil recovery boom and support equipment, including a river jet boat for deployment. All equipment is helicopter transportable for delivery to remote locations not accessible by road. A separate OSCAR unit containing 1,524 m of river boom is also located at the

Kamloops Terminal. Specialized equipment has been developed in-house by Trans Mountain employees for intercepting and recovering oil, if required, from beneath the ice on frozen rivers and lakes. This equipment is stored in the Jasper and Edmonton OSCAR units.

Trans Mountain's current emergency response protocol will not change or need to change in the context of the expanded operating system; Trans Mountain will continue to use the ICS which is designed to adapt to changing operational circumstances. While the emergency response protocol will not change, Trans Mountain anticipates it will increase the amount of its own Project-specific emergency response equipment (*e.g.*, skimmers, booms, absorbent, upgrades of fire water systems at expanded terminals) to reflect the expanded operating system.

Trans Mountain will continue with its existing interfaces with community emergency response services as part of maintaining its normal operations ERP and in the development of its construction phase ERP. Community-based emergency response initiatives that Trans Mountain is involved in include CAER, whereby it collaborates with regional emergency services to review emergency response procedures and community monitoring. Trans Mountain will also be part of a forthcoming collaborative mutual aid protocol between members of the energy pipeline industry, spearheaded by the Canadian Energy Pipeline Association, to support each other's emergency response efforts as needed Trans Mountain is also working with specific Aboriginal communities within the Socio-Economic RSA to involve communities in emergency preparedness.

Marine Response Framework

Various levels of government are involved in marine or coastal emergency response services, including PMV, BC MOE, CCG and Western Canada Marine Response Corporation (WCMRC). Volume 8A provides detailed information regarding Trans Mountain's involvement in marine emergency response protocols.

At the provincial level, the BC MOE is the lead regulatory authority for marine oil spills and prepared the BC Marine Oil Spill Prevention and Preparedness Strategy to coordinate with the federal government, industry and the public (BC MOE 2002). Part of the strategy included the development of the BC Marine Oil Spill Response Plan, which identifies the BC MOE as the lead for coordinating a response with all provincial regulatory authorities during a spill event (BC MOE 2002, 2007). The BC Marine Oil Spill Response Plan outlines the duties of the provincial government in response to a marine oil spill, provides organization and duties based on the BC Emergency Response Management System and summarizes operational guidelines to implement response functions (BC MOE 2007). The BC Marine Oil Spill Response Plan states that it is the responsibility of the party responsible for the spill to initiate its response plan and that the BC Government's role is to monitor, establish protection priorities and augment response efforts (BC MOE 2007). The BC Marine Oil Spill Response Plan is consistent with the CCG's Response Management System (BC MOE 2007).

At the federal level, the CCG, an operating agency of DFO, is the lead regulatory authority for the response component of ship-source and mystery-source marine oil spills and pollution incidents (DFO 2009, 2011). The Marine Spills Contingency Plan – National Chapter provides a scope of response for the CCG. When a pollution incident occurs in waters under federal jurisdiction, the Environmental Response program of the CCG is responsible for preparedness and response. Canada's Marine Oil Spill Preparedness Response Regime is an industry-funded pollution response capacity, established and maintained by certified response organizations (DFO 2011). The CCG also takes the role of Federal Monitoring Officer when the polluter is known, willing and able to respond.

WCMRC is a Transport Canada-certified response organization and responds to oil spills in BC's navigable waters (WCMRC 2012). In addition to its own equipment, and as required by the *Canada Shipping Act*, Trans Mountain is a member of WCMRC and is contracted with them to provide spill response services. To ensure it can meet the requirements set out by Transport Canada, the WCMRC maintains caches of spill response equipment. Their main operating base is located in Burnaby, near the Westridge Marine Terminal, and they maintain several response vessels on the water in Vancouver Harbour to ensure a prompt response, including a skimming vessel kept at the Westridge Marine Terminal.

Municipal and Provincial Emergency Management Programs

All municipalities in Alberta and BC are required to have an Emergency Management Program to coordinate emergency services in the event of an incident (*e.g.*, natural disaster, industry-related incident, or other incident). At all times, local authorities are responsible for managing first response to an emergency event. Provincial emergency management frameworks are in place in Alberta and BC to support communities when an incident overwhelms local capacity. In Alberta, when an emergency event exceeds the capabilities of a municipal response or there is a significant threat to life and property, the Alberta Emergency Management Agency coordinates the Government of Alberta's support to the municipality by linking municipalities with resources to help manage the event (Alberta Municipal Affairs 2013). In BC, Emergency Management British Columbia (EMBC) is the coordinating regulatory authority for the provincial government's emergency management activities. EMBC provides executive coordination, strategic planning, multi-agency facilitation and provides support to local authorities (BC Ministry of Justice 2013a). The provincial emergency management structure is activated when a BC community or any significant infrastructure is threatened by an emergency or disaster which may overwhelm a local authority's ability to respond. In such situations, there will be an increase in the activation level of Provincial Regional Emergency Operation Centres and the Provincial Emergency Coordination Centre to support local governments' emergency operations as required (BC Ministry of Justice 2013b).

Additional assistance is provided by the Government of Canada if the emergency escalates beyond provincial resource capabilities. Requests from the provinces to the Government of Canada are managed through Public Safety Canada, which maintains close operational links with provincial and local emergency authorities and maintains inventories of resources and experts in various fields (BC Ministry of Justice 2013b).

In both Alberta and BC communities also have plans in place to provide social services in the context of emergencies. This involves providing food, lodging, clothing and emotional support, and family reunification services during emergencies that force residents to leave their homes. Plans for Disaster Social Services (in Alberta) or Emergency Social Services (in BC) are typically a specialized component of a community's Emergency Management Program.

Community-Specific Emergency and Protective Services

Edmonton Region

In communities crossed by the proposed pipeline corridor within the Edmonton Region, RCMP detachments are located in Strathcona County, City of Edmonton, City of Spruce Grove and Town of Stony Plain (City of Edmonton 2013a). Parkland County is serviced by three RCMP detachments, located in the Town of Stony Plain, the Hamlet of Evansburg and the Town of Drayton Valley (Parkland County 2013). During technical discussions, some service policing capacity constraints were noted (*e.g.*, in City of Spruce Grove) (Hanlan, Irving pers. comm.). In addition to an RCMP detachment, the City of Edmonton also has the Edmonton Police Service. With a mandate to increase public safety through intervention, prevention and suppression of crime, the Edmonton Police Service has a headquarters located in downtown Edmonton, as well as numerous other community stations located throughout the city (Edmonton Police Service 2013).

Fire services are located in Strathcona County, City of Edmonton, City of Spruce Grove, Town of Stony Plain and Village of Wabamun. The Town of Stony Plain indicated that there are some issues with having a volunteer fire department, including an increased risk of daytime (when most volunteers work a paying job) fires going undetected. The Town of Stony Plain, the City of Spruce Grove and Parkland County are sharing the cost of three new fire trucks over the next few years (Frostad pers. comm.). Parkland County identified that the only full-time fire department providing service to county residents is in Spruce Grove; the Town of Stony Plain and Parkland County have volunteer (paid on-call) fire departments (Hanlan pers. comm.). Parkland County Fire Service places fire apparatuses throughout the county and enters into agreements with local municipalities for services. The county has agreements with the Town of Devon, Parkland Village, Town of Stony Plain, Village of Wabamun, Hamlet of Tomahawk, Hamlet of Entwistle and Summer Village of Seba Beach (Parkland County 2013).

A range of other municipally-offered services are also available in communities crossed by the proposed pipeline corridor. For example, the City of Edmonton provides a range of emergency, protective and social services (City of Edmonton 2013a). The City of Spruce Grove also offers emergency, protective services, and crime prevention programs, as well as Family and Community Support Services (City of Spruce Grove 2013).

Details on firefighting and protective services for key communities along the proposed pipeline corridor in the Edmonton Region are summarized in Table 5.5-7.

TABLE 5.5-7

FIREFIGHTING AND PROTECTIVE SERVICES FOR COMMUNITIES ALONG THE PROPOSED PIPELINE CORRIDOR OF THE EDMONTON REGION

Footprint Community/Region	Police Services	Fire Services	Comments
Strathcona County	RCMP detachment	Strathcona County Emergency Services	• Police and fire services based in Sherwood Park. • Policing: 71 officers, 11 special constables. • Fire services: responsible for fire suppression rescue response, dangerous goods response, fire/arson investigation and inspection, emergency preparedness.
City of Edmonton	RCMP detachment Edmonton Police Service	Edmonton Fire Rescue Service	• RMCP detachment: located at the Edmonton International Airport. • Edmonton Police Service: five larger stations (headquarters downtown, plus one in each of four operational divisions), plus community stations within each division. • Fire services: 26 stations throughout Edmonton; includes teams specializing in hazardous materials, river rescue and technical rescue.
City of Spruce Grove	RCMP detachment	Spruce Grove Fire Service	• Policing: In addition to RCMP, Community Peace Officers also assist with emergency and protective services. • Fire services: integrated fire services including fire suppression and dangerous goods response.
Town of Stony Plain	RCMP detachment	Stony Plain Fire Services	• Policing: 16 officers. • Fire services: 40 part-time volunteer, 3 career firefighters.
Village of Wabamun	Policing provided by Stony Plain RCMP detachment	Wabamun Fire Department	• Fire services: volunteer-based organization.
Parkland County	Policing provided by RCMP detachments in Stony Plain, Spruce Grove, Evansburg and Drayton Valley	Parkland County Fire Services	• Fire services: fire apparatuses placed throughout the county; agreements with numerous local municipalities for manpower.

Sources: City of Edmonton 2004, City of Edmonton 2013a, City of Spruce Grove 2013, RCMP 2012a, Strathcona County 2007, Town of Stony Plain 2013, Village of Wabamun 2011, Parkland County 2013

Rural Alberta Region

In communities crossed by the proposed pipeline corridor within the Rural Alberta Region, RCMP detachments are located in the Town of Edson and the Town of Hinton. The Town of Edson has a strong municipal force (17 members) and a provincial traffic unit as well as some provincial officers (Lemieux pers. comm.). Edson RCMP is usually operating at capacity or stretched past capacity, with fluctuating staff numbers (Chomeakwich pers. comm.). Yellowhead County is serviced by RCMP detachments in the Town of Edson and the Town of Hinton, in addition two RCMP officers are contracted to work in the county (Yellowhead County 2013).

During technical discussions, Yellowhead County noted their experience with temporary work camps and the resulting pressures on protective services. Existing RCMP staffing reflects the current population and does not account for the shadow population of workers living in temporary work camps and hotels. The RCMP detachments in the Hamlet of Evansburg, the Town of Edson and the Town of Hinton are fully manned with no identified plans for expansion. Alberta Sheriffs also operate along the Yellowhead Highway.

In communities crossed by the proposed pipeline corridor within the Rural Alberta Region fire services are located in the Town of Edson and the Town of Hinton. Through an agreement with Yellowhead County, the Hinton Fire Department delivers fire services to approximately 6,600 km² of area around the Town of Hinton (Town of Hinton 2013). Fire and ambulance capacity in the Town of Hinton was noted as adequate, with no capacity issues (Kreiner pers. comm.). During technical discussions with the Town of Edson, it was noted that the town does not have the finances to further expand fire services (Chomeakwich pers. comm.). There are an additional eight volunteer-based fire halls in the region operated by Yellowhead County (Ramme pers. comm., Yellowhead County 2013).

Details on firefighting and protective services for key communities along the proposed pipeline corridor in the Rural Alberta Region are summarized in Table 5.5-8.

TABLE 5.5-8

FIREFIGHTING AND PROTECTIVE SERVICES FOR COMMUNITIES ALONG THE PROPOSED PIPELINE CORRIDOR OF THE RURAL ALBERTA REGION

Footprint Community/Region	Police Services	Fire Services	Comments
Town of Edson	RCMP detachment	Edson Fire Department	• Policing: 17 officers. • Fire services: 38 volunteer, 2 career firefighters.
Town of Hinton	RCMP detachment	Hinton Fire/Rescue Department	• Policing: 17 officers. • Fire services: 33 on call professional, 2 career firefighters.
Yellowhead County	Policing provided by RCMP detachments in Edson and Hinton.	Yellowhead County Fire Department	• Policing: two additional RCMP officers work within the County; Community Peace Officers are also employed by the County. • Fire services: County-operated volunteer services located in hamlets of Evansburg, Wildwood, Niton, Peers, Marlboro, Brule, Cadomin and Robb (approximately 120 volunteers).

Sources: Chomeakwich pers. comm., Knight pers. comm., RCMP 2012a, Town of Edson 2013, Town of Hinton 2013, Yellowhead County 2013

Fraser-Fort George/Thompson-Nicola Region

In communities along the proposed pipeline corridor within the Fraser-Fort George/Thompson-Nicola Region, RCMP detachments are located in the Village of Valemount, the District of Clearwater, the City of Kamloops and the City of Merritt. Various RCMP traffic units exist in the Fraser-Fort George/Thompson-Nicola Region: RCMP Municipal Traffic Unit in Kamloops; RCMP Central Interior Traffic Services in Kamloops, Clearwater and Merritt; Traffic Services Unit in Valemount; and Integrated Road Safety Unit in Kamloops and Valemount (RCMP 2011). There is no RCMP detachment in the Community of Blue River; the nearest RCMP detachment is located in the District of Clearwater (RCMP 2012b), approximately 105 km away. There is also an RCMP detachment serving rural areas of RDFFG Electoral Area H located in the Village of McBride.

Within the Fraser-Fort George/Thompson-Nicola Region, fire services are located in the Village of Valemount, the District of Clearwater, the City of Kamloops and the City of Merritt. The Fraser-Fort George Regional District Robson Valley-Canoe Upstream OCP indicates that the Regional Board is in the process of establishing and expanding fire protection services and the development of fireguards to protect population areas from wildfires (RDFFG 2006). Fire services are also available in the Village of McBride. TNRD operates fire departments in the communities of Vavenby, Black Pool, Blue River, McClure and Little Fort. Many fire departments use volunteer fire fighters, including Barriere and Clearwater. The Cities of Kamloops and Merritt have their own fire departments, which have career staff (Storie pers. comm.). The District of Clearwater has mutual aid agreements with the Hamlet of Black Pool and the Village of Vavenby. The City of Merritt has two fire fighter training programs: a recently approved provincial forest fighting centre for wildfires, and the Merritt training centre for domestic/urban fires (Sibilleau pers. comm.).

Details on firefighting and protective services for key communities along the proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region are summarized in Table 5.5-9.

TABLE 5.5-9

FIREFIGHTING AND PROTECTIVE SERVICES FOR COMMUNITIES ALONG THE PROPOSED PIPELINE CORRIDOR OF THE FRASER-FORT GEORGE/THOMPSON-NICOLA REGION

Footprint Community/Region	Police Services	Fire Services	Comments
Village of Valemount	RCMP Detachment	Valemount Fire Department	• Policing: 5 officers. • Fire services: 25 volunteer, 1 career firefighter. • Valemount and District Road Rescue services also available.
RDFGG	Policing provided by RCMP detachments in Valemount and McBride	Additional fire services in McBride	• Fire services: volunteer service in McBride.
District of Clearwater	RCMP Detachment	Clearwater Fire Department	• Fire services: 20 volunteer, 1 part-time career firefighter.
City of Kamloops	RCMP Detachment	Kamloops Fire Rescue	• Policing: 120 RCMP officers; the City of Kamloops provides an additional 55 municipal employees to support the RCMP. There is also a Kamloops Traffic Services office. • Fire services: 86 career firefighters; six fire stations in the city (three operated by full-time firefighters, while the others are operated by a combination of full-time and paid on-call firefighters).
City of Merritt	RCMP Detachment	Merritt Fire Rescue Department	• Policing: 19 officers; RMCP detachment has a municipal group, a highway group and four Aboriginal groups. • Fire services: 27 paid on-call firefighters, 2 career firefighters, and 5 work experience program firefighters.
District of Barriere[1]	RCMP Detachment	District of Barriere Fire Department	• Fire services: volunteer fire department.
TNRD	Additional policing services provided by RCMP detachments in T'Kumlups, Chase, Logan Lake, Lytton, Clinton, and Ashcroft	Additional fire services in rural areas	• Policing: 47 officers throughout rural RCMP detachments. • Fire services: additional volunteer services located in communities of Vavenby, Black Pool, Blue River, McClure and Little Fort.

Sources: BC Ministry of Justice 2011, City of Kamloops 2013, City of Merritt 2011b, District of Barriere 2013, District of Clearwater 2013a, Kamloops Fire Rescue 2010, Noble pers. comm., RCMP 2012b, Roline pers. comm., Village of Valemount 2013

Note: 1 The District of Barriere is not along the proposed pipeline corridor, but is along the Darfield to Blackpines reactivated segment of TMPL.

Fraser Valley Region

Emergency and protective services are located at various places along the proposed pipeline corridor in the Fraser Valley Region. In communities along the proposed pipeline corridor within the Fraser Valley Region, RCMP detachments are located in the District of Hope and the City of Chilliwack. The Upper Fraser Valley Regional RCMP Detachment, located in Chilliwack, oversees the RCMP Community Police Offices in Hope, Chilliwack, Kent and Boston Bar (Davidsen pers. comm.). During summer months, the volume of police calls increases in the region (Burleigh pers. comm.). During technical discussions, it also was noted that a notable influx of temporary workers to a larger community such as the City of Chilliwack would not be a concern for the RCMP; however, smaller communities such as the District of Hope may see social and/or traffic-related issues that could affect policing services (Burleigh pers. comm.). It was noted that the Hope Community Policing Office has an increased file load during the summer when the tourist population increases. The addition of temporary workers into the community would likely increase stress on the police detachment (Davidsen pers. comm.). The City of Abbotsford has a municipal police department. The Fraser Valley Traffic Services based in the City of Chilliwack enforce traffic laws on arterial highways (Davidsen, Wilson pers. comm.).

Fire services are located in Hope, Chilliwack and Abbotsford. The FVRD also operates seven rural fire departments with over 150 volunteer firefighters. Details on emergency and protective services for key communities along the proposed pipeline corridor in the Fraser Valley Region are summarized in Table 5.5-10.

TABLE 5.5-10

FIREFIGHTING AND PROTECTIVE SERVICES FOR COMMUNITIES ALONG THE PROPOSED PIPELINE CORRIDOR FRASER VALLEY REGION

Footprint Community/Region	Police Services	Fire Services	Comments
District of Hope	RCMP Detachment	District of Hope Fire Department	• Policing: 21 officers. • Fire services: volunteer and paid on-call firefighters.
City of Chilliwack	RCMP Detachments	Chilliwack Fire Department	• Policing: Upper Fraser Valley Regional RCMP Detachment is located in Chilliwack, as well as the Chilliwack Community Police Office. • Fire services: 31 career staff and 130 paid on-call firefighters.
City of Abbotsford	Abbotsford Police Department	Abbotsford Fire Rescue Service	• Policing: 217 officers; approximately 100 civilian staff and 80 volunteers also work for the Abbotsford Police Department. • Fire services: both career and paid on-call firefighters.
FVRD	Additional policing provided by RCMP detachments in Agassiz, Boston Bar and Mission	Rural areas serviced by seven rural volunteer fire departments	• Fire services: 150 volunteers in rural departments, including Chilliwack River Valley Volunteer Fire Department, Columbia Valley Volunteer Fire Department, Popkum Volunteer Fire Department, Boston Bar/North Bend Volunteer Fire Department, Yale and District Volunteer Fire Department, Hemlock Valley Volunteer Fire Department, and North Fraser Volunteer Fire Department.

Sources: Abbotsford Police Department 2011, City of Abbotsford 2013, City of Chilliwack 2013, Davidsen pers. comm., Hope BC 2012, RCMP 2012b

Metro Vancouver Region

Within the Metro Vancouver Region, RCMP detachments are located in each of the proposed pipeline corridor communities (Township of Langley, City of Surrey, City of Coquitlam and City of Burnaby) as well as various other Socio-Economic RSA communities. The Surrey Detachment is the largest in Canada and the Langley Detachment serves both the City and Township of Langley (RCMP 2012b). In the cities of Burnaby and Surrey, there are RCMP Municipal Traffic Units (RCMP 2011).

There are fire services located in each of the major urban centres in the Metro Vancouver Region, including the footprint communities.

Details on firefighting and protective services for communities crossed by proposed pipeline corridor in the Metro Vancouver Region are summarized in Table 5.5-11.

TABLE 5.5-11

FIREFIGHTING AND PROTECTIVE SERVICES FOR COMMUNITIES ALONG THE PROPOSED PIPELINE CORRIDOR OF THE METRO VANCOUVER REGION

Footprint Community/Region	Police Services	Fire Services	Comments
Township of Langley	RCMP Detachment	Township of Langley Fire Department	• Policing: 188 RCMP officers. In addition, five Community Police Offices in the City and Township of Langley. The main detachment is in Murrayville, with Community Police Offices in Aldergrove, Brookswood, Willoughby and Walnut Grove. • Fire services: 92 career and 127 paid-on call firefighters in Township of Langley Fire Department. Services also available through City of Langley (Langley City Fire-Rescue Service, which has 20 career staff and 22 paid on-call firefighters).
City of Surrey	RCMP Detachment	Surrey Fire Service	• Policing: Five Community Police Offices in Surrey. Also 250 City of Surrey support staff. • Fire services: 342 career and 99 paid-on-call firefighters.

TABLE 5.5-11 Cont'd

Footprint Community/Region	Police Services	Fire Services	Comments
City of Coquitlam	RCMP Detachment	Coquitlam Fire and Rescue	• Policing: 302 career and civilian RCMP members. Two Community Police Offices in Coquitlam. Serves Coquitlam, Anmore, Belcarra and Port Coquitlam. • Fire services: 148 career and 30 paid on-call.
City of Burnaby	RCMP Detachment	City of Burnaby Fire Department	• Policing: four Community Police Offices stations are located in Burnaby. An additional 127 support staff are provided by the City of Burnaby. • Fire services: five divisions: Administration, Suppression, Training, Fire Prevention and Mechanical. Fast response fireboat services available.

Sources: City of Burnaby 2013, City of Coquitlam 2013, City of Surrey 2013, RCMP 2012b, City of Langley 2013, Township of Langley 2013

5.5.6.2 Social Services

Generally, community and social services are provided by a combination of local authorities with mandated responsibilities, municipal and band-funded initiatives, non-profit community organizations and private providers. Service providers work closely with health authorities, police, corrections and educational institutions among other organizations. They provide a wide range of services in response to social, psychological, employment, income and crisis needs of the population.

In Alberta, Alberta Ministry of Human Services provides a framework for a range of human and family support services, including family and community services, disability services, family violence services, women's and youth programs, homelessness services, financial support, employment services, and newcomers' services. Numerous service delivery offices, Alberta Works Centres, Child and Family Services Authorities, and Employment Services offices provide a range of programs and services across Alberta to Socio-Economic RSA communities (Alberta Human Services 2013).

In BC, several provincial ministries are involved in the provision of social services. BC Ministry of Social Development and Innovation provides services in the areas of income assistance, disability services, and employment and labour market services. BC Ministry of Child and Family Development provides various programs and services in the areas of: early childhood development, child protection and foster care, Aboriginal services, youth engagement and youth education assistance. Services are provided through Service BC or Work BC offices in many communities throughout the Socio-Economic RSA, as well as through numerous contracted organizations.

Aboriginal communities and Aboriginal-focused organizations play an active role in service provision for many community members. Many Bands provide education, social and health services to their members (see Aboriginal Community Overview in the Socio-Economic Technical Report of Volume 5D). Also, Aboriginal Affairs and Northern Development Canada provides funds to support the delivery of social development programs in Aboriginal communities, including: the Income Assistance Program; National Child Benefit Reinvestment; Assisted Living Program; First Nations Child and Family Services Program; and Family Violence Prevention Program (Aboriginal Affairs and Northern Development Canada 2013).

5.5.7 Recreation Amenities

This subsection discusses the recreation amenities in key communities in the Socio-Economic RSA, focusing on communities that are likely to be construction hubs. A discussion of outdoor recreation activities and areas is found in Section 5.4.5 Outdoor Recreation Use. Refer to Section 8.7 of the Socio-Economic Technical Report of Volume 5D for a full discussion of recreation amenities.

5.5.7.1 Edmonton Region

The Edmonton Region offers a diverse mix of urban-based and outdoor recreational facilities and organizations. Communities have a range of recreational infrastructure and services typically commensurate with their size. Larger centres (*i.e.*, Sherwood Park Urban Service Area, the City of

Edmonton, the City of Spruce Grove and the Town of Stony Plain) tend to have a wide range of recreational services. In and around the City of Edmonton, there are many sports and recreation facilities including the City of Edmonton Recreation Centre, the Commonwealth Community Recreation Centre, outdoor and indoor swimming pools, the Edmonton Valley Zoo as well as numerous golf courses, sports fields, theatres and hiking/biking trails (City of Edmonton 2013a). The Parkland Recreation Plan outlines priorities for future development, such as water spray parks, picnic areas, playgrounds, skating rinks, BMX bicycle parks, skateboard parks, cross country ski trails, outdoor swimming pools, boat launches, off leash dog parks, campgrounds, sports arenas, baseball diamonds, climbing walls, curling rinks, museums and dance rooms (Parkland County 2007).

Smaller communities, such as the Village of Wabamun, typically have a smaller range of recreational infrastructure due to smaller populations, but generally have resources such as community halls, rinks, parks and playgrounds. Recreational amenities in the Village of Wabamun include a water park, three baseball diamonds and sports field, hiking/biking trails, museums, arenas, golf courses and a bowling alley (Village of Wabamun 2011). According to the Wabamun MDP, developing recreational amenities within the village is a priority for Council (Village of Wabamun 2010).

All-season recreational amenities are located in the Hamlet of Entwistle and the Hamlet of Evansburg. Recreational amenities include a farmers market, hiking and biking trails, tubing, swimming and fishing, a golf course, art gallery, tennis courts, a fitness gym, baseball diamonds, soccer pitches and an arena (Evansburg and Entwistle 2012). Pembina Provincial Park is located between the Hamlet of Entwistle and the Hamlet of Evansburg and offers camping, volleyball, swimming, fishing, canoeing and hiking trails (ATPR 2012).

5.5.7.2 Rural Alberta Region

The Rural Alberta Region offers all-season recreational amenities, including indoor and outdoor recreational facilities. A range of indoor recreational amenities, including recreation complexes, a curling rink, arenas, swimming pools and leisure centres are found in the Town of Edson and the Town of Hinton. Outdoor recreation amenities are abundant in the Rural Alberta Region, including golf courses, outdoor arenas, hiking/biking trails, snowmobile/ATV trails, a skateboard park, camping, fishing, skiing and numerous sports fields (Town of Edson 2013, Town of Hinton 2013). According to the Edson MDP, there will be further development of regional parks, major recreational facilities, special use parks and small neighbourhood playgrounds within the Town of Edson (Town of Edson 2006).

The Hamlet of Wildwood, in the HORU LSA, offers recreational services for all seasons including a recreational complex (soccer, curling, ice skating and roller skating), trails for biking, snowmobiling, cross country skiing, walking and hiking, Chip Lake Park is located approximately 8 km southwest of Wildwood and offers camping, a playground and group use area, as well as fishing boating and swimming (Wildwood Alberta 2012).

5.5.7.3 Fraser-Fort George/Thompson-Nicola Region

The Fraser-Fort George/Thompson-Nicola Region offers a diverse mix of urban-based and outdoor recreational facilities and organizations. Communities have a range of recreational infrastructure and services typically commensurate with their size. Larger centres (*i.e.*, the City of Kamloops and the City of Merritt) tend to have a wide range of recreational services. The City of Kamloops promotes itself as Canada's Tournament Capital, housing numerous sports venues and facilities. Recreational services found in Kamloops include multi-purpose facilities, arenas, a Canada Games Aquatic Centre, swimming pools, fitness rooms, outdoor facilities (BMX track, ball diamonds, soccer fields, tennis courts, skate parks), auditorium, theatre, hiking and biking trails (City of Kamloops 2013). The City of Merritt also offers all-season recreational services including aquatic centres, civic centre, ice hockey rinks, curling rinks, golf courses, mountain biking, water park, summer festivals, Nicola Valley Lake (City of Merritt 2007, Noble pers. comm.).

Smaller communities, such as the Village of Valemount and the Community of Blue River, typically have a smaller range of recreational infrastructure due to smaller populations, but generally have resources such as community halls, rinks, parks and playgrounds. In and around the Village of Valemount there are many sports and recreation facilities including a community theatre, yoga, the Canoe Valley Recreation Centre

(arena), baseball diamonds, art gallery, and rodeo grounds which host an annual rodeo event (Village of Valemount 2013).

5.5.7.4 Fraser Valley Region

The Fraser Valley Region offers a diverse mix of urban-based and outdoor recreational facilities and organizations. The District of Hope and cities of Chilliwack and Abbotsford have been identified as construction hubs for the Project, which could result in an increased use of recreation amenities by crews.

The District of Hope offers a variety of recreational services including indoor facilities (cinema, library, aquatic centre, arena, curling, bowling and racquetball) and outdoor activities such as skiing, bird watching, canoeing or kayaking, biking, fishing, golf and hiking (Hope BC 2012). In the City of Chilliwack, recreational services include skating rinks, leisure centre (weight room, wave pool, swimming pool and waterpark), fitness clubs, outdoor activities (biking, canoeing, paragliding, kayaking, windsurfing and wildlife viewing), golf, museums, and theatres (City of Chilliwack 2013). Recreational services in the City of Abbotsford include a recreation centres (weight room, swimming pool and arena), exhibition park (running track, sports fields and BMX track), ball diamonds, tennis and volleyball courts, skate park, basketball courts, cultural centre, art gallery and auditorium (City of Abbotsford 2013).

5.5.7.5 Metro Vancouver Region

The Metro Vancouver Region offers primarily urban-based indoor and outdoor recreational facilities and organizations. The recreational infrastructure and services reflect the communities' size and location in the densely populated Metro Vancouver area. The Township of Langley and cities of Surrey, Coquitlam and Burnaby all offer a wide variety of recreation and community centres, pools, fitness centres, playing fields and parks (City of Burnaby 2013, City of Coquitlam 2013, City of Surrey 2013, Township of Langley 2013). The Metro Vancouver Regional District has been identified as a construction hub for the Project. Metro Vancouver includes many of the largest municipalities in BC, offering diverse recreation amenities. Metro Vancouver operates 22 regional parks, a conservation reserve and is working with the FVRD to implement the Experience the Fraser project, designed to connect Hope with the Salish Sea by terrestrial and aquatic trails (Metro Vancouver 2011a).

The Metro Vancouver Region also offers a range of both marine and fresh water-based recreational amenities. Kayaking, canoeing, boating and swimming are popular activities in the City of Burnaby's Deer Lake, Burnaby Lake and at the Barnet Marine Park in the Burrard Inlet (City of Burnaby 2013). The Burrard Inlet is a multi-use water body that offers recreational opportunities including boating, fishing and wildlife viewing (BIEAP 2002).

5.6 Navigation and Navigation Safety

This subsection presents the setting pertaining to navigation and navigation safety. The potential effects on navigation and navigation safety arising from the construction and operation of the proposed pipeline and facilities, as well as mitigation, are discussed in Section 7.2.6.

The NEB indicates it intends to follow Transport Canada's longstanding definition of navigable waters and will be guided by the following definition:

> *"navigable water will be considered as any body of water capable, in its natural state, of being navigated by floating vessels of any description for the purpose of transportation, recreation or commerce, and may also be a human-made feature such as a canal or reservoir."* (NEB 2013b).

As discussed in the Fisheries (Alberta) Technical Report in Volume 5C, criteria for the definition of navigability have been established for the purposes of assessment. The navigability criteria outlined in the *Minor Works and Waters Ministerial Order* (*Navigable Waters Protection Act*) (*NWPA*) (Government of Canada 2009) and the *Minor Waters User Guide* (Transport Canada 2010) were used as the basis for determining whether each watercourse crossed by the Project could be classed as a minor navigable water and, therefore, unlikely to be navigable. In addition to the *Minor Works* criteria, a supplemental benchmark based on industry experience was also used to further expand classification of presumably non-navigable watercourses.

According to the Navigable Waters Protection Program Application Guide (Transport Canada 2010) navigable water is defined as "any body of water capable of being navigated by floating vessels of any description for the purpose of transportation, commerce or recreation. This includes both inland and coastal waters" (Transport Canada 2010).

Wetlands in some circumstances fall within this definition as they have characteristics that allow for floating vessels to traverse them (*i.e.*, deeper, more permanent water channels through the wetland). Specific types of wetlands that would fall under this designation include deep emergent marshes, open water ponds and non-woody fens which have open water channels throughout or any wetlands associated with a classified watercourse.

Results from field investigations were used to screen watercourses against the following criteria to determine if each watercourse could be defined as a minor navigable water (*i.e.*, non-navigable). Class 1 or Class 2 non-navigable waters meet the conditions in either Section 11(2) or 11(3), respectively, of the Minor Navigable Waters of the *Minor Works and Waters* (*NWPA*) *Ministerial Order* (Government of Canada 2009). In addition to Class 1 and 2 non-navigable waters, a third class (Class 3) was added to include minor watercourses up to 5 m wide. Experience has also shown that watercourses from 3-5 m wide, and with one or more of the criteria used to categorize Class 2 non-navigable waters, are also likely to be deemed "non-navigable". The classes of non-navigable minor waters for the Project are defined as follows.

- **Class 1:** Watercourses that have one of the following:
  - an average width measured at the high water level that is less than 1.20 m; or
  - an average depth measured at the high water level that is less than 0.30 m.
- **Class 2:** Watercourses that have an average width measured at the high water level that is greater than 1.2 m and less than 3 m and at least one of the following:
  - an average depth at the high water level that is greater than 0.30 m but not more than 0.60 m;
  - a slope measured at high water level that is greater than 4%;
  - a sinuosity ratio that is greater than 2; or
  - more than two natural obstacles with at least one upstream and another downstream from the crossing.
- **Class 3:** Watercourses that have an average width measured at the high water level that is greater than 3 m but less than 5 m and at least one of the criteria of a Class 2 minor navigable water (above).

Watercourses that did not meet the criteria of any of these three classifications were assumed to be navigable for recreational, commercial or traditional purposes.

Additional criteria were developed to help with identifying any potentially navigable wetlands. Criteria used included:

- classification of wetland (*i.e.*, deep marsh, open water pond, non-woody fen or any wetland associated with classified watercourses);
- permanency of water (i.*e.*, semi-permanent or permanent); and
- presence of semi-permanent or permanent open water channels within the wetland (*e.g.*, within non-woody fens).

In Alberta, the proposed pipeline corridor crosses 4 watercourses that are considered navigable, 34 watercourses that are considered potentially navigable and 92 potentially navigable wetlands. In BC, the proposed pipeline corridor crosses 49 watercourses that are considered navigable, 70 watercourses that are considered potentially navigable and 84 potentially navigable wetlands. The Pipeline EPP

(Volume 6B) provides a list of watercourses and wetlands crossed by the proposed pipeline corridor, including their classification of navigability. Traditional Aboriginal use of watercourses for navigation, while touched on briefly in this subsection, is discussed in Section 5.2 Traditional Land and Resource Use. The Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report in Volume 8B provides further information about marine use patterns and navigation in the marine waters of Burrard Inlet.

Key navigable watercourses crossed by the proposed pipeline corridor that have known traditional and non-traditional human uses and that were identified as valued watercourse resources during stakeholder consultation and Aboriginal engagement and the various Community Workshops and ESA Workshops are presented in Table 5.6-1.

TABLE 5.6-1

USE AND VESSELS ON KEY NAVIGABLE WATERCOURSES CROSSED BY THE PROPOSED PIPELINE CORRIDOR

Watercourse (RK)	Types of Use	Types of Vessels/Craft
EDMONTON REGION		
North Saskatchewan River	Commercial • paddlewheeler tours Non-commercial • fishing (*e.g.*, pike, lake trout, whitefish) • canoeing • kayaking • jet boating/skiing	• fishing boats • paddlewheelers • canoes • kayaks • motorboats • jet skis
RURAL ALBERTA REGION		
Pembina River	Commercial • fishing • tubing Non-commercial • tubing • fishing • kayaking • traditional navigation route	• rafts • tubes • fishing boats • kayaks • canoes • motorboats
McLeod River	Non-commercial • fishing • canoeing	• fishing boats • canoes
Maskuta Creek	Non-commercial • fishing	• fishing boats
FRASER-FORT GEORGE/THOMPSON-NICOLA REGION		
Fraser River	Commercial • raft expeditions • kayak tours • fishing (*e.g.*, several species of salmon) Non-commercial • fishing (*e.g.*, several species of salmon, sturgeon) • boating • rowing	• rafts • kayaks • fishing boats • rowboats
Swift Creek	Commercial • fishing (*e.g.*, salmon)	• canoes
Raft River	Commercial • whitewater kayaking	• whitewater kayaks
Thompson River	Commercial • whitewater rafting tours Non-commercial • swimming • fishing	• whitewater rafts • fishing boats
Coldwater River	Non-commercial • fishing (*e.g.*, coho, steelhead, Chinook)	• fishing boats

TABLE 5.6-1 Cont'd

Watercourse (RK)	Types of Use	Types of Vessels/Craft
Nicola River	Commercial • whitewater rafting • whitewater kayaking	• whitewater rafts • whitewater kayaks
FRASER VALLEY REGION		
Coquihalla River	Commercial • whitewater rafting • whitewater kayaking Non-commercial • fishing (*e.g.*, steelhead) • traditional Aboriginal cleansing[1] • tubing • swimming	• whitewater rafts • whitewater kayaks • fishing boats • tubes
Chilliwack/Vedder River	Commercial • kayaking courses Non-commercial • fishing (*e.g.*, steelhead, salmon, trout) • kayaking	• kayaks • fishing boats
Sumas River	Non-commercial • competitive rowing	• rowboats
METRO VANCOUVER REGION		
Fraser River	Commercial • coastal and deep sea cargo transport • log sorting and booming • moorage • river cruises Non-commercial • fishing	• cargo ships • tugs • barges • scows • paddlewheeler steamboats • sailboats • fishing boats

Sources: BIEAP 2006, CHRS 2013, City of Edmonton 2013b, Destination BC 2013, DFO 2013d, Hanlan pers. comm.

Note: 1 Some traditional uses were identified through Project-specific biophysical field studies and socio-economic interviews with Aboriginal communities.

In addition to the watercourses presented in Table 5.6-1, there are also numerous creeks, tributaries and wetlands crossed by the proposed pipeline corridor (many unnamed) that are navigable. Particular uses on such watercourses are unknown, but could include commercial and non-commercial fishing activities, kayaking, canoeing, boating and rafting. Shore-side use for commercial and non-commercial fishing is also common along watercourses crossed by the proposed pipeline corridor.

Edmonton Region

The proposed pipeline corridor in the Edmonton Region crosses 1 watercourse that is considered navigable, the North Saskatchewan River, 12 potentially navigable watercourses and 46 potentially navigable wetlands. Table 5.6-1 presents key navigable watercourses crossed by the proposed pipeline corridor that were noted as used watercourses during stakeholder consultation, as well as types of use and types of vessel/craft.

The North Saskatchewan River is a focus for many outdoor recreation activities including angling and pleasure boating. The City of Edmonton park system, through its trails, provides numerous points of access to the North Saskatchewan River; boats can be launched at several locations in Edmonton (City of Edmonton 2013a). It was noted during Aboriginal participation in Project-specific biophysical field studies that the North Saskatchewan and Elk rivers are used for fishing. Navigation and navigation safety are not specifically addressed in most land use plans along the proposed pipeline corridor. The Town of Stony Plain requires a minimum setback of 10 m from watercourses and wetlands (Armin A. Preiksaitis & Associates 2005).

Rural Alberta Region

The proposed pipeline corridor in the Rural Alberta Region crosses 3 watercourses that are considered navigable, including the Pembina River, Wolf Creek and McLeod River, 22 potentially navigable watercourses and 46 potentially navigable wetlands. Table 5.6-1 presents key navigable watercourses crossed by the proposed pipeline corridor that were noted as used watercourses during stakeholder consultation, as well as types of use and types of vessel/craft.

The Pembina River was identified as a navigational route and an ideal fishing area by Aboriginal participants during biophysical studies. Fishing by Aboriginal communities occurs on the McLeod River, and Maskuta Creek in Alberta. The McLeod River has traditionally been used for canoeing.

The Hinton MDP states that land along the banks of creeks/rivers and lakes must be protected for recreational access. Any development close by must create a transition between development and natural areas (Town of Hinton 1998).

Fraser-Fort George/Thompson-Nicola Region

The proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region crosses 30 watercourses that are considered navigable, including: the Fraser River; North Thompson River; Thompson River; Nicola River; Canoe River; Coldwater River; Albreda River; and Thunder River; 33 potentially navigable watercourses and 62 potentially navigable wetlands. Table 5.6-1 presents key navigable watercourses crossed by the proposed pipeline corridor that were noted as used watercourses during stakeholder consultation, as well as types of use and types of vessel/craft.

The Fraser River acts as a major provincial transportation corridor, is historically and environmentally important, and is an internationally recognized salmon run and nesting/staging area for shorebirds and waterfowl (BC MOE 2012, CHRS 2013). The river and basin are also used by recreationalists for sportfishing, rafting and boating (BC MOE 2012). During Project-specific field studies, Aboriginal participants noted that the Fraser River is used for fishing. The Fraser River is crossed by the proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola Region as well as in the Metro Vancouver Region.

Fraser Valley Region

The proposed pipeline corridor in the Fraser Valley Region crosses 17 watercourses that are considered navigable, including the Coquihalla River, Sumas River, and Chilliwack River, 30 watercourses that are potentially navigable and 12 potentially navigable wetlands. Table 5.6-1 presents key navigable watercourses crossed by the proposed pipeline corridor that were noted during stakeholder consultation, as well as types of use and types of vessel/craft.

During Project-specific biophysical field studies, Aboriginal participants noted that the Coquihalla River is used for traditional cleansing (bathing). Historically, before damming, the river was an important transportation corridor; presently, it is mainly used for recreational activities such as tubing and swimming. Kayaking courses and swimming occurs on the Vedder River. The Sumas River is used for competitive rowing (Destination BC 2013). According to the Chilliwack Forest District SRMP, the Coquihalla River is closed to fishing activities for conservation purposes; however, Kawkawa Lake is popular for kokanee fishing (BC ILMB 2004).

Metro Vancouver Region

The proposed pipeline corridor in the Metro Vancouver Region crosses two watercourses that are considered navigable, the Fraser River and Salmon River, seven watercourses that are potentially navigable and ten potentially navigable wetlands. Table 5.6-1 presents key navigable watercourses crossed by the proposed pipeline corridor that were noted as used watercourses during stakeholder consultation, as well as types of use and types of vessel/craft.

The Fraser River is the largest river in BC (1,375 km), and supports high value salmon habitat as well as staging and nesting areas for shorebirds and waterfowl. The river also supports high recreation values including fishing, rafting and boating (CHRS 2013). The City of Surrey and City of Coquitlam are located on the north and south sides of the Fraser River, respectively, at the proposed pipeline corridor crossing

in the Metro Vancouver Region (RK 1168.9) The City of Surrey has a system of dikes along the shore of the river to protect the city during high river levels (City of Surrey 2013). The City of Surrey is currently extending its dike system to the west of the proposed pipeline corridor (Baron pers. comm.). The City of Coquitlam also has dikes on sections of the city along the Fraser River (City of Coquitlam 2013). PMV has jurisdiction over various terminals and facilities on the Fraser River, including the Fraser Surrey Docks, a marine terminal that handles containers, lumber, logs and wood pulp, steel and general cargo that is located within the boundaries of the City of Surrey (PMV 2013).

The City of Surrey, in partnership with the Fraser River Estuary Management Program (FREMP), develops policies, coordinates water use decisions and protects areas along the Fraser River. According to the Surrey OCP, there is a mandate to increase public access to rivers (such as access to the Fraser River in non-industrial land use areas) (City of Surrey 2013).

The proposed pipeline corridor ends at the Westridge Marine Terminal, which is located on Burrard Inlet in the Metro Vancouver Region. Burrard Inlet is a tidal saltwater inlet of 11,300 ha and is the location of Canada's busiest port, PMV (BIEAP 2011). It is also one of Canada's most productive coastal marine ecosystems and is an essential habitat for salmon and many other species of fish, birds and wildlife, as well as a destination for marine recreation and tourism.

Eight municipalities surround Burrard Inlet, including the City of Vancouver, the City of Burnaby, the City of Port Moody, the Villages of Belcarra and Anmore, the City of North Vancouver, the District of North Vancouver and the District of West Vancouver. Burrard Inlet is composed of several distinct sections, including the Outer Harbour, the Inner and Central Harbour, the Port Moody Arm and the Indian Arm. The Inner Harbour is for the most part heavily industrialized and is bounded by the First Narrows to the west and the Second Narrows to the east. The Second Narrows is crossed by a vehicle bridge and rail bridge. The Central Harbour continues east of the Second Narrows and contains marine terminals including the Westridge Marine Terminal. The Central Harbour also is the location of an oil refinery, a Rockfish Conservation Area, regional parks, and popular dive sites. Port Moody Arm was heavily industrialized in the past, and still contains some major marine terminals as well as mixed residential and urban development. Indian Arm is mostly surrounded by provincial and regional parks, although much of the land area has been extensively logged (BIEAP 2011).

PMV has jurisdiction over commercial port operations and management in the Lower Mainland, including Burrard Inlet. PMV is responsible for oversight of all marine traffic within Burrard Inlet, and operates harbour patrol vessels and services including emergency response, harbour monitoring and support services (PMV 2013). The port contains 28 major cargo terminals, 23 of which are in Burrard Inlet. Vancouver is the homeport for the Vancouver-Alaska cruise ship industry, with two cruise ship terminals in the Inner Harbour which provide berthing facilities for cruise ship companies (PMV 2013). Commercial vessel traffic in Burrard Inlet is comprised of vessels accessing the various marine terminals within Burrard Inlet, including:

- cargo ships (forest products, steel products, machinery, grains, coal, chemicals, potash and sulphur);
- oil tankers (petroleum products);
- cruise ships; and
- container ships (household goods) (PMV 2013).

According to the PMV Consolidated LUP, the proposed pipeline corridor crosses a water use area zoned for Log Storage & Moorage (approximately RK 1168.7), a water area zoned as Undetermined (approximately RK 1169.1) and a water area zoned as Recreation/Park (approximately RK 1169.1) (PMV 2010a).

5.7 Employment and Economy

This subsection describes local and regional economic activity, employment and labour force characteristics, and educational attainment in the Socio-Economic RSA. Income patterns are discussed in Section 5.3 Social and Cultural Well-Being. Potential Project-related effects and mitigation/enhancement measures pertaining to employment and economy are discussed in Section 7.2.7.

For further discussion on employment and economy, see the Socio-Economic Technical Report and the Worker Expenditures Along the Pipeline Corridor Technical Report in Volume 5D as well as the Conference Board of Canada's report entitled Expansion of the Trans Mountain Pipeline: Understanding the Economic Benefits for Canada and its Regions (Volume 2).

5.7.1 Economic Activity

This subsection provides an overview of key economic activity in the various socio-economic regions of the Socio-Economic RSA, including key business sectors and industries. This provides context for understanding the extent to which regional industries may be able to participate in opportunities related to the Project. Emphasis is placed on economic activities in the communities that are crossed directly by the proposed pipeline corridor. Refer to the Socio-Economic Technical Report of Volume 5D for a full discussion of economic activity in the Socio-Economic RSA.

5.7.1.1 Edmonton Region

The Edmonton Region's economic base is diverse and has expanded from a provincial government and regional commercial centre to include agriculture, biofuels, chemicals and petrochemicals, commercial/retail, residential, forestry and related industries, infrastructure, institutional, mining, oil and gas, oil sands, other industrial, pipelines, power, and tourism and recreation. The top three leading private employers are PCL Construction Group Inc., CN and Stantec Inc. (City of Edmonton 2011, Edmonton Economic Development Corporation 2013). The Edmonton Region is encompassed by the Capital Region Plan that aims to deliver improved land-use planning, inter-municipal transit, information services and affordable housing (Government of Alberta 2012b). In 2011, the most active industries in the City of Edmonton (by industrial classification) were: retail trade (employing approximately 11.1% of the labour force); health care and social assistance (10.5%); and construction (10.5%) (Statistics Canada 2013a).

The City of Spruce Grove has grown from a small agricultural service centre, to a more diversified regional commercial and industrial service centre. The city has a growing retail and commercial sector and an industry base that includes agriculture, food processing, oil field services and manufacturing, general manufacturing and fabrication, consulting engineering, construction services and transportation/logistics/warehousing (City of Spruce Grove 2010). In 2011, the most active industries in the City of Spruce Grove (by industrial classification) were: construction (employing approximately 14.7% of the labour force); health care and social assistance (10.5%); and retail trade (10.5%) (Statistics Canada 2013a). The city has identified several sectors as growth areas over the next 10 years including: transportation and logistics; warehousing and supply; food processing and distribution; environmental products, services and technologies; oilfield and industrial services and manufacturing; destination retail/hospitality; business and professional services; and event tourism (City of Spruce Grove 2013).

The Town of Stony Plain's economy is based around coal, cement, oil and gas, and agriculture. The Fording Coal Mine and Edmonton Genesee Power Plant are major contributors to the local economy. Light manufacturing and government services have also played a role in the town's economic growth. The town has two business parks zoned for commercial and light industrial use. Businesses located in the business parks include Maple Leaf Gold Inc., Petro Canada, Best Western Inn & Suites, Canada Safeway and Jen-Col Construction (Alberta Community Profiles 2013). In 2011, the most active industries in the Town of Stony Plain (by industrial classification) were: construction (employing approximately 13.7% of the labour force); retail trade (10.7%), and health care and social assistance (10.1%) (Statistics Canada 2013a).

The Village of Wabamun's economy has traditionally been based on coal, electric power generation, gravel, and strip mining. In recent years, the village has been moving toward residential and commercial growth and tourism (Alberta Community Profiles 2013).

For the Edmonton Region overall within in the Socio-Economic RSA, in 2011 the most active industries (by industrial classification) were: retail trade (employing approximately 11.1% of the labour force); health care and social assistance (10.5%); and construction (9.8%). Public administration was another key industry (employing 8.1% of the labour force), as well as professional, scientific and technical services (6.9%) and educational services (7.4%) (Statistics Canada 2013a).

5.7.1.2 Rural Alberta Region

The Rural Alberta Region's economy is diverse and is more resource-based than the Edmonton Region. Key sectors include forestry, coal, oil and gas, agriculture and tourism. Forestry and coal mining are in flux, but the oil and gas industry is a steady contributor to the economy within Yellowhead County (Lyons pers. comm.). The leading employers include Teck Coal, Hinton Pulp and Grande Yellowhead Regional Division (Town of Hinton 2013). For the Rural Alberta Region overall within in the Socio-Economic RSA, in 2011 the most active industries (by industrial classification) were: mining, quarrying, and oil and gas extraction (employing approximately 16.6% of the labour force); retail trade (11.2%); construction (8.5%); and accommodation and food services (7.5%) (Statistics Canada 2013a). The Town of Edson's economy is resource-based; resources available locally include coal, clay, sand/gravel, oil and natural gas and timber. Agriculture is also a key economic activity in the surrounding area. Key businesses/services in the town include: Luscar (mining), Weyerhaeuser (forestry), Sundance Forest Industries and construction services (Alberta Community Profiles 2013). In 2011, the most active industries in the Town of Edson (by industrial classification) were: retail trade (employing approximately 14% of the labour force); mining, quarrying, and oil and gas extraction (12.7%); accommodation and food services (11%); and construction (7.2%) (Statistics Canada 2013a).

The Town of Hinton is also aiming to further diversify its economy beyond resource-based industries and is hoping to expand its identity as a college/educational services community (Kreiner pers. comm.). The town is a service centre for other communities including the Town of Grande Cache, Municipality of Jasper, Yellowhead County and the Village of Valemount, BC (Town of Hinton 2013). In 2011, the most active industries in the Town of Hinton (by industrial classification) were: mining, quarrying, and oil and gas extraction (employing approximately 17.7% of the labour force); retail trade (13.2%); accommodation and food services (9.7%); and manufacturing (9.8%) (Statistics Canada 2013a).

5.7.1.3 Fraser-Fort George/Thompson-Nicola Region

The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. For the Fraser-Fort George/Thompson-Nicola Region overall within in the Socio-Economic RSA, in 2011 the most active industries (by industrial classification) were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013a).

The TNRD RGS aims to increase economic diversity while balancing human, economic and environmental actions (TNRD 2013). In the TNRD, the industrial sector is expected to grow, with a projected 4,000 jobs being created over 25 years. The most rapidly growing sector in the TNRD is anticipated to be health services, while the slowest growing sector is projected to be manufacturing and processing (TNRD 2013).

The RDFFG key economic sectors are forestry and wood products, agriculture, tourism, senior government services, and freelance professional services and active retirees (RDFFG 2010). Forestry has traditionally been the main economic driver, but recent initiatives have diversified the economy and facilitated growth in sectors such as education, tourism and clean energy (Northern Development Initiatives Trust [NDIT] 2013).

The Village of Valemount's economy is based on logging and a growing tourism industry. Valemount is on the main transportation route between Edmonton and Vancouver and close to Jasper National Park and Mount Robson Provincial Park. During the summer season, more than 1.2 million travellers use Highway 5, and more than 120,000 visitors spend the night in Valemount's tourist lodgings annually (NDIT 2013, RDFFG 2010). In 2011, the most active industries in the Village of Valemount (by industrial classification) were: accommodation and food services (employing approximately 19.4% of the labour force); transportation and warehousing (17.2%); retail trade (7.5%); and health care and social assistance (7.5%) (Statistics Canada 2013a).

The District of Clearwater's economy is traditionally based on forestry, but has diversified to include a range of other service industries. The district is aiming to expand tourism opportunities, as well as light industry and commercial ventures (District of Clearwater 2013b, NDIT 2013, RDFFG 2010). Key employers in the district include Borrow Enterprises (construction), Canadian Forest Products, the District of Clearwater, and Interior Health Authority (District of Clearwater 2013b). In 2011, the most active

industries in the District of Clearwater (by industrial classification) were: accommodation and food services (employing approximately 14.7% of the labour force); construction (12.7%); health care and social assistance (12.7%); retail trade (9.5%); and agriculture, forestry, fishing and hunting (9.1%) (Statistics Canada 2013a).

The City of Kamloops has a diverse economy traditionally based on forestry, mining and agriculture. Recently, growth has occurred in other sectors including technology, bioenergy, tourism and manufacturing (Grover pers. comm., Venture Kamloops 2012). The leading employers include Interior Health Authority, School District No. 73 and Thompson Rivers University, followed by Highland Valley Copper Mine (Venture Kamloops 2012). In 2011, the most active industries in the City of Kamloops (by industrial classification) were: retail trade (employing approximately 13.4% of the labour force); health care and social assistance (13.1%); accommodation and food services (8.7%); and educational services (7.6%) (Statistics Canada 2013a).

The City of Merritt's economy is based on forestry (timber storage, sawmills and other wood manufacturers), agriculture, transportation and tourism. Health, education, government services, research, arts and culture are growing contributors to the local economy. The city aims to diversify the economy further by promoting tourism and entertainment events. Tourism in the City of Merritt is boosted by highway traffic volumes during the summer (City of Merritt 2011a). In 2011, the most active industries in the City of Merritt (by industrial classification) were: retail trade (employing approximately 15.3% of the labour force); health care and social assistance (10.5%); educational services (11.1%); and manufacturing (10.4%) (Statistics Canada 2013a).

5.7.1.4 Fraser Valley Region

The economy of the Fraser Valley Region is based primarily on agriculture, manufacturing and construction. Historically, the predominant sectors have been agriculture and resource development, but the economy is diversifying based on growth in the manufacturing, services, aerospace and technology sectors (FVRD 2010). The FVRD generates the largest annual farm receipts of any Regional District in BC and is one of the most intensively farmed areas in Canada. The ALR is a provincial zone where agriculture is recognized as the priority use and where farming is encouraged and non-agricultural uses are controlled. The ALR has historically contained urban growth. Nonetheless, the region is growing to include a greater variety of commercial and industrial activity. The FVRD's agricultural production has continued to grow in terms of livestock, land under cultivation and agriculture taking place in greenhouses (FVRD 2004). While the economies of the City of Abbotsford and the City of Chilliwack have diversified and grown, the economies in many smaller communities remain resource-dependent (FVRD 2010). For the Fraser Valley Region overall within in the Socio-Economic RSA, in 2011 the most active industries (by industrial classification) were: retail trade (employing approximately 11.6% of the labour force); health care and social assistance (10%); construction (9.9%); and manufacturing (8.5%) (Statistics Canada 2013a).

The District of Hope's economy was historically based around forestry, transportation and mining. The economy has diversified to include tourism and transportation-related industries, spurred by its location on Highways 1, 3 and 5 (Advantage Hope 2011, Hope Chamber of Commerce 2013). Commercial manufacturing and retail services are also important economic contributors. In 2011, the most active industries in the District of Hope (by industrial classification) were: health care and social assistance (employing approximately 14.7% of the labour force); retail trade (13.5%); and accommodation and food services (10.8%); and construction (9.7%) (Statistics Canada 2013a).

The City of Chilliwack has a diverse and growing economy based around agriculture, manufacturing, retail and wholesale trade and professional services. Retail, wholesale trade, insurance, finance, real estate, public administration, health and education are the largest of these sectors and account for approximately 50% of the city's GDP. The goods producing industries and manufacturing account for 13%, construction at 8% and agriculture and forestry at 5% of Chilliwack's GDP. Agriculture remains a key economic driver of the city's economy (Chilliwack Economic Partners Corporation 2010). In 2011, the most active industries in the City of Chilliwack (by industrial classification) were: retail trade (employing approximately 12.8% of the labour force); health care and social assistance (11.5%); and construction (9.2%) (Statistics Canada 2013a).

The City of Abbotsford is a growing business centre due to its location and proximity to key transportation infrastructure including the Abbotsford International Airport, US border crossings, rail lines and the Trans-Canada Highway. Abbotsford's economy is based around agriculture, regional retail and services, health, education, transportation, accommodation and manufacturing (City of Abbotsford 2009). In 2011, the most active industries in the City of Abbotsford (by industrial classification) were: retail trade (employing approximately 11.8% of the labour force); construction (9.5%); health care and social assistance (9.3%); and manufacturing (9%) (Statistics Canada 2013a).

5.7.1.5 Metro Vancouver Region

The Metro Vancouver Region's economic base is diverse and includes trade and commerce, manufacturing, goods distribution, professional services, tourism, education and agriculture. Most of the employment is in sales and service, business, finance and administration, and trades and related occupations (Metro Vancouver 2010a, PMV 2009, Vancouver Economic Commission 2012). For the Metro Vancouver Region overall within in the Socio-Economic RSA, in 2011 the most active industries (by industrial classification) were: retail trade (employing approximately 10.4% of the labour force); health care and social assistance (9.6%); accommodation and food services (7.8%); and professional, scientific and technical services (9.2%) (Statistics Canada 2013a).

PMV is an economic generator in the Metro Vancouver Region due to the amount of employment that the port generates as well as essential infrastructure linking Canada's domestic market to markets around the world (Metro Vancouver 2010a, PMV 2009). PMV is the busiest port in Canada and the fourth largest tonnage port in North America. The port facilitates trade with more than 160 world economies, with 95% of port activity focused on Canadian import/export markets. In 2011, the port moved a record 122 million tonnes of cargo (a 3.4% increase over 2010), and is planning a series of terminal expansion projects to increase the throughput capacity in order to meet forecasted demand through 2030. On-going operations at PMV make considerable contributions to regional employment and the provincial economy, as well as to jobs, wages, and GDP across Canada. It is estimated that PMV's operations support 38,200 direct jobs in BC, of which 91.8% are in the Metro Vancouver Region. The direct economic impact of this employment on the BC economy has been estimated at $3.5 billion in GDP, $8.5 billion in economic output, and $2.3 billion in wages. It is estimated PMV operations support an additional 7,000 direct jobs across Canada (InterVISTAS Consulting 2013).

Tourism is a key industry for the region. The provincial government is aspiring to double tourism revenues by 2015. Vancouver and surrounding areas offer a wide variety of tourism opportunities and services for business meetings and conventions. The Vancouver Economic Commission indicates that visitor spending is approximately $600 million annually, and that between 2008 and 2015 these numbers are anticipated to more than double (Vancouver Economic Commission 2012). In 2011, tourism generated a direct contribution to the BC economy of approximately $6.5 billion in terms of GDP, and in 2010, the tourism industry employed about 127,000 people in BC (BC Ministry of Jobs, Tourism and Skills Training 2013b,c).

Generally, the economy of the Metro Vancouver Region is expected to continue to grow. The RGS Plan aims to guide the region's development while supporting and improving transportation, infrastructure and community services. The strategy aims to balance space for industry and commerce throughout the region while protecting environmental assets (Metro Vancouver 2010a).

5.7.2 Labour Force and Employment

This subsection provides an overview of labour force and employment characteristics in the various socio-economic regions, including labour force size, unemployment rates and participation rates and identification of future labour force trends. The labour force includes the adult population (aged 15 and older) that is working, looking for work or willing to work, including both those employed or unemployed. It does not include adults that have opted out of seeking wage employment for whatever reason (*e.g.*, retirement, engaging in traditional livelihoods). The participation rate represents the proportion of the adult population that is in the labour force. The unemployment rate represents the proportion of the labour force that is not employed. This information provides context for understanding the extent to which regional workers may be available to participate in Project-related employment opportunities. Emphasis is placed on labour force characteristics of the communities that are crossed directly by the proposed

pipeline corridor. Refer to the Socio-Economic Technical Report of Volume 5D for a full discussion of economic activity in the Socio-Economic RSA.

Generally, both Alberta and BC are in a period of economic growth resulting in growing employment and a tightening in labour supply. Alberta's economy is projected to grow 2.9% in 2013. In Alberta, high in-migration has taken pressure off of the labour market and has prevented the unemployment rate from declining. As a result of Alberta's strong labour market, population growth is anticipated to stay around 2% per year between 2013 and 2016, drawing individuals from other provinces and countries (Alberta Treasury Board and Finance 2012).

In 2012, Alberta had the lowest unemployment rate in the country at 4.6%, compared to 7.2% for Canada and 6.7% for BC. While the natural rate of unemployment in a region can vary based on a number of factors, the Alberta government notes that a 5% unemployment rate often indicates a balanced labour pool (Alberta Enterprise and Advanced Education 2009), with higher rates of unemployment suggesting a surplus labour market. Labour shortages tend to occur when the unemployment rate drops to 3% or less. In 2012, Alberta's employment rate of 70% continued to be the highest among all provinces. The Canadian employment rate was 61.8%. Alberta's rate of 70% was 0.3 percentage points higher than the year before and 1.9 percentage points higher than in 2010. The number of unemployed people in Alberta declined for the third consecutive year in 2012: it fell by 1,400 in 2010, 19,700 in 2011, and by 17,200 in 2012. In 2012, Alberta saw increases in the numbers of interprovincial in-migrants and temporary foreign workers and landed immigrants compared to 2011 (Government of Alberta 2012c). From 2010 to 2021, Alberta's labour demand is projected to grow by an annual average rate of 2.4%, while occupational supply is anticipated to increase at a rate of 1.9% annually. Alberta could experience a labour shortage of approximately 114,000 workers by 2021 (Alberta Enterprise and Advanced Education 2013a).

The Construction Sector Council anticipates that the construction industry in Alberta will continue to expand and employment will rise. Recruiting challenges have been reported in both the residential and non-residential sectors. The oil sands are anticipated to lead resource development in Alberta between 2012 and 2021. The Construction Sector Council anticipates a plateau in employment growth from 2014 to 2016, as a result of declining housing activity and the completion of certain major infrastructure projects. The momentum of resource development will increase, resulting in a period of expansion from 2016 to 2021. The Construction Sector Council anticipates that the construction labour force will expand by 14,000 workers from 2013 to 2021. Taking into consideration replacement demands and first-time new entrants, there is anticipated to be a gap of 21,000 workers which will need to be sourced outside of the construction industry (Construction Sector Council 2013).

BC is also anticipated to face labour constraints over the next decade. The BC Labour Market Scenario Model indicates that 1.03 million job openings are expected in BC between 2010 and 2020. The BC Ministry of Finance forecasts employment in BC to expand by 1.4% in 2013 (33,000 jobs). Annual employment growth is projected to increase 1.4% in the coming decade although approximately 78% of job openings are expected to require some post-secondary or a higher level of education and training. The three occupational sectors expected to incur the most job openings are: sales and service; business, finance and administration; and trades, transport and equipment operators and related occupations (BC Ministry of Jobs, Tourism and Skills Training 2013a). The BC Labour Market Outlook 2010-2020 indicates that by 2016 the number of workers need in BC is expected to exceed the number of workers available province wide. The trend toward a tightening labour market is more apparent in some regions; labour shortfalls are anticipated earliest in BC's Northeast and Cariboo regions (the Project traverses a portion of BC's Cariboo region). It is estimated that there will be a shortage of approximately 61,500 workers across BC by 2020 (WorkBC 2013a). The Business Council of BC's also anticipates labour shortages to occur (go2 Tourism HR Society 2012).

The Construction Sector Council anticipates that job gains will continue in most sectors of the construction industry in BC to 2016. It is anticipated that by 2016, most of the skilled workforce will be absorbed, coinciding with the timing of planned resource development projects. Labour requirement estimates rely on these proposed projects. It is anticipated that demand for labour will be felt more in northern BC where there is a concentration of utility and mining projects. Strong demands for specialized labour in trades and construction occupations will likely occur. The Construction Sector Council anticipates that the construction labour force will expand by 22,500 workers from 2013 to 2021. Taking into consideration replacement demands and first-time new entrants, there is anticipated to be a gap of

30,500 workers which will need to be sourced outside the construction industry (Construction Sector Council 2013).

The Petroleum Human Resources Council of Canada (PHRCC) indicates that in Canada, the petroleum industry is at risk of not meeting 36% of its net hiring requirements between 2012 and 2015. This is primarily due to a shortage of potential labour supply and amounts to approximately 3,400 jobs. If employee turnover occurs, particularly the loss of workers to competing industries, PHRCC anticipates that the labour shortage will be substantially higher. Moreover, there are disconnects between the skills and experience of the available labour supply and those required to replace retiring workers, which can cause a skill shortage and may impact worker productivity (PHRCC 2012).

As of 2011, there were almost 2.2 million workers in the Socio-Economic RSA labour force, with notable distinctions amongst socio-economic regions. In areas of new pipeline construction, the labour force ranged from approximately 17,000 workers in the Rural Alberta Region to a high of almost 1.3 million workers in the Metro Vancouver Region. Table 5.7-1 provides an overview of select labour force characteristics in the Socio-Economic RSA by socio-economic region. The Socio-Economic Technical Report of Volume 5D provides further detail on select labour force characteristics by socio-economic region and by each community, where data were available.

TABLE 5.7-1

SELECT LABOUR FORCE CHARACTERISTICS IN THE SOCIO-ECONOMIC RSA (2011)

Location	Labour Force Size[3]	Participation Rate (%)	Unemployment Rate (%)	Construction Industry (%)
EDMONTON REGION				
Sub-Total Municipal Areas	591,220	73.0	5.8	9.4
Sub-Total Rural Areas	104,125	74.7	4.2	12.5
Sub-Total Indian Reserves	1,265	49.7	23.3	7.9
Edmonton Region Total	696,610	73.2	5.6	9.8
RURAL ALBERTA REGION				
Sub-Total Municipal Areas	10,785	75.2	5.7	6.7
Sub-Total Rural Areas	6,095	72.3	6.3	11.5
Sub-Total Indian Reserves	105	23.1	N/A[1]	10.0
Rural Alberta Region Total	16,985	73.2	5.9	8.5
JASPER NATIONAL PARK REGION				
Sub-Total Municipal Areas	2,490	84.3	1.6	4.6
Sub-Total Rural Areas	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Sub-Total Indian Reserves[2]	-	-	-	-
Jasper National Park Region Total	2,490	84.3	1.6	4.6
FRASER-FORT GEORGE/THOMPSON-NICOLA REGION				
Sub-Total Municipal Areas	55,140	64.1	8.8	7.2
Sub-Total Rural Areas	5,470	62.1	11.4	12.0
Sub-Total Indian Reserves	2,565	59.4	17.7	9.3
Fraser-Fort George/Thompson-Nicola Region Total	63,175	63.7	9.4	7.7
FRASER VALLEY REGION				
Sub-Total Municipal Areas	134,210	65.1	7.6	9.9
Sub-Total Rural Areas	2,395	63.7	7.7	11.5
Sub-Total Indian Reserves	1,880	47.8	37.2	6.1
Fraser Valley Region Total	138,485	64.7	8.0	9.9
METRO VANCOUVER REGION				
Sub-Total Municipal Areas	1,262,475	66.2	7.1	6.5
Sub-Total Rural Areas	5,360	52.4	9.4	1.7
Sub-Total Indian Reserves	3,595	57.2	11.1	7.0
Metro Vancouver Region Total	1,271,430	66.1	7.1	6.4
SOCIO-ECONOMIC RSA TOTAL	2,189,175	68.1	6.8	7.8

TABLE 5.7-1 Cont'd

Source: Statistics Canada 2013a

Notes: 1 N/A – not available; data for this area have been suppressed for data quality or confidentiality reasons.

2 No IRs are located in the Jasper National Park Region.

3 Labour force estimates are calculated based on data provided by the National Household Survey (NHS). Underlying population counts may differ from those provided by the Census of Canada; however, labour force metrics based on the NHS are the best available at the community/municipality level.

As of 2011, average unemployment rates for the socio-economic regions were lower in Alberta than in BC. Unemployment rates ranged from a low of 5.6% in the Edmonton Region, to a high of 9.3% in the Fraser-Fort George/Thompson-Nicola Region. While more recent data specific to Socio-Economic RSA communities are not available, recent labour force information for the provincial economic and development regions in which the socio-economic regions are located indicate further employment growth and tightening of the labour market since 2011. In June 2013, the unemployment rates in relevant Alberta economic regions was between 4% and 4.6%; unemployment rates in the relevant BC economic regions were between 5% and 6.6% (Alberta Enterprise and Advanced Education 2013b, WorkBC 2013b,c,d,e).

Aboriginal people comprise a significant percentage of the labour force in Western Canada; however, labour market outcomes tend to be lower for Aboriginal people. In 2006, Aboriginal people had a higher unemployment rate, lower employment rate, lower incomes and a lower participation rate than the Canadian average (Sharpe and Arsenault 2010). The Aboriginal population could play a key role in mitigating the looming long-term labour shortages caused by Canada's aging population and low birth rate. This is true not only because of their relatively young population and higher population growth rate, but also because their participation and employment rates currently lag far behind the Canadian average. Among men, labour force participation for Aboriginal and non-Aboriginal people appeared to be stabilizing. In 2005, employment rose and unemployment declined for both Aboriginal men and women. In Alberta in 2005, the highest rate of labour force participation (70%) and employment (64.1%) was amongst Aboriginal people. Aboriginal people in Alberta also had the lowest unemployment rate (8.5%) among the Aboriginal people in western provinces. In coming years, the Aboriginal young adult population (aged 20 to 29) is projected to experience a faster growth rate than that of the same age group for the overall population. Aboriginal youth offer an enormous potential for increasing Aboriginal people's participation in the labour market (Luffman and Sussman 2007). If trends continue, it is anticipated that the Aboriginal population will account for 19.9% of labour force growth and 22.1% of employment growth between 2006 and 2026 across Canada (Sharpe and Arsenault 2010).

5.7.2.1 Edmonton Region

For the Edmonton Region overall within the Socio-Economic RSA, in 2011 there was a labour force of approximately 696,000 workers, with a participation rate of approximately 73.2% and an unemployment rate 5.6%. Approximately 9.8% of the regional labour force worked in the construction industry (Statistics Canada 2013a).

The City of Edmonton has recently experienced job growth in the manufacturing sector, which has gained more than 14,000 full-time jobs in 2012. Employment growth is projected to be strongest in the manufacturing and primary industry sectors along with wholesale trade, commercial and non-commercial services, and construction. It is estimated that employment will continue to grow by 2.3% annually for a total of 135,000 additional jobs by 2016. Future employment growth projections from 2016 to 2041 could slow to 1% to 1.2% per year, resulting in an additional 200,000 jobs. Employment throughout the Edmonton Region is expected to grow to 863,000 jobs by 2041 (Government of Alberta 2007).

The City of Edmonton's unemployment rate improved from 4.7% in March 2012 to 4.2% in March 2013. The unemployment rate also improved between February and March 2013 from 4.4% to 4.2% (City of Edmonton 2013a). Residents of Edmonton also experience a higher per capita average annual disposable income than the national average and higher than Canada's largest centres, including Toronto and Vancouver (Edmonton Economic Development Corporation 2013).

As of 2011, the Town of Stony Plain had a labour force size of approximately 8,255 with an unemployment rate of 4.9% (Statistics Canada 2013a). Most residents of Stony Plain commute to

Edmonton, with only approximately 40% staying in the town to work. Many individuals also travel west to work at coal and power plants, as well as in Fort McMurray (Frostad pers. comm.).

Labour force participation rates tend to be lower in IRs within the Edmonton Region within the Socio-Economic RSA. For example, based on available data in 2011 the average labour force participation rate for municipal areas and rural areas within the region was 73% and 74.7% respectively, while the participation rate for IRs was 49.7% (Statistics Canada 2013a).

5.7.2.2 Rural Alberta Region

For the Rural Alberta Region overall within in the Socio-Economic RSA, in 2011 there was a labour force of approximately 17,000 workers, with a participation rate of approximately 73.2% and an unemployment rate of 5.9%. Approximately 8.5% of the regional labour force worked in the construction industry (Statistics Canada 2013a).

The Rural Alberta and Jasper National Park regions are encompassed by the Government of Alberta's Banff-Jasper-Rocky Mountain House economic region. In 2010, the labour force in the Banff-Jasper-Rocky Mountain House area declined by 1,000 participants. Throughout the course of 2011, the unemployment rate fluctuated between 2.7% and 5.9%. In March 2013, unemployment rates decreased slightly from previous months to 4.3% (Government of Alberta 2013a).

As of 2011, the Town of Edson had a labour force size of approximately 4,960 with an unemployment rate of 5.1%. The Town of Hinton had a labour force size of approximately 5,825 with an unemployment rate of 6.7% (Statistics Canada 2013a). The Town of Edson identified that labour force capacity is tight, however, there are more available workers now than before the 2007/2008 boom (Lemieux, Lyons pers. comm.). It was noted that it is challenging to find service workers and skilled workers in the town (Lemieux pers. comm.).

Labour force participation rates tend to be lower in IRs within the Rural Alberta Region of the Socio-Economic RSA. For example, based on available data in 2011 the average labour force participation rate for municipal areas and rural areas within the region was 74.2% and 72.3% respectively, while the participation rate for IRs was 23.1% (Statistics Canada 2013a). Labour force data are available for only one reserve in the Socio-Economic RSA within the Rural Alberta Region (Indian Reserve O'Chiese 203).

5.7.2.3 Fraser-Fort George/Thompson-Nicola Region

In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies by community. While the overall regional labour force is over 63,000, it ranges from a high of approximately 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%) The rural areas within the Fraser-Fort George/Thompson-Nicola Region have a collective labour force of approximately 5,500 with an unemployment rate of 11.4% (Statistics Canada 2013a). Approximately 7.7% of the regional labour force was experienced in the construction sector (Table 5.7-1).

The Village of Valemount and the RDFFG are included in the BC Cariboo Development Region. The Cariboo Development Region (including areas that extend beyond the Socio-Economic RSA) expanded its labour market by 4,800 jobs in 2010 and 900 jobs in 2011. Goods-producing industries job losses were offset by employment growth in the service-producing sectors (Institute of Chartered Accountants of BC 2012). In the Village of Valemount, there is limited available local available labour (McCracken pers. comm.).

The TNRD, District of Clearwater, City of Kamloops and City of Merritt are located in BC's Thompson-Okanagan Development Region. In 2011, the Thompson-Okanagan Development Region's economy lost 1% of jobs across all sectors, primarily in the goods sector. Growth in the service sector created 1,700 jobs. The annual average unemployment rate was 7.9% in 2011, below the 2009 high of 8.8% (Institute of Chartered Accountants of BC 2012). The industrial sector throughout the TNRD is expected to grow and create a projected 4,000 jobs over 25 years. The most rapidly growing sector is health, while the slowest growing sector is projected to be manufacturing and processing (TNRD 2013). The labour force is expected to grow by an average of 0.7% per year, more slowly than the overall

population increase of 0.8% per year. Approximately 17,000 new jobs across all sectors are forecast to be created over the next 25 years (TNRD 2013).

While the District of Barriere is not crossed by the proposed pipeline corridor, it is centrally located in the Fraser-Fort George/Thompson-Nicola Region and, therefore, is considered a source of regional labour. During consultation, it was noted that residents of the District of Barriere may commute to areas such as Vavenby and Kamloops for work (Humphreys pers. comm.). Labour force data are not reported for the District of Barriere.

In 2011, the City of Merritt had a labour force of about 3,300 with a participation rate of 57.8% and an unemployment rate of 11.5%. During consultation, it was noted that there is high unemployment in the Merritt area, particularly in First Nation communities (Perog pers. comm.). In the City of Merritt, the local labour market was characterized as young, with numerous contractors and road builders (Umpherson pers. comm.).

There are numerous First Nations reserves in the Fraser-Fort George/Thompson-Nicola Region of the Socio-Economic RSA; however, labour force data for many are not available. The largest First Nation reserve in the region is Kamloops No. 1, which in 2011 had a labour force of about 1,300, a participation rate of 54.8%, and an unemployment rate of 11.3%. Labour force participation rates tend to be lower in reserves within the region. For example, in 2011 the average labour force participation rate for municipal areas within the region was 64.1%, while the participation rate for First Nations reserves was 59.2% (Statistics Canada 2013a).

5.7.2.4 Fraser Valley Region

Of the total labour force in the Fraser Valley Region (approximately 138,500 in 2011), the labour force in municipal areas ranged from a low of approximately 580 in the Village of Harrison Hot Springs to a high of approximately 71,000 in the City of Abbotsford (Statistics Canada 2013a). Jobs in the Fraser Valley Region are concentrated within the urban areas of Abbotsford, Chilliwack and Mission. Smaller communities surrounding these centres provide jobs primarily in the agricultural areas. Service industries in the region are expected to remain the dominant growth sector (*e.g.*, jobs related to health care, retail trade, accommodation and food services). Health care-related jobs are one of the largest growing sectors as the population continues to age (FVRD 2010). In 2011, approximately 9.9% of the regional labour force was experienced in the construction sector (Statistics Canada 2013a).

In 2011, the District of Hope had a labour force of approximately 2,600 workers, with a participation rate of 51.9% and an unemployment rate of 9.8%. The largest private employers in the District of Hope in 2010 were Nestlé Waters bottling facility, Cooper's Foods and Emil Anderson Maintenance (Advantage Hope 2011). Also in 2011, the City of Chilliwack's labour force was estimated at about 39,000 people, representing a participation rate of 63.1% and with an unemployment rate of 6.3% (Statistics Canada 2013a).

The City of Abbotsford indicated it is familiar with temporary workers, particularly in relation to the seasonal farm workers in the agricultural sector (Teichroeb pers. comm.). The District of Hope is also experienced with temporary workers in relation to seasonal work associated with forestry, forestry fire-fighting, and the rail industry (McBride pers. comm.).

There are numerous First Nations reserves in the Fraser Valley Region of the Socio-Economic RSA; however, labour force data for many are not available due to data suppression for small communities. Based on available data, labour force participation rates tend to be lower in reserves within the region. For example, in 2011 the average labour force participation rate for municipal areas and rural areas within the region was 65.1% and 63.7% respectively, while the participation rate for First Nations reserves was 47.8% (Statistics Canada 2013a).

5.7.2.5 Metro Vancouver Region

In 2011, the total labour force in the Metro Vancouver Region was almost 1.3 million workers, representing a participation rate of 66.1%. The workforce ranged from a high of approximately 349,000 workers in the City of Vancouver to a low of approximately 360 workers in the Village of Belcarra. The regional unemployment rate was 7.2% (Statistics Canada 2013a). Approximately 6.4% of the regional

labour force worked in the construction industry. The Metro Vancouver and Fraser Valley regions are located within BC's Mainland/Southwest Development Region. Between 2010 and 2011, 30,700 new jobs were created in the Mainland/Southwest Development Region. 2011 marked the second year of overall positive employment growth since the 2009 recession. Employment growth was observed in the goods producing sector rather than in the service sector (Institute of Chartered Accountants of BC 2012).

Within the Metro Vancouver Region, the labour force on First Nations reserves in 2011 was about 3,500 workers representing a participation rate of 57.2%; the unemployment rate for First Nations reserves within the Metro Vancouver Region was 10.6%.

5.7.3 Educational Attainment

This subsection discusses educational attainment of the Socio-Economic RSA labour force. Labour force educational attainment and post-secondary (or higher) education are directly related to labour productivity and the ability to participate in emerging employment opportunities. Refer to the Socio-Economic Technical Report of Volume 5D for a full discussion of economic activity in the Socio-Economic RSA.

Across the Socio-Economic RSA in 2011, 27.2% of the adult population (aged 15 or older) had a high school certificate or degree as their highest level educational attainment. Approximately 56.6% of the adult population had a post-secondary certificate as their highest level of educational attainment. Approximately 9.5% of the population had an apprenticeship or trades certificate or diploma as the highest level of educational attainment (Table 5.7-2).

There are notable differences between socio-economic regions. In 2011, the Rural Alberta Region had the highest proportion of the adult population with an apprenticeship or trades certificate or diploma (16.1%) as their highest level of educational attainment. The Metro Vancouver Region had the lowest proportion of the adult population with an apprenticeship or trades certificate or diploma (8.1%).

The population on IRs tended to show lower levels of educational attainment within their socio-economic regions, particularly in Alberta. In the Rural Alberta Region, 42.9% of the adult population had a post-secondary certificate, diploma or degree as their highest level of education attainment, while only 6.6% of the population on IRs had a similar level of educational attainment. The on-reserve population in BC regions are more comparable to off-reserve population in terms of educational attainment. In the Metro Vancouver Region, 58.6% of the total adult population had a post-secondary certificate, diploma or degree as their highest level of education attainment, and 58.7% of the adult population on IRs also had completed a similar level of educational attainment.

TABLE 5.7-2

**LABOUR FORCE EDUCATIONAL ATTAINMENT
IN THE SOCIO-ECONOMIC RSA (HIGHEST LEVEL ACHIEVED) (2011)**

Location	No Certificate, Diploma or Degree (%)	High School Certificate or Degree (%)	Post-Secondary Certificate, Diploma or Degree (%)	Apprenticeship or Trades Certificate or Diploma (%)[3]	College, CEGEP or Other Non-University Certificate or Diploma (%)[3]	University Certificate Below the Bachelor Level (%)[3]	University Certificate, Diploma or Degree at Bachelor Level or Above(%)[3]	Bachelor's Degree (%)[4]	University Certificate, Diploma or Degree Above Bachelor Level (%)[4]
EDMONTON REGION									
Sub-Total Municipal Areas	17.5	26.5	55.9	10.3	18.3	4.7	22.6	15.2	7.5
Sub-Total Rural Areas	17.5	28.0	54.4	15.1	19.6	3.6	16.0	11.8	4.1
Sub-Total Indian Reserves	53.8	17.3	29.1	10.4	13.9	2.4	2.0	2.0	0.0
Edmonton Region Total	17.6	26.7	55.7	11.0	18.5	4.6	21.6	14.6	7.0
RURAL ALBERTA REGION									
Sub-Total Municipal Areas	26.4	29.0	44.5	15.2	18.1	2.2	9.0	6.9	2.1
Sub-Total Rural Areas	31.6	26.2	42.1	18.3	14.4	3.1	6.3	4.8	1.5
Sub-Total Indian Reserves	90.1	3.3	6.6	3.3	2.2	0.0	2.2	0.0	0.0
Rural Alberta Region Total	29.5	27.5	42.9	16.1	16.5	2.5	7.9	6.0	1.9

TABLE 5.7-2 Cont'd

Location	No Certificate, Diploma or Degree (%)	High School Certificate or Degree (%)	Post-Secondary Certificate, Diploma or Degree (%)	Apprenticeship or Trades Certificate or Diploma (%)[3]	College, CEGEP or Other Non-University Certificate or Diploma (%)[3]	University Certificate Below the Bachelor Level (%)[3]	University Certificate, Diploma or Degree at Bachelor Level or Above(%)[3]	Bachelor's Degree (%)[4]	University Certificate, Diploma or Degree Above Bachelor Level (%)[4]
JASPER NATIONAL PARK REGION									
Sub-Total Municipal Areas	12.7	32.7	54.5	12.2	19.8	4.2	18.3	13.5	4.7
Sub-Total Rural Areas	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Sub-Total Indian Reserves[2]	-	-	-	-	-	-	-	-	-
Jasper National Park Region Total	12.7	32.7	54.5	12.2	19.8	4.2	18.3	13.5	4.7
FRASER-FORT GEORGE/THOMPSON-NICOLA REGION									
Sub-Total Municipal Areas	19.0	30.1	50.9	13.7	16.3	5.8	15.1	10.2	4.9
Sub-Total Rural Areas	20.7	35.0	44.3	13.6	15.8	4.9	10.1	6.7	3.3
Sub-Total Indian Reserves	25	29.5	45.4	13.9	16.3	5.2	9	6.4	2.1
Fraser-Fort George/Thompson-Nicola Region Total	19.4	30.5	50.1	13.7	16.3	5.7	14.4	9.7	4.7
FRASER VALLEY REGION									
Sub-Total Municipal Areas	21.3	31.3	47.4	12.5	16.4	5.9	12.6	7.5	5.1
Sub-Total Rural Areas	19.3	29.3	51.6	16.0	16.4	7.8	11.4	7.4	4.3
Sub-Total Indian Reserves	34.0	25.7	39.9	14.8	14.3	5.4	4.1	2.1	1.1
Fraser Valley Region Total	21.6	31.1	47.3	12.6	16.4	5.9	12.4	7.4	5.0
METRO VANCOUVER REGION									
Sub-Total Municipal Areas	14.6	26.8	58.6	8.1	16.3	6.6	27.5	17.6	9.9
Sub-Total Rural Areas	7.4	20.1	72.5	3.0	5.6	4.5	59.4	23.3	36.1
Sub-Total Indian Reserves	18.5	23.8	57.7	11.9	17.8	5	23.1	13.9	8.8
Metro Vancouver Region Total	14.6	26.8	58.6	8.1	16.3	6.6	27.7	17.6	10.1
SOCIO-ECONOMIC RSA TOTAL	16.2%	27.2%	56.6%	9.5%	16.9%	5.9%	24.3%	15.7%	8.6%

Source: Statistics Canada 2013a

Notes: Educational attainment estimates are calculated based on labour force data provided by the NHS. Underlying population counts may differ from those provided by the Census of Canada, however, educational attainment metrics based on the NHS are the best available at the community/municipality level. Percentages represent portion of labour force that has achieved that level of attainment. Percent totals do not sum to 100%, as certain sub-categories are also presented as a percentage of the total labour force opposed to a percentage of the category to which they belong.

1 N/A – not available; data for this area have been suppressed for data quality or confidentiality reasons.

2 No IRs are located in the Jasper National Park Region.

3 These educational attainment categories are sub-categories under "Post-Secondary Certificate, Diploma or Degree".

4 These educational attainment categories are sub-categories under "University Certificate, Diploma or Degree at Bachelor Level or Above".

5.8 Community Health

Health is largely determined by where we live, the state of our environment, our income and education levels, our jobs, and our relationships with friends, family and the larger community. These critical factors are often called *health determinants* (or *determinants of health*) because of their roles in shaping health in individuals and communities. Some health determinants are under the direct control of individuals: for example, the choice to smoke, to eat healthy foods, or to use seatbelts. Other health determinants are more closely tied to the physical environment (air and water quality, subsistence resources), activities under the control of governments (public utilities, land use, access to alcohol and tobacco), working conditions (jobs, income), or the social environment (social, emotional and religious supports).

These health determinants ultimately give rise to biomedical health outcomes: diseases such as hypertension or gastrointestinal illness; mental health states such as depression or anxiety; and injuries

or traumas, such as broken legs or concussions. They also give rise to other important health outcome indicators such as death rates, healthy births and overall well-being.

This subsection describes a number of health determinants and biomedical health outcomes that may be relevant to the population in the Socio-Economic RSA in the context of the Project.

Information on the selection of communities that were included in the Socio-Economic RSA and the way in which these are grouped into six regions can be found in Section 5.0 of this volume as well as in the Community Health Technical Report of Volume 5D. A description is also provided about the overlap between Socio-Economic RSA regions and the boundaries of Health Zones in Alberta and Health Service Delivery Areas (HSDAs) in BC. Potential Project-related effects and mitigation pertaining to community health are discussed in Section 7.2.8.

5.8.1 General Health

This subsection on general health presents measures that are used to describe population health on a macro-level. Self-rated health, life expectancy and infant mortality are common measures that are used to compare the health of one population group to others. Statistics are presented at the level of the Health Zone in Alberta and HSDA in BC as well as provincial averages to facilitate comparisons between the regions. The following categories of measures are summarized in Table 5.8-1.

Overall well-being: Self-rated health is one of the strongest and most consistent predictors of subsequent illness and premature death (Idler and Benyamini 1997). As shown in Table 5.8-1, a similar proportion of the population in Alberta and BC rates their health as “very good” or “excellent”: 61.7% of the population in Alberta and 59.6% in BC. At the level of the health authority, a wider variance is seen. In particular, the North Health Zone in Alberta and the Northern Interior HSDA and the Fraser East HSDA in BC have percentages of self-rated health that are substantially below the respective provincial averages.

Functional health represents an individual’s functional ability in vision, hearing, speech, mobility, dexterity, feelings, cognition and pain. Self-rated “good or full” functional health is similar for the two provinces: 81.2% in Alberta and 81.5% in BC and is comparable for most health regions. The Richmond HSDA stands out with very high rates of functional health compared with any other health region (at 88.2%), although this does not correspond to higher levels of self-rated health within the Richmond HSDA.

Mortality: Mortality measures are used to depict the ultimate impact of different diseases in a population and to compare this impact over various geographic regions.

Life expectancy at birth indicates how long a baby born today can expect to live. Infant mortality describes the rate of death among children under one year of age. All-cause mortality shows the overall rate of death in the population, and is age standardized (see Community Health Technical Report of Volume 5D for explanation of age standardization) so that different regions can be compared. Rates of mortality from specific conditions (*e.g.*, cancer, circulatory disease, respiratory disease and unintentional injury) are also shown.

Some systematic differences in health regions can be seen when looking across these measures. Within Alberta, the North Health Zone appears to have a mortality rate that is higher than the provincial average, and a life expectancy that is lower than average, while the Edmonton Health Zone fares somewhat better than the provincial average for both measures. Within BC, the Northern Interior and Thompson Cariboo Shuswap HSDAs have higher mortality rates and lower life expectancies than other areas (Table 5.8-1).

Morbidity: Morbidity describes the burden of disease and various health conditions in a population. Where mortality only captures those diseases that result in death, morbidity measures enable the identification of a broader range of conditions (*e.g.*, hypertension, arthritis).

The morbidity conditions presented in Table 5.8-1 are important in that they can considerably impair an individual’s overall quality of life and ability to function. Rates of these different conditions vary substantially between the different health regions, however, it should be noted that the rates are not age-standardized. Therefore, the differences may be driven at least in part by the different age structure of the population in the different regions; regions with a higher proportion of older people are likely to have higher rates of conditions linked to older age such as chronic obstructive pulmonary disorder,

overweight and arthritis; and regions with a higher proportion of younger adults are likely to have higher rates of injury, which is more prevalent in younger populations. Therefore, while the morbidity data in the table are not useful for providing direct comparisons across the different regions, it is nonetheless useful to demonstrate the extent to which the overall population in any one area experiences ill health and to identify which conditions poses the biggest health challenges to individuals and the health care system.

Personal health behaviours: Personal health choices such as physical activity, smoking and diet are key determinants of health. These factors interact with environmental and biological factors to contribute to the prevention or onset of disease.

The rates of current smoking and heavy drinking, which are behaviours that can contribute to ill health, are substantially higher than provincial averages for the North Health Zone in Alberta and in the Northern Interior and Thompson Cariboo Shuswap HSDAs in BC (Table 5.8-1). The Richmond HSDA has rates of smoking that are close to the provincial average, but reports very low rates of heavy drinking. Fruit and vegetable consumption and physical activity are behaviours that can beneficially affect health. As with the other measures shown in the table, there is variation in these behaviours within the health areas, but little indication of systematic differences.

TABLE 5.8-1

MEASURES OF GENERAL HEALTH

Socio-Economic Region	Edmonton Region	Rural Alberta/ Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Population Profile[1]											
Population	1,192,158	454,342	-	144,558	224,230	286,785	726,525	616,412	197,631	668,690	-
Overall Well-being[2]											
Perceived health rated as "very good or excellent" (%)	62.1	55.8	61.7	53.3	58.4	52.7	59.9	58.3	59.4	61.1	59.6
Functional health rated as "good or full" (%)	81.6	79.2	81.2	79.5	78.4	79.5	81.0	84.0	88.2	81.7	81.5
Mortality											
Life expectancy at birth[3] (years)	81.2	79.1	80.7	78.6	79.6	80.6	82.0	82.5	85.7	83.2	81.7
Infant mortality (per 1,000 live births)	N/A	N/A	5.5	4.9	5.3	3.9	3.8	3.1	3.5	4.9	4.2
All causes of death[4] (A-S rate per 100,000)	498.6	589.4	501.1	670.1	598.4	571.2	507.5	511.6	399.3	471.8	523.1
All cancers[4] (A-S rate per 100,000)	146.8	158.2	142.7	203.9	154.7	164.5	147.1	146.7	126.1	134.4	152.5
Circulatory diseases[4] (A-S rate per 100,000)	142.8	176.0	151.1	183.4	171.7	167.4	157.5	161.6	118.2	131.7	153.9
Respiratory diseases[4] (A-S rate per 100,000)	45.5	55.2	43.9	59.5	50.8	56.8	43.8	48.9	35.5	42.5	45.3
Unintentional injuries[4] (A-S rate per 100,000)	17.3	38.0	21.1	35.9	41.5	27.8	21.2	21.4	12.2	21.4	25.6
Morbidity[2]											
Asthma (%)	9.4	8.1	9.0	9.0	8.8	9.4	7.1	6.5	5.0	7.9	7.5
Chronic Obstructive Pulmonary Disorder (%)	3.8	3.3	3.4	5.0	5.4	6.6	3.8	2.4	N/A	2.1	3.8
High blood pressure (%)	15.1	14.8	14.9	15.9	17.8	15.5	14.7	13.2	15.9	12.0	14.9
Diabetes (%)	4.8	4.6	5.1	5.2	5.8	6.0	6.5	6.1	6.1	4.2	5.3

TABLE 5.8-1 Cont'd

Socio-Economic Region	Edmonton Region	Rural Alberta/ Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Overweight or obese (%)	52.7	63.0	53.3	54.9	53.4	52.0	48.1	39.7	34.0	31.7	44.7
Arthritis (%)	15.3	16.7	15.1	15.1	18.9	14.2	14.4	12.2	10.5	9.9	15.2
Injuries in the past 12 months causing limitation of normal activities (%)	17.0	16.6	16.8	22.2	24.3	16.2	14.2	14.5	6.5	12.2	16.3
Personal Health Behaviours[2]											
Current smoker, daily or occasional (%)	23.7	28.3	23.0	23.4	21.6	16.6	13.8	15.7	17.2	14.9	16.7
Heavy drinking (%)	17.7	23.5	18.9	19.8	22.7	13.6	14.7	12.3	9.9	15.1	15.8
Fruit and vegetable consumption, 5 or more/day (%)	40.6	37.9	41.3	38.6	41.8	41.3	42.9	45.8	35.8	39.4	43.8
Physical activity, active or moderate (%)	54.7	53.4	56.2	60.3	64.5	55.9	54.1	54.6	47.6	58.3	59.3

Sources: Government of Alberta 2013b, Statistics Canada 2013b

Notes: 1 Year 2011
2 Years 2009/10
3 Years 2007-2009
4 Years 2009-2011
A-S means age-standardized

5.8.2 Socio-Economic Health Effects

As recognized in the NEB *Filing Manual*, development projects can bring about changes to social and cultural well-being through an influx of temporary or permanent workers, through the provision of jobs and income or through changes to culture, tradition and social cohesion. These changes to social and economic environments are extensively described in the assessments of social and cultural well-being (Section 7.2.3); HORU (Section 7.2.4); infrastructure and services (Section 7.2.5); and employment and economy (Section 7.2.7).

The social and economic conditions associated with development activities also have well-established links to health outcomes that manifest at an individual and community level. These health outcomes include beneficial outcomes such as those that stem from financial security and ability to purchase healthy foods; as well as effects on overall health status; mental well-being outcomes such as stress, anxiety, and suicide rates; alcohol and drug use; sexually transmitted infection rates; violence, injury and trauma; and the use of specific health services including emergency departments and mental health and addictions services (Barron *et al*. 2010, Pfeiffer *et al.* 2010, Orenstein *et al.* 2013). Although much of the literature around these effects focuses specifically on resource development activity, the primary driver for this effect is a substantial temporary increase in employment in a given area, often filled primarily through the use of mobile workforces supplemented by jobs for local residents. In this respect, the Project is similar to resource development activities and parallels may be drawn in terms of the potential for socio-economic health effects.

The potential for health effects stemming from social and/or economic changes associated with development activities is currently very much on the minds of health authorities across Canada. A number

of reports have been produced by regional Medical Officers of Health that discuss potential or observed changes and provide guidance for provincial health authorities about how to prepare for future change.

- In 2007, a report entitled "Population Health and Oil and Gas Activities: A Preliminary Assessment of the Situation in North Eastern BC" was produced by Dr. Lorna Medd, Medical Health Officer (Medd 2007). The purpose of the report was to identify population health and safety concerns in northeastern BC communities and to make recommendations that would assist the regional and provincial health authorities with policy development related to the oil and gas industry. The report identified a number of priority areas and key concerns. As a result of this report, the Northeast BC Oil and Gas Health Working Group was formed in 2009: a multi-disciplinary group representing the health authorities, the oil and gas industry, the local municipalities, other BC ministries, and local advocacy groups.

- In 2012, the Chief Medical Officer of Health of New Brunswick released a report reviewing potential health impacts and providing recommendations associated with shale gas development in the province (New Brunswick Department of Health 2012). This report also focused strongly on health effects associated with changes in the social environment and, in particular, health improvements that could be stimulated by "large-scale increases in employment, tax and royalty revenues" and negative impacts such as "increases in crime, drug and alcohol abuse, sexually-transmitted infections (STIs), and domestic violence…. inadequate infrastructure and public services capacity (including policing, local government, mental health services, social services, and health care)."

The focus on socio-economic health issues in these reports by the health authorities indicates that these effects are important and are of substantial concern to the public health sector across the country.

In addition, health effects related to social and economic changes brought about by development are a strong concern for residents of Alberta, BC and elsewhere.

- A report submitted by the Fraser Basin Council to the BC Ministry of Health in March 2012 documented public concerns about health in relation to oil and gas development in northeastern BC. The report stated that stress, along with associated sleep deprivation and reduced quality of life, was among the most commonly cited concerns about resource development (Fraser Basin Council 2012).

- Newspaper articles have also documented the fact that these issues are of interest to local residents of resource communities across Canada and the US (Associated Press 2013, Burnett 2011, Levy 2011, Vaughan 2012).

5.8.2.1 Mental Well-Being

Mental well-being is an important dimension of health. People with good mental health are able to realize their potential, to cope with the normal stresses of life, to work productively and to make a contribution to their community (Bartram *et al.* 2012, World Health Organization 2001). Mental well-being is linked to physical health outcomes; for example, stress and anxiety are thought to contribute to the development of many poor health conditions including heart disease, stroke, high blood pressure, upper respiratory disease and poor immune response (Schneiderman *et al.* 2005). Exposure to stress can also contribute to behaviours such as smoking, over-consumption of alcohol and less-healthy eating habits.

It is important to note that mental well-being is a separate concept from mental illness. Mental illness is defined according to diagnosable disorders such as schizophrenia, bipolar disorder and depressive disorders. In contrast, mental well-being does not refer to the presence or absence of a disorder, but instead a state or absence of well-being; consequently, mental health is achievable by those with or without mental illness (Lakaski and Trottier 2009).

Table 5.8-2 shows data relevant to understanding existing conditions for a number of mental well-being dimensions across the different regions in Alberta and BC. Consistent with results across the country, a relatively high proportion of people in all regions rated their perceived mental health as "very good or excellent". Rates were substantially higher for the Richmond HSDA than for other areas in BC; otherwise, the overall average varied slightly but not a great deal between regions. Similarly, a very high proportion of people in both Alberta and BC, over 90% on average, rated life satisfaction as "satisfied or very

satisfied". Perceived life stress refers to the perception that most days in the respondent's life are "quite a bit" or "extremely" stressful. Across both Alberta and BC, just over 20% of the population reported high levels of life stress. Rates varied among regions, with the Thompson Cariboo Shuswap HSDA reporting the lowest levels of life stress (18.7% of the population) and the Edmonton Health Zone and Fraser South HSDA reporting the highest (over 24%).

Antidepressants are medications used for managing depression, and are among the most commonly prescribed drugs by medical psychologists, psychiatrists and general practitioners. Anxiolytics are medications used for short-term relief of extreme anxiety and nervousness caused by psychological problems. For the most part, rates of antidepressants and anxiolytic prescriptions were much lower in the HSDAs in the Metro Vancouver Region than for the province as a whole or for the Fraser-Fort George/Thompson-Nicola Region (Fraser Health Authority 2010). Comparable information is not available for Alberta.

Suicide is a relatively rare outcome that reflects an extreme lack of mental well-being. Suicide rates for the regions in BC are shown in Table 5.8-2; comparable figures for Alberta are not available. Within BC, rates for the Northern Interior and Thompson Cariboo Shuswap HSDAs, both in the Fraser-Fort George/Thompson-Nicola Region, were substantially above the provincial average, and the Richmond HSDA had substantially lower rates. Across all regions, males had a much higher rate of suicide than females, and suicide has been more common among Aboriginal populations in Canada (First Nations Health Authority 2012).

TABLE 5.8-2

MENTAL WELL-BEING MEASURES

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Perceived mental health, very good or excellent[1] (%)	73.6	73.7	73.8	67.1	68.1	71.0	71.6	71.7	78.5	70.0	71.0
Life satisfaction, satisfied or very satisfied[1] (%)	90.0	90.4	91.1	90.7	88.4	91.1	90.0	92.6	92.6	89.6	91.2
Perceived life stress[1] (%)	24.1	22.0	22.3	22.3	18.7	19.1	24.0	21.4	20.2	20.2	21.4
Individuals (non-FN) receiving prescriptions for antidepressants[2] (%)	N/A	N/A	N/A	12.3	12.7	11.9	9.7	8.9	6.6	8.7	11.6
Individuals (non-FN) receiving prescriptions for anxiolytics[2] (%)	N/A	N/A	N/A	8.3	10.3	9.2	9.2	8.3	8.0	9.2	10.2
Suicides and self-inflicted injuries, deaths[1] (per 100,000 population)	N/A	N/A	11.1	10.4	11.6	8.5	7.2	7.8	5.7	8.7	8.8

Sources: Fraser Health Authority 2010, Statistics Canada 2013b

Notes: 1 Year 2009/10

2 Year 2006

N/A means not available

FN means First Nations

5.8.2.2 Alcohol and Drug Misuse

At moderate levels of consumption, alcohol use is not problematic. However, excessive use of alcohol and consumption of illicit drugs causes problems at both the individual and community level. Heavy drinking (defined by Statistics Canada as consuming five or more drinks per occasion at least once per month) or binge drinking (defined by Statistics Canada as consuming five or more drinks per occasion at least twice per month) can have serious health and social consequences, especially when combined with other behaviours such as driving while intoxicated.

Table 5.8-3 presents data relevant to understanding existing conditions on alcohol and drug misuse.

TABLE 5.8-3

ALCOHOL AND DRUG MISUSE MEASURES

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Heavy drinking[1] (% of population)	17.7	23.5	18.9	19.8	22.7	13.1	14.7	12.3	9.9	15.1	15.8
Binge drinking[2] (% of population)	14.4	16.4	13.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Per Capita Alcohol Sales[2] (dollars spent)	N/A	N/A	N/A	$810	$926	$610	$604	$535	$482	$817	$791
Per Capita Alcohol Sales[2] (litres consumed, ages 19+)	N/A	N/A	N/A	122	141	87	77	72	53	96	104
Per capita alcohol consumption, ages 15+[2] (litres of absolute alcohol per year, ages 15+)	N/A	N/A	N/A	9.34	10.71	7.10	6.60	5.95	4.64	7.97	8.56
Cannabis use in the past 30 days (%)	N/A	N/A	N/A	11.4	9.5	6.4	6.9	8.6	N/A	8.6	9.1
Non-cannabis drug offences[3] (per 100,000 population)	N/A	N/A	N/A	232.4	203.8	161.8	187.4	101.5	224.0	328.3	193.6
Illicit drug deaths[3] (per 100,000 population)	N/A	N/A	N/A	8.7	14.5	11.0	6.8	5.5	2.3	8.9	7.7

Sources: BC Stats 2013, Centre for Addictions Research of BC 2013, Government of Alberta 2013b, Statistics Canada 2013b, Zhao *et al.* 2011

Notes: 1 Year 2009/10

2 Year 2011

3 Years 2008-2010 average

Heavy drinking = five or more drinks on one occasion at least once per month

Binge drinking = (five or more drinks two or more times per month)

One Litre of Absolute Alcohol = 58 Standard Drinks

As shown in Table 5.8-3, within Alberta, the North Health Zone appears to have higher rates of heavy drinking and binge drinking than the Alberta average. Recent data were not available for per-capita alcohol consumption or drug-related statistics. While the North Health Zone data may be heavily influenced by the major population centres of Fort McMurray and Grande Prairie, older data confirm that alcohol and drug misuse is prevalent in Edson and Hinton, two communities of particular interest in the Rural Alberta Region. A 2006 report entitled *Social and Health Indicators of Addiction* presented a wide range of data points on alcohol and drug use for 28 Alberta service areas as well as for the province as a

whole (Goatcher 2006). For both the Edson and Hinton service areas, rates of most measures of addiction were higher than the provincial average, as shown in Table 5.8-4. For volume of alcohol sold, the report notes that alcohol sales are influenced by tourism, which skews figures upwards in areas with a large amount of tourism, such as in Jasper, which falls into the Hinton service area.

TABLE 5.8-4

SOCIAL AND HEALTH MEASURES OF ADDICTION, EDSON AND HINTON SERVICE AREAS

Measure (rate per 1,000 population ages 15 and older)	Edson	Hinton	Alberta
Litres of alcoholic beverages sold	143	250	124
Impaired driving	7.73	10.76	4.92
Reported offences: disturbing the peace, non-sexual and sexual assault	30.35	42.97	23.57
Injury and fatality collisions involving drivers who have consumed alcohol or were impaired	0.93	0.43	0.52
Alcohol-related deaths	0.19	0.35	0.28
Reported offences: cannabis and other illicit drugs	6.70	13.02	3.54
Drug-related deaths	0.09	0.09	0.15
Admissions to Alberta Alcohol and Drug Abuse Commission for addictions	16.98	11.89	10.37

Source: Goatcher 2006

Note: Data for year 2004/05

More data on alcohol and drug misuse are currently available for BC than for Alberta. The statistics presented in Table 5.8-3 are derived from different sources using different methodologies; however, some consistent trends appear. Within BC, alcohol consumption, both average alcohol consumption as measured by average litres consumed and dollars spent, and heavy alcohol consumption, are elevated in the Northern Interior and Thompson Cariboo Shuswap HSDAs compared with the provincial average. The communities in the Metro Vancouver Region trend towards average and heavy alcohol consumption below the provincial average.

Measures of illegal drug use (*i.e.*, non-cannabis offences and illicit drug deaths) are also available for BC. Past 30 days cannabis use did not have a large variation from the provincial average of 9.1% of the population. The Northern Interior HSDA had the highest reported rates at 11.4%, and the Fraser East and Fraser South HSDAs had the lowest rates at 6.4% and 6.9%. Non-cannabis drug offences is a measure that is influenced both by the extent of illegal drug use and by the extent to which use is tolerated or prosecuted by the local policing system. The highest rates of non-cannabis drug offences were found in the Vancouver HSDA, followed by elevated rates in the Northern Interior and Richmond HSDAs. The lowest rates were found in Fraser North. Illicit drug deaths are not influenced by prosecution preferences; however, because illicit drug death is a rare outcome, rates can vary greatly from year to year, especially in regions with small populations. For the years 2008-2010, the three-year average was highest in the Thompson Cariboo Shuswap HSDA, with a rate of 14.5 drug deaths per 100,000 population, almost doubling the provincial average. Rates were also high in the Fraser East HSDA, and lowest in the Richmond HSDA. The illicit drugs that had the highest usage were cannabis, cocaine/crack and opioids (Chow and Carsley, year not stated).

5.8.2.3 Mental Health and Addictions Services

Mental health and addictions services are available to provide counselling, treatment, information and referral services to people who face mental health, psychosocial, substance misuse or addiction concerns. Mental health and addictions services are organized and operated by the provincial health care systems.

In the Edmonton Region, mental health and addictions services are offered at a number of locations. Services include: detoxification programs; counselling; day programs; opioid dependency programs; shelters; and adult residential treatment centres. However, a 2010 study conducted on mental health and addictions services in Alberta indicated that there is an overall trend of increasing demand on these services (Wild *et al*. 2010). Approximately 50% to 66% of practitioners interviewed indicated that more

people sought treatment than they had resources for. Also, over half of mental health and addictions program directors indicated that they were inadequately staffed to meet current service needs.

In the Rural Alberta Region, mental health and addictions services are available in both the towns of Edson and Hinton. Services offered include: outpatient addiction treatment; addiction prevention services; referrals for in-patient addiction treatment; mental health outpatient treatment; visiting psychiatrist visit twice per month; and mental health promotion activities. In both the towns of Edson and Hinton, there are two full-time equivalent positions available to work in mental health and addictions services. When the mental health and addictions services are fully staffed, capacity has been sufficient to meet the needs of the local communities; however, staff retention has been a problem (Zuidhof-Knoop pers. comm.).

In the Jasper National Park Region, mental health and addictions services are available at the Provincial Building in Jasper town site. Services are similar to those offered in Edson and Hinton and include: outpatient addiction treatment; addiction prevention services; referrals for in-patient addiction treatment; mental health outpatient treatment; Tele-mental health for diagnoses required by psychiatrists; and mental health promotion activities. There is only one half-time employee dedicated to mental health and addictions services in Jasper (Zuidhof-Knoop pers. comm.). Staff recruitment is particularly challenging for Jasper due to its unique setting and cost of living.

In the Fraser-Fort George/Thompson-Nicola Region there is a mental health and addictions community program that is split between Valemount and the community of McBride, located one hour north of Valemount. This program offers counselling, case management and life skills training among other services. In the Thompson Cariboo Shuswap HSDA, there are mental health programs available in the Districts of Clearwater and Barriere as well as in the cities of Kamloops and Merritt. These programs offer services in adult short-term assessment and treatment, community residential programs, crisis intervention, day and outpatient programs, addictions counselling, concurrent disorders services, group therapy, peer support, and after-hours mental health support. The City of Kamloops has a few other centres capable of treating mental illness as well as addictions and mental well-being disorders.

In the Fraser Valley Region, there are a variety of services available for addictions, including: Daytox (a medically monitored group-based day program offering withdrawal management for individuals in early recovery or whose substance misuse does not require intensive residential withdrawal management services); residential treatment programs; and withdrawal management programs. In terms of mental health programs, the Fraser Valley Region is home to a community residential short-stay treatment program as well as tertiary in-patient rehabilitation (Fraser Health Authority 2013).

There are a wide variety of mental health and addictions services offered in the Metro Vancouver Region. Services offered include: adult community support; adult short-term assessment and treatment; community residential programs; geriatric programs; crisis intervention; day and outpatient programs; addictions counselling; concurrent disorders services; group therapy; peer support; and after-hours mental health support. Mental health clinics are available in Burnaby, Fraser Valley, Langley, Maple Ridge/Pitt Meadows, New Westminster, Surrey/White Rock/Delta, and Tri-Cities.

5.8.2.4 Other Socio-Economic Health Issues

In addition to mental well-being and alcohol/drug misuse, a number of other socio-economic health outcomes are commonly associated with development activities, as described in the beginning of this subsection. Existing conditions for many of these other outcomes are described elsewhere in the socio-economic assessment, including:

- rates of sexually transmitted infections in Section 5.8.3 under the indicator infectious diseases;
- health care services, including hospitals, emergency departments, mental health and addictions services and other health care services in Section 5.8.6 under the indicator health care service provision;
- existing conditions on employment, income and poverty in Sections 5.3 Social and Cultural Well-being and Section 5.7 Employment and Economy;

- data on housing, including crowding and housing affordability in Section 5.5 Infrastructure and Services; and

- rates of crime and violent crime in Section 5.3 Social and Cultural Well-being.

5.8.3 Infectious Diseases

Infectious diseases are also known as communicable diseases and include any disease that is transmitted from one person to another or from an insect or animal source (such as a mosquito or bird) to a person. Since infectious diseases can comprise a serious threat to public health, the *Public Health Acts* of BC and Alberta identify a number of infectious diseases that must be reported to the regional Medical Officer of Health.

Development activities are often associated with circumstances that can exacerbate the spread of certain infectious diseases. The spread of infectious disease in a community can be triggered by an influx of people moving temporarily into a rural or remote area, or by crowded working or living conditions in homes or camps. There are three types of infectious diseases that are of concern in the context of the Project:

- sexually transmitted infections;

- respiratory infections; and

- gastrointestinal illnesses.

5.8.3.1 Sexually Transmitted Infections

Sexually transmitted infections (STIs) include gonorrhea, chlamydia, syphilis and HIV/AIDS as well as others such as hepatitis B and C and human papilloma virus. These diseases are transmitted from one person to another through unprotected sexual contact. STIs can cause irritating symptoms that need to be treated; they can also have much more serious consequences including infertility or sterility, or even in some cases, death. They represent a large public health concern because of their ability to spread rapidly through the population and their increasing resistance to antibiotics (BC Centre for Disease Control 2011).

Across both Alberta and BC, sexually transmitted infections have generally been on the increase over the past 10 years, particularly among young adults 20-24 years (BC Centre for Disease Control 2012, Government of Alberta 2011). Chlamydia remains the most common STI, followed by gonorrhea. In the last few years, there has been a resurgence of the once-rare disease of syphilis, with a rate that has increased 15-fold since 2000. HIV/AIDS is another important STI, with a little more than 200 cases of new HIV infection presenting each year in Alberta and over 250 new cases per year in BC (BC Centre for Disease Control 2012, Government of Alberta 2012d).

Table 5.8-5 shows the rates of new infection with STIs across the different health zones in Alberta and BC. Alberta has STI rates that are among the highest in the country. Within Alberta, rates for both the Edmonton Health Zone and the North Health Zone were substantially higher than the Alberta average for both chlamydia and gonorrhea. Within BC, the Northern Interior HSDA had the highest rates of chlamydia; the Vancouver HDSA was highest for rates of most other STIs, with the Northern Interior HSDA having the second-highest rates for gonorrhea, hepatitis C and HIV.

The trends for which demographic groups are most likely to acquire specific STIs are similar across Alberta and BC. The highest rates of chlamydia are found in females ages 15-24 years; gonorrhea is highest in two groups: females ages 15-24 years and males 20-29 years; and HIV infection is consistently higher among males than females (BC Centre for Disease Control 2012, Government of Alberta 2012d).

TABLE 5.8-5

RATES OF NOTIFIABLE SEXUALLY TRANSMITTED INFECTIONS

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Sexually Transmitted Infections (rate per 100,000 population)											
Chlamydia	410.9	512.0	369.5	423.2	287.8	175.6	177.4	225.8	224.9	359.9	255.4
Gonorrhea	58.0	70.9	39.4	58.7	28.3	11.7	22.0	29.4	16.6	115.4	34.2
Hepatitis C	N/A	N/A	N/A	58.8	43.4	62.1	43.1	33.1	19.7	47.6	43.1
HIV	7.9	3.8	5.7	9.8	1.3	5.5	2.2	3.7	3.0	24.8	6.3
Syphilis (infectious)	3.1	1.3	2.5	2.1	2.2	1.7	1.2	2.1	1.5	19.9	4.2

Sources: BC Centre for Disease Control 2012, Government of Alberta 2012d, Government of Alberta 2013b

Notes: N/A means not available

Data for year 2011

5.8.3.2 Respiratory Infections

Common respiratory infections include the common cold, strep throat, influenza (flu), pneumonia, bronchitis, measles and chicken pox. Many infectious diseases merely pose a nuisance to those who acquire them; however, some infectious respiratory diseases can be very serious or life-threatening, and those who are very old, very young, or who have pre-existing health conditions are usually at highest risk.

Table 5.8-6 shows the rates of notifiable respiratory illnesses in Alberta and BC. Notifiable refers to the fact that health care facilities are required to report cases of this disease to the provincial registry. Not all respiratory diseases are notifiable; for example, bronchitis, pneumonia and the cold are not notifiable, and chicken pox (varicella) is notifiable in Alberta but not BC.

Within Alberta, the North Health Zone experiences substantially higher than average rates of most notifiable infectious respiratory illnesses (Table 5.8-6). Within BC, there was no consistent pattern indicating higher rates within any given region for respiratory disease in 2011; the Northern Interior HSDA experienced higher than average rates of invasive pneumococcal disease and tuberculosis; the Thompson Cariboo Shuswap HSDA had higher than average rates of pneumococcal disease only; the Fraser East HSDA had high rates of pertussis, pneumococcal and streptococcal disease; Fraser South HSDA experienced high rates of measles and tuberculosis; the Fraser North HSDA was high for mumps; the Richmond HSDA experienced high rates of mumps and tuberculosis; and the Vancouver HSDA had greater than average rates of measles, mumps, streptococcal disease and tuberculosis.

Some of this variation may be due to time-limited outbreaks in specific geographic areas; for many of these diseases there is substantial year-to-year variation. For example, the rate of pertussis, also known as whooping cough, in Alberta's North Health Zone varied dramatically over the last five years, with rates swinging between 1.17 and 40.63 cases per 100,000 people per year (Government of Alberta 2013b).

Particular note should be taken of tuberculosis (TB). Tuberculosis (previously known as "consumption") is a serious disease that was once considered close to eradicated but that has recently re-emerged as a major health problem in Canada. Tuberculosis transmission is closely linked to overcrowding, and rates are particularly high in Aboriginal populations and among recently arrived immigrants from a relatively small number of high-incidence countries. Due to the potential seriousness of this disease, there are government plans for elimination of TB in both provinces (BC Communicable Disease Policy Advisory Committee 2012, Government of Alberta 2012e).

TABLE 5.8-6

RATES OF NOTIFIABLE RESPIRATORY ILLNESSES

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Respiratory Illnesses (rate per 100,000 population)											
Measles	N/A	N/A	N/A	0.0	0.0	0.0	0.3	0.0	0.0	0.3	0.2
Mumps	0.1	0.2	0.3	1.7	0.0	0.7	1.5	6.1	2.6	5.1	2.9
Pertussis	1.4	15.2	3.2	0.7	0.3	3.5	0.7	1.0	0.5	0.6	1.3
Pneumococcal disease (invasive)	9.9	14.3	9.4	9.7	8.5	8.4	6.1	5.7	6.1	6.3	7.1
Streptococcal Disease (Group A invasive)	7.6	6.4	5.9	3.5	2.3	7.3	3.6	3.6	3.0	4.8	4.0
Tuberculosis	N/A	N/A	N/A	8.3	1.8	4.5	10.3	5.8	8.1	11.8	5.9
Influenza	52	19	37	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Sources: BC Centre for Disease Control 2012, Government of Alberta 2013b

Notes: N/A means not available

Data for year 2011

5.8.3.3 Gastrointestinal Illnesses

Gastrointestinal (GI) illnesses such as E.coli, norovirus and hepatitis A are caused by a variety of bacterial and viral pathogens. Depending on the organism causing the illness, people may experience stomach cramping, fever, vomiting, and/or diarrhea for several hours up to several weeks. GI illnesses are spread from direct contact from person to person but can also be spread through contaminated food, water, or surfaces, and may be linked to poor food-handling practices or sanitation. GI illnesses can also be spread between animals and people if there is contact with infected fecal matter, such as through the contamination of streams with giardia from sheep, deer or cattle.

As with respiratory diseases and other infectious diseases, there can be substantial differences in year-to-year rates in a single region due to localized outbreaks. Table 5.8-7 shows rates of notifiable GI illnesses for Alberta and BC in 2011. Campylobacteriosis, salmonellosis (salmonella poisoning) and giardiasis (giardia) were the most common infections. While rates of specific illnesses varied across health regions, there did not appear to be any noteworthy regional trends.

TABLE 5.8-7

RATES OF NOTIFIABLE GASTROINTESTINAL ILLNESSES

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Gastro-intestinal Illnesses (rate per 100,000 population)											
Campylobacteriosis	17.1	14.8	26.1	16.6	26.6	39.1	30.0	37.2	39.5	53.1	37.7

TABLE 5.8-7 Cont'd

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Cryptosporidiosis	1.4	2.4	3.0	1.4	0.9	2.1	1.2	1.0	1.0	1.4	1.2
E. coli	1.6	0.9	2.0	2.1	2.6	4.5	2.3	1.5	1.0	3.0	2.4
Giardiasis	9.7	7.7	12.5	8.3	10.8	13.6	16.5	11.7	5.1	21.8	13.5
Hepatitis A	N/A	N/A	N/A	0.7	0.9	0.7	0.7	0.5	0.5	1.1	2.3
Salmonellosis	25.1	22.5	24.1	15.2	18.4	31.0	31.0	25.5	25.3	25.6	24.1

Sources: BC Centre for Disease Control 2012, Government of Alberta 2012d, Government of Alberta 2013b

Notes: N/A means not available

Data for year 2011

5.8.4 Environmental Health Effects

Environmental health effects refer to potential health changes that could arise as a result of exposure to Project-related hazards via environmental media.

Table 5.8-8 presents region-specific data on a number of health conditions that can be related to contaminant exposure. These include some cancers and other chronic conditions. It is important to note that all these conditions arise from a complex combination of genetics, environment and other factors and that development-related contaminant exposure is unlikely to be the main driving force behind the current rates of these diseases at a population level. This baseline information is used to inform the modelling of human health outcomes presented in the Screening Level Human Health Risk Assessment of Pipeline and Facilities of Volume 5D and in Sections 7.5.8 and 7.6.8.

TABLE 5.8-8

RATES OF SELECT CHRONIC CONDITIONS

Socio-Economic Region	Edmonton Region	Rural Alberta/ Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Lung cancer incidence[1] (A-S per 100,000)	52.6	59.0	50.9	61.9	52.9	49.0	50.4	53.8	43.5	46.0	48.8
Lung cancer mortality[2] (A-S per 100,000)	41.5	45.9	38.5	52.4*	43.8*	37.1*	37.1*	37.1*	28.1*	28.1*	37.5
Liver cancer incidence[3] (A-S per 100,000)	N/A	N/A	N/A	3.7*	3.6*	4.1*	4.1*	4.1*	6.8*	6.8*	4.8
Liver cancer mortality[3] (A-S per 100,000)	N/A	N/A	N/A	2.1*	1.0*	1.9*	1.9*	1.9*	3.9*	3.9*	2.2
Leukemia incidence[3] (A-S per 100,000)	N/A	N/A	13	9.7*	13.8*	12.3*	12.3*	12.3*	11.2*	11.2*	11.6

TABLE 5.8-8 Cont'd

Socio-Economic Region	Edmonton Region	Rural Alberta/ Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Leukemia mortality[3] (A-S per 100,000)	N/A	N/A	4	6.2*	5.4*	4.4*	4.4*	4.4*	4.6*	4.6*	4.7
Ischemic heart disease death rate[2] (A-S per 100,000)	N/A	N/A	84.6	78.0	81.6	82.3	81.2	85.4	57.2	55.7	84.6
End stage renal disease[4] (A-S per 100,000)	11.4	6.4	10.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Asthma[5] (%)	9.4	8.1	9.0	9.0	*8.8*	9.4	7.1	6.5	*5.0*	7.9	7.5
Bronchitis, emphysema and asthma deaths[2] (A-S per 100,000)	N/A	N/A	2.3	2.8	2.5	3.2	2.1	2.4	2.5	2.0	2.8
COPD[5] (%)	3.8	3.3	3.4	*5.0*	*5.4*	*6.6*	*3.8*	*2.4*	n/a	*2.1*	3.8
Low birth weight[2] (% of live births)	6.4	6.0	6.7	5.4	5.8	4.9	6.3	6.1	5.6	6.2	5.7
Preterm birth (% of live births)	8.3	7.9	8.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Infant mortality rate[2] (per 1,000 live births)	6.5	6.6	6.0	4.9	5.3	3.9	3.8	3.1	3.5	4.9	4.2

Sources: Alberta Health Services (AHS) 2012, BC Cancer Agency 2011, Government of Alberta 2013b, Statistics Canada 2013b

Notes: 1 Years 2007-2009

2 Years 2005-2007

3 Year 2009

4 Year 2011

5 Year 2009/10

* These rates are presented at the level of the Health Authority, not the HSDA

Data from Alberta and BC are taken from different sources and, therefore, data across provinces may not be comparable

COPD – Chronic Obstructive Pulmonary Disorder

N/A – not available

Italics means statistics should be interpreted with caution due to high instability

A-S means age-standardized

5.8.5 Public Safety

Public safety is a determinant of health that may be affected by development projects. The primary way in which public safety may be affected by the construction and operation of the pipeline and associated facilities is through an increased potential for traffic-related injury and mortality associated with Project-related traffic or road conditions. Existing conditions relevant to traffic-related injury and mortality are discussed below.

It should be noted that public safety in relation to potential accidents and malfunctions is discussed in Section 7.9 Accidents and Malfunctions.

Infrastructure related to roads, including current capacity of roads to handle traffic patterns is discussed in Section 5.5. The following subsection focuses on the community health/public safety component of transportation, namely collision-related injury and mortality outcomes associated with traffic collisions.

Existing conditions for traffic-related injury and mortality are shown below. Data are presented separately for Alberta and BC since the ways in which data are collected and reported differ substantially between the two provinces.

Alberta

Collision data are not publicly available by location in Alberta. Aggregate statistics for the province were published annually through 2010. Across the province in 2010, there were a total of 151,289 motor vehicle collisions. Approximately 9% of these collisions (13,552 collisions) resulted in non-fatal injuries, while a further 0.2% (307 collisions) resulted in fatalities (Alberta Transportation 2010).

The rates of collisions, injuries and deaths are not uniform across the different regions of the province. As shown in Table 5.8-9, the rate of deaths from motor vehicle traffic accidents per 100,000 population was 8.2 for Alberta as a whole in 2010; the rate for the Edmonton Health Zone was lower at 6.6, and the rate for the North Health Zone was substantially higher, at 17.6.

TABLE 5.8-9

RATE OF MOTOR VEHICLE FATALITIES IN ALBERTA

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions	
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta
Death due to motor vehicle traffic accidents (age-standardized rate per 100,000 population)	6.6	17.6	8.2

Source: Government of Alberta 2013b

Note: Data for year 2010

Across Alberta, alcohol consumption was implicated in a large proportion of injury and fatality collisions, and as the severity of the collision increased, the involvement of alcohol dramatically increased. A total of 4.7% of drivers involved in injury crashes were judged to have consumed alcohol prior to the crash, compared with 21.8% of drivers involved in fatal collisions. Of pedestrians involved in injury collisions, 12.5% had consumed alcohol before the collision, compared with 55.9% of pedestrians involved in fatal collisions (Alberta Transportation 2010).

Passenger cars, mini-vans/multi-purpose vehicles and pick-up trucks/vans were the vehicles most frequently involved in total casualty collisions. Tractor-trailers made up 1.8% of total vehicles in casualty crashes, but 6.7% of vehicles in fatal crashes (Alberta Transportation 2010).

British Columbia

BC collated and published statistics on traffic collisions on an annual basis through 2007, the last year for which these data are available. Traffic collision statistics for the communities in the Socio-Economic RSA for the year 2007 are shown in Table 5.8-10. For this year, the total number of collisions was highest for Surrey Municipal, Vancouver Municipal, and Kamloops Municipal RCMP jurisdictions. Burnaby Municipal, Langley Township Municipal and Coquitlam Municipal also each registered more than 1,000 collisions. Although Vancouver and Surrey experienced the highest number of traffic fatalities in 2007, Abbotsford Provincial and Coquitlam Provincial recorded fairly high rates of fatalities as a percentage of total collisions.

TABLE 5.8-10

RATE OF MOTOR VEHICLE COLLISIONS, INJURIES AND FATALITIES IN BC

Socio-Economic Region	RCMP Jurisdiction	Total Number of Collisions	Injury Collisions		Fatality Collisions		Total Number of Victims
			Number	Percent of Collisions	Number	Percent of Collisions	
Fraser-Fort George/ Thompson-Nicola	McBride P	90	29	32.2	0	0.0	35
	Valemount P	153	32	20.9	3	1.9	50
	Barriere P	109	36	33.0	1	1.2	55
	Clearwater P	8	1	12.5	0	0.0	2
	Kamloops M	1,720	573	33.3	5	0.3	808
	Merritt M	99	31	31.3	1	1.0	43
	Merritt P	343	147	42.9	3	0.9	221
Fraser Valley	Hope M	43	14	32.6	0	0.0	20
	Hope P	226	115	50.9	3	1.3	162
	Chilliwack M	776	325	41.9	3	0.4	475
	Chilliwack P	45	24	53.3	0	0.0	32
	Abbottsford M	979	499	51.0	13	1.3	728
	Abbottsford P	14	4	28.6	2	14.3	6
	Mission M	405	146	36.0	2	0.5	203
	Mission P	69	29	42.0	0	0.0	42
Greater Metropolitan Vancouver	Langley City M	388	176	45.4	1	0.3	233
	Langley Township M	1,161	456	39.3	11	0.9	663
	Surrey M	3,078	1,535	49.9	24	0.8	2,275
	Surrey P	8	5	62.5	0	0.0	8
	Coquitlam M	1,097	435	39.7	4	0.4	619
	Coquitlam P	9	3	33.3	2	22.2	6
	Burnaby M	1,111	667	60.0	9	0.8	925
	New Westminster M	585	229	39.1	1	0.2	336
	Delta M	1,102	321	29.1	2	0.2	441
	Maple Ridge M	783	329	42.0	5	0.6	431
	N Vancouver City M	709	212	29.9	2	0.3	259
	N Vancouver District M	185	63	34.1	0	0.0	79
	N Vancouver P	28	8	28.6	1	3.6	12
	Pitt Meadows M	187	77	41.2	2	1.1	106
	Port Coquitlam M	340	148	43.5	2	0.6	198
	Richmond M	956	495	51.8	6	0.6	663
	Vancouver M	2,476	1,498	60.5	25	1.0	2,034
	West Vancouver M	559	169	30.2	2	0.4	230
	White Rock M	68	29	42.6	0	0.0	37

Source: BC Motor Vehicle Branch 2007

Notes: Data for year 2007

P – Provincial; M – Municipal; N – North

As in Alberta, alcohol was implicated in a large proportion of collisions in BC. In 2007, 11.3% of police-attended injury collisions and 30.9% of fatal collisions involved alcohol, consumed by either the driver or the victim. The report also notes that alcohol-related injury and fatal collisions were more likely to occur on weekends (Friday, Saturday, Sunday) than on weekdays. Illegal drugs were also implicated in a disproportionate amount of collision injuries and fatalities (BC Motor Vehicle Branch 2007).

Vehicles driven for personal use comprised 82.2% of the vehicles involved in police-attended injury and fatal collisions. Vehicles used for commercial and business purposes (including heavy trucks/trailers, logging trucks, construction equipment) accounted for 9.2% of the vehicles in collisions (BC Motor Vehicle Branch 2007).

5.8.6 Health Care Service Provision

Health care services are those services that are responsible for the diagnosis and treatment of disease, and the promotion, maintenance and restoration of health (Orenstein *et al.* 2013). They include: hospitals; health care clinics; and allied health services such as pharmacy, public health, mental health and addictions services, laboratory services, health promotion and other specialty areas. Development projects have the potential to affect health care provision either by increasing the size of the population requiring service or by changing the demand for certain specific services. If increased demand exceeds the capacity of local services, then community health may be affected by reduced access to and quality of available health care services.

This subsection describes the existing capacity of health care services in the Socio-Economic RSA, with a focus on hospitals/health care facilities; mental well-being and addictions services; and emergency medical response: areas that have been shown to bear particular strain during construction periods (Medd 2007). Since demand on health care services is linked to the Project workforce, existing conditions focus on those communities that have been proposed as construction hubs for Project housing and work sites.

5.8.6.1 Health Care Context

In Alberta and BC, responsibility for health care lies with geographically defined health authorities that have exclusive territory in which they organize and provide care. In rural areas, most health care professionals, including nurses, laboratory and radiology technicians, physiotherapists, and hospital pharmacists are employed by the health authorities. Physicians, for the most part, operate privately and not under the health authority.

Health care in Alberta is provided through AHS, which organizes delivery through five health “zones”. The Project passes through the Edmonton Health Zone and the North Health Zones. A figure showing these health zones in relation to Socio-Economic RSA regions in Alberta is shown in the Community Health Technical Report of Volume 5D.

Health care in BC is provided through the BC Ministry of Health, which organizes service delivery through six health authorities. The Project passes through four health authorities: Northern; Interior; Fraser; and Vancouver Coastal. Each of these health authorities is further split into geographically-bounded HSDAs. A figure showing these health authorities and HSDAs in relation to Socio-Economic RSA regions in BC is shown in the Community Health Technical Report of Volume 5D.

It should be noted that health care for on-reserve Aboriginal populations is the constitutional responsibility of the federal government, rather than the provinces. However, the way in which Aboriginal health care services have evolved in Alberta and BC is complex and is more fully described in Section 5.8.7 Aboriginal Health.

There are common challenges that face each health authority in the Socio-Economic RSA. Overall population increase, the aging of the population and the large-scale retirement of many physicians and technicians expected in the next 5-10 years are likely to place a substantial burden on health care service capacity in the near future. Rural areas will be particularly hard hit since recruitment to isolated areas remains a challenge.

Each health authority also faces the challenges of treating diverse population groups. Cultural practices and ethical norms dictate quality of care and health care staff are and will have to continue to adapt to meet the needs of the populations that they serve. For urban areas, there is an ever-increasing diversity of cultures requiring practitioners to evolve with their clientele. In rural areas, a large presence of Aboriginal populations presents unique challenges to provision of care, where understanding traditional cultural beliefs is key for providing quality care.

The measures shown in Table 5.8-11 provide a snapshot of access to and quality of health care services in each region of the Socio-Economic RSA.

Potentially avoidable mortality from treatable causes provides an indication of deaths that could have potentially been avoided through the provision of medical care. In the Socio-Economic RSA, the more

rural areas such as the North Health Zone in Alberta and the Northern Interior HSDA in BC have higher rates of potentially avoidable mortality from treatable causes, indicating that access to care may be limited in these regions.

Ambulatory care sensitive conditions describe the rate of medical conditions in the population where appropriate primary care could have avoided or reduced the need for admission to hospital. This measure, therefore, provides an indication of sufficient access to primary care, and a high rate indicates problems in obtaining access to primary care. As shown in Table 5.8-11, the rates of ambulatory care sensitive conditions are greater in rural areas (North Health Zone and Northern Interior HSDA) compared to more urban areas (*e.g.*, Edmonton and Vancouver).

Regular medical doctor describes the percentage of people in a region who report having a regular medical doctor. Access to a medical doctor is important for early detection and treatment of medical conditions and for continuity of care. Overall, it seems that more British Columbians have a regular medical doctor than Albertans across all regions.

Doctor's rate provides an indication of the number of general/family physicians or specialists available to a given population. A high rate indicates that there is potential for good access to a physician/specialist in a geographic region. As shown in Table 5.8-11, specialists tend to congregate in urban centres such as Edmonton and Vancouver. The distribution of general/family physicians is less divergent among regions than for specialists.

TABLE 5.8-11

HEALTH CARE CAPACITY AND ACCESS TO CARE IN THE SOCIO-ECONOMIC RSA

Socio-Economic Region	Edmonton Region	Rural Alberta/Jasper Park Regions		Fraser-Fort George/Thompson-Nicola Region		Fraser Valley Region	Metro Vancouver Region				
Provincial Health Authorities	Edmonton Health Zone	North Health Zone	Alberta	Northern Interior HSDA	Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA	Fraser North HSDA	Richmond HSDA	Vancouver HSDA	British Columbia
Potentially avoidable mortality from treatable causes[1] (per 100,000 population)	65.5	78.7	67.2	77.2	65.3	65.3	59.5	50.2	42.6	55.6	57.5
Ambulatory care sensitive conditions[2] (per 100,000 population)	240	551	309	497	324	333	253	223	156	200	263
Regular medical doctor[3] (%)	79.8	75.4	79.7	88.8	85.0	92.6	86.7	84.9	85.0	82.3	86.3
Doctors rate – general/family physician[4] (per 100,000 population)	120	84	109	125	109	92	79	83	88	169	119
Doctors rate – specialist physicians[4] (per 100,000 population)	145	22	103	55	58	45	48	75	65	264	96

Source: Statistics Canada 2013b

Notes: 1 Year 2006/2008

2 Year 2010/11

3 Year 2009/10

4 Year 2010

5.8.6.2 Hospitals and Health Care Centres

Edmonton Region

Compared to Alberta as a whole, health care services are robust in the Edmonton Region. There is a high physician-to-population ratio and almost 80% of people have a regular physician. These statistics are in agreement with the low rate of ambulatory care sensitive conditions, which is a measure of access to primary health care.

Edmonton houses a large number of primary health centres, regional and tertiary hospitals and ancillary services, and acts as the referral centre for all of the Edmonton Health Zone as well as for the North Health Zone.

Details on hospital facilities located in the Edmonton Region are presented in Table 5.8-12. The key services listed in the table (*i.e.*, 24-hour emergency care, CT scan/MRI, and general and orthopaedic surgery) are those that are most likely to be in demand as a result of any Project-related increase in health service needs. The provision of these key services is also an indication of the extent to which a hospital or health facility is able to treat serious conditions without transferring the patient to a more comprehensive facility.

A figure showing the location of health care facilities in the Edmonton Region in relation to the proposed pipeline corridor is provided in Section 4.6 of the Community Health Technical Report of Volume 5D.

TABLE 5.8-12

HEALTH CARE FACILITIES IN THE EDMONTON REGION

Facility Name	Location	Service Area	Key Services provided	Staffing Levels	Number of Beds
Grey Nuns Community Hospital	Edmonton	Edmonton Health Zone and North Health Zone	• 24-hour emergency • CT scan • MRI • general surgery • orthopaedic surgery	N/A	347
Misericordia Community Hospital	Edmonton	Edmonton Health Zone and North Health Zone	• 24-hour emergency • CT scan • MRI • general surgery • orthopaedic surgery	N/A	306
Royal Alexandra Hospital	Edmonton	Edmonton Health Zone; North Health Zone; Western Canada	• 24-hour emergency • CT scan • MRI • general surgery • orthopaedic surgery	N/A	678
University of Alberta Hospital	Edmonton	Edmonton Health Zone and North Health Zone	• 24-hour emergency • CT scan • MRI • orthopaedic clinic	N/A	650
Northeast Community Health Centre	Edmonton	Edmonton Health Zone	• 24-hour emergency	N/A	N/A
Health First Strathcona	Sherwood Park	Edmonton	• after-hours urgent care • CT scan • MRI	N/A	N/A
Westview Health Centre	Stony Plain	Stony Plain area	• 24-hour emergency • day surgery	N/A	68
Fort Saskatchewan Community Hospital	Fort Saskatchewan	Fort Saskatchewan area	• 24-hour emergency	N/A	38

TABLE 5.8-12 Cont'd

Facility Name	Location	Service Area	Key Services provided	Staffing Levels	Number of Beds
Sturgeon Community Hospital	St. Albert	St. Albert area	• 24-hour emergency • CT scan	N/A	167
Drayton Valley Health Centre	Drayton Valley	Drayton Valley area	• 24-hour emergency • CT scan • MRI	N/A	34
Redwater Health Centre	Redwater	Redwater area	• 24-hour emergency • CT scan	N/A	21
Devon General Hospital	Devon	Devon area	• 24-hour emergency • CT scan	N/A	21
Leduc Community Hospital	Leduc	Leduc area	• 24-hour emergency • CT scan	N/A	70

Source: AHS 2013a

Note: N/A means not available

Rural Alberta Region

The Rural Alberta Region is serviced by health care centres located in the towns of Edson and Hinton. Details of these facilities are shown in Table 5.8-13. A figure showing the location of health care facilities in the Rural Alberta Region in relation to the proposed pipeline corridor is provided in Section 4.6 of the Community Health Technical Report of Volume 5D.

TABLE 5.8-13

HEALTH CARE FACILITIES IN THE RURAL ALBERTA REGION

Facility Name	Location	Service Area	Key Services Provided	Staffing Levels	Number of Beds
Edson Healthcare Centre	Edson	Edson and surrounding area	• 24-hour emergency • Day surgery • Orthopaedic surgery (visiting) • X-ray	N/A	Acute: 23 Continuing care: 50
Hinton Healthcare Centre	Hinton	Hinton and surrounding area	• 24-hour emergency • CT scan • MRI • Day surgery	General practitioners: 14 Nurses: 79 Surgeon: 1	Acute care: 21

Sources: AHS 2013a, Lodder pers. comm.

Note: N/A means not available

The Edson Healthcare Centre is considered a full-service community hospital and is also a major service centre for western Alberta. A new hospital is being planned for Edson, which will further increase capacity (Lemieux pers. comm.). The Hinton Healthcare Centre is considered a full-service acute care centre, and provides a narrower range of services than Edson. The facility provides basic services as well as 24-hour emergency services. Imaging services include a new CT scanner as well as a visiting MRI which is available one week out of every five (Lodder pers. comm.). The Hinton Healthcare Centre works closely with facilities in the towns of Edson and Jasper and with Rapid North, a critical care consultation group, to accommodate in-patient needs and to transfer patients to the most appropriate facility when required (Lodder pers. comm.). Although the Hinton Healthcare Centre experiences staff turnover, their current recruitment systems have been adequate to meet staffing needs and the health care needs of the community (Lodder pers. comm.).

Jasper National Park Region

Jasper has one health care centre located in the centre of town. Key services as well as staffing levels are described in Table 5.8-14. The Jasper Healthcare Centre offers acute care and community care services; however, patients requiring surgery or suffering from serious life-threatening injuries are transferred to a referral hospital in Edmonton. A figure showing the location of health care facilities in the Jasper Region in relation to the proposed pipeline corridor is shown in Section 4.6 of the Community Health Technical Report of Volume 5D.

TABLE 5.8-14

HEALTH CARE FACILITIES IN THE JASPER NATIONAL PARK REGION

Facility Name	Location	Service Area	Key Services Provided	Staffing Levels	Number of Beds
Jasper Healthcare Centre	Jasper	Jasper National Park	• 24-hour emergency • X-ray	N/A	Acute: 10 Palliative: 1

Source: AHS 2013a

Note: N/A means not available

Fraser-Fort George/Thompson-Nicola Region

The Fraser-Fort George/Thompson-Nicola Region spans the southern tip of the Northern Interior HSDA (a subsection of the Northern Health Authority) and as well as most of the Thompson Cariboo Shuswap HSDA (a subsection of the Interior Health Authority). Health care facilities for this region are described in Table 5.8-15 and a figure showing the location of health care facilities in the Fraser-Fort George/Thompson-Nicola Region in relation to the proposed pipeline corridor is shown in Section 4.6 of the Community Health Technical Report of Volume 5D.

TABLE 5.8-15

HEALTH CARE FACILITIES IN THE FRASER-FORT GEORGE/THOMPSON-NICOLA REGION

Facility Name	Location	Service Area	Key Services Provided	Staffing Levels	Number of Beds
McBride Hospital	McBride	Valemount, McBride, Albreda, Tête Jaune Cache	• 24-hour emergency • x-ray	General practitioners: 3 Nurses: 6 LPN: 6	Acute: 2 ER stretchers: 2
Valemount Community Health Centre	Valemount	Valemount, McBride, Albreda, Tête Jaune Cache	• 24-hour emergency • x-ray	General practitioners: 3 Nurses: 3 Technicians: 2	ER stretchers: 3
Blue River Health Centre	Blue River	N/A	• N/A	N/A	N/A
Dr. Helmcken Memorial Hospital	Clearwater	N/A	• 24-hour emergency • X-ray	General practitioner: 1 + locum physicians	Acute care: 16
Barriere Health Centre	Barriere	N/A	• 11-hour emergency • X-ray	General practitioners: 3	N/A
Royal Inland Hospital	Kamloops	N/A	• 24-hour emergency • CT scan • MRI • General surgery • Orthopaedic surgery	N/A	Total: 216 Acute care: 141
Nicola Valley Hospital and Health Centre	Merritt	N/A	• 24-hour emergency • X-ray	General practitioners: 6	Total: 8 Acute care: 8

Sources: Interior Health Authority 2013, Strang pers. comm.

Note: N/A means not available

In the Village of Valemount (the only community in the Socio-Economic RSA that lies within the Northern Interior HSDA), there is one community health centre that operates from 8:00am-4:30pm with after-hours on-call support. The centre has basic health care services including 24-hour emergency care, laboratory and X-ray. The facility sometimes experiences staff shortages and in the past has had to transfer all after-hours care to the McBride hospital, which lies 45 minutes north of the Village of Valemount (Strang pers. comm.). The centre recently completed a 3.3 million dollar renovation that improved emergency room space and equipment, making it comparable to other larger facilities in the district. Patient cases that require more advanced care are transferred to the Village of McBride (for in-patient care) or the City of Prince George (for MRI/CT scan) (Strang pers. comm.).

The Blue River Health Centre is a community health centre that in the past has suffered from severe staff shortages forcing it to temporarily close its doors due to limited staff availability (Interior Health Authority 2012a).

The Dr. Helmcken Memorial Hospital is located in the District of Clearwater and is considered a Community Level One hospital providing emergency and acute care services only. Bed occupancy rates are high (81.5%) but are within capacity of the hospital. Compared to the other two hospitals in the Thompson Cariboo Shuswap HSDA, this hospital sees much fewer emergency department visits (approximately 2,286 unscheduled visits in 2010/11). Seventy-seven percent of all patients are admitted through the emergency department (Doberstein 2012a). According to the City Administrator, there is a doctor shortage in the District of Clearwater with only one physician residing in town. The hospital meets its current needs through the placement of visiting physicians; however, the physician shortage is a concern of the community. Efforts are in place to recruit more physicians to the area (Young 2013).

The Barriere Health Centre is a community health centre located in the District of Barriere. At the health centre, there are three full-time physicians, an emergency centre, lab, and other services available. Emergency services are only available from 8:00am to 7:00pm Monday through Friday.

The Royal Inland Hospital is located in the City of Kamloops and is considered a tertiary referral hospital, meaning that it offers a wider variety of services compared to community hospitals and services a larger geographic area. The hospital sees well over 50,000 emergency visits per year. Besides the medical/surgical beds shown in Table 5.8-15, Royal Inland also has beds for intensive care or critical care units (14), obstetrics (8), paediatrics (9), psychiatry (26), and rehabilitation (18). The number of beds at this hospital has not changed over the last three service years; however, the occupancy rate has slowly increased over this same time period to 107%, indicating that this hospital is operating over-capacity. Sixty-two percent of all patients are admitted through the emergency department (Doberstein 2012b).

The Nicola Valley Health Centre is located in the City of Merritt. The number of emergency department visits is high considering the number of in-patient beds available. Overall, this facility operates at 113% capacity. As with the Royal Inland Hospital, the number of beds has not increased in the last three years. Seventy-eight percent of all patients are admitted through the emergency room. The number of unscheduled emergency department visits has been decreasing from 11,012 in 2009 and 2010 to 9,421 in 2011 and 2012. This decrease coincides with an increase in scheduled emergency department visits during this same time period. This could indicate that more patients are scheduling appointments compared to simply showing up at the emergency department for regular care services such as diabetes management (Doberstein 2012c). Municipal officials state that there are no doctor shortages in the City of Merritt with six full-time physicians. The Nicola Valley Health Centre is currently working with Interior Health to get some services returned to the hospital (*e.g.*, ultrasound) (Roline pers. comm.).

Fraser Valley Region

Fraser Health is comprised of three HSDAs: Fraser East; Fraser South; and Fraser North. The Fraser East HSDA is the only one that falls within the Fraser Valley Region of the Socio-Economic RSA.

There are four hospitals located in the Fraser East HSDA: Abbotsford Regional Hospital; Chilliwack Hospital; Fraser Canyon Hospital; and Mission Memorial Hospital. Details on these health care facilities are shown in Table 5.8-16 and a figure showing the location of health care facilities in the Fraser Valley

Region in relation to the proposed pipeline corridor is shown in Section 4.6 of the Community Health Technical Report of Volume 5D.

TABLE 5.8-16

HEALTH CARE FACILITIES IN THE FRASER VALLEY REGION

Facility Name	Location	Service Area	Key Services Provided	Staffing Levels	Number of Beds
Fraser Canyon Hospital	Hope	Hope and area	• 24-hour emergency • Day surgery	N/A	Total: 10
Chilliwack Hospital	Chilliwack	Chilliwack and region	• 24-hour emergency • CT scan • General surgery • Orthopaedic surgery	N/A	Total: 104
Abbotsford Regional Hospital	Abbotsford	Eastern Fraser Valley	• 24-hour emergency • CT scan • MRI • General surgery	N/A	Total: 268
Mission Memorial Hospital	Mission	Mission and area	• 24-hour emergency • Day surgery • Orthopaedic surgery	N/A	Total: 22 Palliative: 2

Source: Fraser Health Authority 2013

Note: N/A means not available

In their latest service plan, Fraser Health estimated that they will need to recruit 350 registered nurses over the next 5 years in order to meet projected staffing needs, although this figure is for the entire Fraser Health Authority and not specific to the Fraser East HSDA. Likewise, the report states that by 2020, they will need an additional 1,100 acute beds to meet the needs of their growing population (Interior Health Authority 2012b). Many facilities across the Fraser Health Authority, such as the Abbotsford Regional Hospital, are facing bed shortages and sometimes have to treat patients for an extended period in hallways. This is noted to be a systemic issue and not more strongly associated with any given facility (Baker 2012a,b).

Metro Vancouver Region

The Metro Vancouver Region comprises four HSDAs: Fraser South; Fraser North; Vancouver; and Richmond. Health care facilities in these areas are described in Table 5.8-17. A figure showing the location of health care facilities in the Metro Vancouver Region in relation to the proposed pipeline corridor is provided in Section 4.6 of the Community Health Technical Report of Volume 5D.

TABLE 5.8-17

HEALTH CARE FACILITIES IN THE METRO VANCOUVER REGION

Facility Name	Location	Service Area	Key Services Provided	Staffing Levels	Number of Beds
Langley Memorial Hospital	Langley	Langley and area	• 24-hour emergency • CT scan • General surgery	Total staff: 1,683	Total: 166 Long-term: 224
Surrey Memorial Hospital	Surrey	Surrey and Vancouver area	• 24-hour emergency • CT scan • MRI • General surgery • Orthopaedic surgery	N/A	ER: 40
Delta Hospital	Delta	Delta and area	• 24-hour emergency • CT scan • General surgery	Total staff: 580	Acute: 50 Residential: 92

TABLE 5.8-17 Cont'd

Facility Name	Location	Service Area	Key Services Provided	Staffing Levels	Number of Beds
Ridge Meadows Hospital	Maple Ridge	Maple Ridge and area	• 24-hour emergency • CT scan • General surgery	100+ doctors	Acute: 125 Psychiatric: 20 Convalescent: 10 Hospice: 10 Long-term care: 148
Eagle Ridge Hospital	Port Moody	Port Moody and area	• 24-hour emergency • CT scan • General surgery	N/A	Acute: 102 Other: 35
Royal Columbian Hospital	New Westminster	New Westminster and area	• 24-hour emergency • CT scan • MRI • General surgery • Orthopaedic surgery	N/A	Acute: 397 ER: 50 stretchers
Burnaby Hospital	Burnaby	Burnaby, east Vancouver, Tri-cities area	• 24-hour emergency • CT scan • MRI • General surgery • Orthopaedic surgery	N/A	Total: 289 Operating rooms: 6/10 ER: 33
Lions Gate Hospital	North Vancouver	North Shore, Powell River, Sechelt, Sea to Sky and the Bella Bella/Bella Coola	• 24-hour emergency • CT scan • MRI	N/A	Total: 268
Mount Saint Joseph Hospital	Vancouver	East Vancouver	• 12-hour emergency	N/A	Rehab: 76 Residential: 100
St. Paul's Hospital	Vancouver	Vancouver, BC and Yukon	• 24-hour emergency • Orthopaedic clinic	N/A	Total: 440
Vancouver General Hospital	Vancouver	Vancouver, BC and Yukon	• 24-hour emergency • CT scan, MRI • All surgery types	N/A	Total: 1,900
Richmond Hospital	Richmond	Richmond, Delta, travelers using airport or BC Ferries	• 24-hour emergency • CT scan	N/A	Total: 125

Sources: Fraser Health Authority 2013, Vancouver Coastal Authority 2013

Note: N/A means not available

Like Edmonton, the Metro Vancouver Region houses a large number of primary health centres, regional and tertiary hospitals and ancillary services. It is home to most specialist physicians in BC and also contains a large number of general practitioners compared to the rest of the province. The hospitals in this region are the busiest in the province, each servicing tens of thousands of patients per year. Many of the hospitals are currently functioning over-capacity and expect to face major capacity challenges in the near future as staff retires and the population ages and continues to increase.

Burnaby Hospital is the closest hospital to the Westridge Marine Terminal, at a distance of approximately 8 km. The hospital recently received a high amount of criticism in a report written by a community consultation committee that was compiled by Fraser Health (Burnaby Hospital Community Consultation Committee 2012). The report was prompted by complaints from physicians regarding high outbreaks of the bacterium *C. difficile* in the hospital. Overall, the report concluded that Burnaby Hospital is greatly underfunded compared to other hospitals in Fraser Health and that new building structures are required to prevent disease outbreaks. Burnaby Hospital now has the third busiest emergency department in BC, receiving over 70,000 emergency department visits per year, much beyond its capacity. Many other departments were noted to be operating over-capacity as well. For example, the oncology department was designed to serve 1,800 to 2,000 patients a year but currently treats up to 10,000 patients per year.

The report also points out that the area around Burnaby Hospital is slated for increased development. This has worried many stakeholders who were interviewed for the Socio-Economic Assessment, stating that the hospital scarcely meets current needs let alone any future growing demand.

5.8.6.3 Emergency Medical Response

Emergency medical response comprises those services and systems that deal with medical emergencies prior to patients arriving in hospitals. The purpose of effective emergency medical response is to minimize adverse health (and other) consequences after an initial precipitating event has taken place.

Emergency medical response includes: first responders such as fire departments and emergency medical services (EMS) including ground and air ambulances; receiving facilities such as emergency departments and hospitals/health care centres; and the services involved in transferring unstable patients to higher levels of care. Emergency medical response also includes the systems used to coordinate services and dispatch resources on either a local or a regional level. Finally, it also includes the planning and overall organization of the health care system as it pertains to emergency health care and response, and ties in to emergency planning and preparedness of municipalities. These services respond to emergency events ranging from the very small to the very large, including individual health crises, motor vehicle collisions, and community-wide fires or other emergencies or disasters.

EMS practitioners and ambulance crews provide two distinct levels of care: Basic Life Support and Advanced Life Support. Basic Life Support services are provided by Emergency Medical Responders (EMR) and Primary Care Paramedics; these responders provide care for traumatic injuries and medical emergencies. When more advanced care is required and an Advanced Life Support crew is available, Advanced Care Paramedics are dispatched (BC Ambulance Service [BCAS] 2011). Alberta's designation of EMS practitioners differs from the national standard and includes three tiers of service: EMR; Emergency Medical Technologist – Ambulance (EMT); and Emergency Medical Technologist – Paramedic (EMT-P). EMT is equivalent to Primary Care Paramedic; EMT-P is equivalent to Advanced Care Paramedics.

The EMS system is comprised of two main functions: 1) communications, including dispatch and coordination of response; and 2) delivery of care, including vehicles and crews. In both Alberta and BC, EMS is organized at the provincial level, as described below.

Alberta

In Alberta, Emergency Health Services are the responsibility of the provincial health authority (AHS) and are provided either directly by AHS or through one of more than 40 contracted EMS service providers. EMS consists of both ground and air transportation options. In the province, there are more than 500 emergency vehicles and 12 fixed wing air-craft that can respond to emergencies 24 hours a day. AHS has also established a relationship with the Shock Trauma Air Rescue Society (STARS) to ensure rotary air transport is available out of three locations: Edmonton, Calgary and Grande Prairie.

In Alberta, 9-1-1 calls are routed to public safety answering points. Municipalities are responsible for public safety answering points, which may operate as standalone centres which evaluate the call and transfer it to a dispatcher or as part of a coordinated emergency dispatch centre that may include any combination of police, fire and ambulance services. As with EMS service providers, dispatch centres in Alberta include both AHS-operated and AHS-contracted providers. Although EMS transport is coordinated through a Central Communication Centre in Edmonton, service areas and responsibilities for various dispatchers has led to "borders in what is meant to be a borderless provincial EMS system" (Health Quality Council of Alberta 2013).

The responsibility of AHS for EMS services does not extend to remote industrial sites and to those Aboriginal communities that operate their own ambulance services. Industrial sites such as drilling operations contract private companies to provide on-site emergency health services and some ground transport. Such sites may contract STARS' remote site registration service to improve emergency preparedness and coordination of response for more severe medical events and injuries.

British Columbia

In BC, air and ground EMS are operated by the BCAS. BCAS operates under the authority of the Emergency and Health Services Commission which has the legislated mandate to provide residents with access to pre-hospital emergency and patient transfer services (BCAS 2013a). This model of care closely aligns BCAS with health care service delivery in the province (BCAS 2011).

There are three regional dispatch centres for BCAS, located in the cities of Kamloops, Vancouver and Victoria. Critical care paramedics are located in each regional centre for dispatch across the Socio-Economic RSA. BCAS has a total of 6 airplanes, 4 helicopters, and access to 40 charter carriers throughout the province. Ground operations include over 540 emergency vehicles that are deployed from 184 stations across the province.

BCAS has also partnered with the provincial Emergency Management Office which provides oversight for multi-casualty incidents or emergency situations that involve multiple patients at one time. BCAS crews participate in emergency planning and mock disaster exercises, amongst other trainings, in order to be fully prepared to respond to these types of emergency situations.

Table 5.8-18 identifies the locations of EMS services in the communities of the Socio-Economic RSA that house, at a minimum, basic ground ambulance services. Hospitals with emergency departments are destinations to which ambulances would deliver patients; tertiary care centres receive more complicated or unstable patients as well as all almost all air ambulance medical evacuations.

TABLE 5.8-18

EMS SERVICES IN THE SOCIO-ECONOMIC RSA

Socio-Economic Region	Community	Ground Ambulance Base	24-hour Emergency Department	Tertiary Care Trauma Centre	EMS Region	Air Ambulance Base
Edmonton Region	Fort Saskatchewan	•	•		Edmonton Zone	
	Edmonton	•	•	•	Edmonton Zone	•
	Spruce Grove	•			Edmonton Zone	
	Stony Plain	•	•		Edmonton Zone	
	Wabamun	•			Edmonton Zone	
	Mayerthorpe	•			North Zone	
	Onoway	•			North Zone	
	Alberta Beach	•			North Zone	
	Morinville	•			Edmonton Zone	
	Gibbons	•			Edmonton Zone	
	Legal	•			North Zone	
	Redwater	•	•		Edmonton Zone	
	St. Albert	•	•		Edmonton Zone	
	Drayton Valley	•	•		Central Zone	
	Breton	•			Central Zone	
	Leduc	•	•		Edmonton Zone	
	Beaumont	•			Edmonton Zone	
	Calmar	•			Central Zone	
	Devon	•	•		Edmonton Zone	
	Warburg	•			Central Zone	
Rural Alberta Region	Edson	•	•		North Zone	
	Hinton	•	•		North Zone	
Jasper National Park Region	Jasper	•	•		North Zone	

TABLE 5.8-18 Cont'd

Socio-Economic Region	Community	Ground Ambulance Base	24-hour Emergency Department	Tertiary Care Trauma Centre	EMS Region	Air Ambulance Base
Fraser-Fort George/Thompson-Nicola Region	Valemount	•			Kamloops	
	McBride	•	•		Kamloops	
	Clearwater	•	•		Kamloops	
	Kamloops	•	•	•	Kamloops	•
	Merritt	•	•		Kamloops	
	Barriere	•	• (not 24-hr)		Kamloops	
	Chase	•			Kamloops	
	Logan Lake	•			Kamloops	
	Princeton	•			Kamloops	
Fraser Valley Region	Hope	•	•		Vancouver	
	Chilliwack	•	•		Vancouver	
	Abbotsford	•	•	•	Vancouver	
	Mission	•	•		Vancouver	
Metro Vancouver Region	Langley	•	•		Vancouver	
	Surrey	•	•		Vancouver	
	Coquitlam	•			Vancouver	
	Burnaby	•	•		Vancouver	
	Maple Ridge	•	•		Vancouver	
	White Rock	•	•		Vancouver	
	New Westminster	•	•		Vancouver	
	Delta	•	•		Vancouver	
	Port Coquitlam	•			Vancouver	
	Richmond	•	•		Vancouver	
	Port Moody	•	•		Vancouver	
	North Vancouver	•	•	•	Vancouver	•
	West Vancouver	•			Vancouver	
	Lions Bay	•			Vancouver	

Sources: Alberta Health 2013, AHS 2013a, BCAS 2013b, Fraser Health Authority 2013, Health Quality Council of Alberta 2013, Interior Health Authority 2013, ScanBC 2013, Vancouver Coastal Authority 2013

Note: • means available

5.8.7 Aboriginal Health

Development projects have the potential to affect components of the natural environment that comprise a valuable part of the lives of many Aboriginal people and communities. Since the Project will encounter a number of Aboriginal traditional lands along the proposed pipeline corridor, it is important to understand health conditions in those communities as well as the unique way in which the natural environment comprises a central component of health for many Aboriginal peoples.

The potential for Project interaction with and effects on Aboriginal populations in Alberta and BC is considered in a number of different sections within this volume, including: heritage resources (Section 7.2.1); TLRU (Section 7.2.2); social and cultural well-being (Section 7.2.3); HORU (Section 7.2.4); and employment and economy (Section 7.2.7) of this volume as well as in several biophysical elements of Volume 5A including: water quality and quantity (Section 7.2.3); fish and fish habitat (Section 7.2.7); wetland loss or alteration (Section 7.2.8); vegetation (Section 7.2.9); wildlife and wildlife habitat (Section 7.2.10); and species at risk (Section 7.2.11). Volume 8A discusses effects on marine components relevant for Aboriginal populations.

In this subsection, existing conditions are described that are relevant to the health of Aboriginal populations and that are not considered elsewhere in the socio-economic setting (Sections 5.0 and 6.0 of Volume 5B) or the environmental setting (Sections 5.0 and 6.0 of Volume 5A). These are:

- definitions of health among Aboriginal peoples;
- diet and nutritional outcomes;
- overall health status of Aboriginal populations in the Socio-Economic RSA; and
- Aboriginal health care service provision.

Trans Mountain has embarked on an extensive program to engage Aboriginal communities along the proposed pipeline corridor, facilitating TLU, TMRU and socio-economic studies as well as the participation on biophysical field surveys for the Project with interested Aboriginal communities. Detailed methods of TEK collection during biophysical field survey participation can be found within the Vegetation, Wildlife, Wetland Evaluation, Fisheries (Alberta) and Fisheries (British Columbia) Technical Reports of Volume 5C. Results of the preliminary interests identified, the TLU and TMRU studies completed to date can be found in Volumes 5D and 8A, respectively. This subsection relies on existing information that has been collected on Aboriginal populations in Alberta and BC. This information has been collected recently in a sensitive manner and with the coordination of Aboriginal populations, especially in BC. It is hoped that these data present accurate conditions of Aboriginal health in the Socio-economic RSA. Details regarding Trans Mountain's framework for the comprehensive engagement with each community are provided in Volume 3B.

5.8.7.1 Definitions of Health Among Aboriginal Peoples

It is important to acknowledge that the way that health is conceptualized is different for Aboriginal peoples in Alberta and BC than for many non-Aboriginal populations. Aboriginal concepts of health are deeply rooted in the inter-relationships between land, water, culture and identity (First Nations Health Society 2010, Loppie-Reading and Wien 2009, Office of the Provincial Health Officer 2009). This concept of an inter-relationship between nature and people supports a link between the well-being of the environment and the physical, social, cultural and mental well-being of individuals and communities. To many Aboriginal peoples, these factors cannot be considered separate from one another. A quotation that illustrates this concept is shown below, originally published in the *BC First Nations and Aboriginal People's Mental Wellness and Substance Use 10 Year Plan* (First Nations Health Authority *et al.* 2013).

> *"To live in wellness means striving to be in balance, within self (Body, Mind, Spirit and Emotion), with others (Family & Community), with the Spirit World and with the land (nature). If there is an imbalance in any of these areas there is stress on our overall system. In time this stress causes illness and it can be physical illness, mental/emotional illness (such as depression), or spiritual illness."*

To this end, it is important to recognize that health, for many Aboriginal peoples, comprises an array of factors that is much broader than measures of mortality and morbidity. In addition, many key components and determinants of health and well-being for Aboriginal populations in the Socio-Economic RSA are described in other sections of this application that discuss social and cultural well-being and aspects of the biophysical environment.

5.8.7.2 Diet and Nutritional Outcomes

Health impacts resulting from changes in diet and nutrition are a major concern when development activities affect populations reliant on subsistence resources. Subsistence food sources are important for maintaining a healthy diet, and have been linked with lower rates of conditions such as obesity, diabetes, heart disease and stroke. In addition to supporting a healthy diet, subsistence food sources also support other aspects of culture and community. A quotation that speaks to the importance of subsistence

resources is cited in the report *Healthy Children, Healthy Families, Healthy Communities: BC Provincial Results of the 2008-10 First Nations Regional Health Survey (RHS)* (First Nations Health Authority 2012).

> *"Our traditional foods have nourished us well since the time of our creation and have been of fundamental importance to our culture. We developed sophisticated techniques to preserve a variety of foods year-round to keep our bodies strong and this knowledge has carried us well into our current place. Many challenges now exist for First Nations who wish to access traditional foods. The land and water have experienced changes that now limit the ability to access adequate amounts of our traditional foods. At the same time, our lives have been widely influenced by an abundance of processed, commercially influenced food sources and lack of access to nutritious whole foods.*
>
> *Each year we affirm our identity and reinforce our ties to our indigenous food system and territories by harvesting and eating our traditional foods. Our traditional food remains an important aspect of social and cultural events, all of which center traditional food as an important aspect of being who we are. We thank the salmon, eulachon, clams, moose, deer, elk, beaver, birds, seaweed, berries, roots and medicines and they in turn nourish our bodies and spirits and help protect our body from illness and remind us of our past and help us think about our future.*
>
> *Protecting, restoring and relying on our traditional foods more can provide greater food security to our community and healthier food choices."*

This subsection focuses on the use of subsistence foods in relation to diet and nutritional outcomes. It should be noted that Aboriginal communities' use of subsistence resources in the Socio-Economic RSA is also discussed in other sections of this volume and in other volumes in the application. Although exposure to contaminants in subsistence foods is a factor that could substantially impact health for Aboriginal populations, the potential for and possible results of exposure to contaminants is discussed in the Screening Level Human Health Risk Assessment of Pipeline and Facilities of Volume 5D. This subsection focuses solely on diet and nutritional outcomes associated with subsistence food consumption patterns.

The First Nations Food, Nutrition and Environment Study (FNFNES) is being carried out across Canada to identify traditional food consumption patterns in Aboriginal populations living on-reserve and levels of contaminants in traditional foods (Chan *et al.* 2011). The FNFNES uses many different methods for collecting data, including: a traditional food frequency questionnaire; a 24-hour dietary recall; a socio/health/lifestyle questionnaire; a food security questionnaire; food sampling for contaminants; water sampling for trace metals and pharmaceuticals; and hair sampling for mercury. BC was the first region to implement the FNFNES study, with data collected in 2008 and 2009. Alberta is expected to begin data collection in late 2013 with the final report expected to be released in 2015.

The FNFNES study separates results into specific Ecozones and Cultural Areas. The Ecozones represent common distributions of plants and animals that are separated by natural barriers. Cultural Areas are an anthropological concept that separates geographic areas by traits or cultural affinities shared by indigenous communities. There are two Ecozones that correspond to the Socio-Economic RSA in BC: the Montane Cordillera/Plateau (Ecozone 3); and the Pacific Maritime/Plateau (Ecozone 7). Plateau is the cultural area that most closely aligns with the Socio-Economic RSA in BC. Note that the Lower Nicola, Splatsin and Douglas First Nations communities within these Ecozones align with the Fraser-Fort George/Thompson-Nicola and the Fraser Valley regions in the Socio-Economic RSA, respectively (Table 5.8-19).

TABLE 5.8-19

FNFNES ECOZONES AND FIRST NATION COMMUNITIES IN THE SOCIO-ECONOMIC RSA IN BC

Ecozone Number	Ecozone/Cultural Area Name	Name of Participating Communities	Socio-Economic Region	Year of Data Collection	Number of Participants
3	Montane Cordillera/Plateau	Lower Nicola	Fraser-Fort George/Thompson-Nicola	2009	41
		Splatsin (Spallumcheen)	Fraser-Fort George/Thompson-Nicola	2009	52
7	Pacific Maritime/Plateau	Samahquam	N/A	2009	20
		Douglas	Fraser Valley	2009	4
		Lil'wat (Mount Currie)	N/A	2009	93

Source: Chan *et al.* 2011

Note: N/A means not applicable

As shown in Table 5.8-20, First Nations communities located in the Fraser-Fort George/Thompson-Nicola and Fraser Valley regions have high consumption of subsistence foods, with over 90% of participants reporting consumption of wild fish in the previous year, over 80% reporting consumption of land mammals, approximately 90% reporting consumption of wild berries, and over 60% reporting consumption of fruits grown in home or community gardens (Table 5.8-20). These data underline the importance of subsistence foods as part of the diet of Aboriginal communities in these regions.

TABLE 5.8-20

DIET AND NUTRITION INDICATORS FOR ECOZONES IN THE SOCIO-ECONOMIC RSA IN BC

Socio-Economic Region	Fraser-Fort George/Thompson-Nicola	Fraser Valley	All BC First Nations communities
Ecozone	3	7	
Percent on-reserve who eat fruits and vegetables from their gardens or community gardens (%)	79	64	58
Participation in traditional food harvests			
Hunted or set snares (%)	31	15	20
Fished (%)	37	57	37
Collected seafood (%)	3	4	17
Participation in traditional food gathering			
Collected wild plant food (%)	54	42	33
Planted a garden (%)	35	26	25
Consumption of traditional food in the last year			
Fish (%)	93	94	95
Beach foods (%)	23	14	60
Sea mammals (%)	0	0	3
Land mammals (%)	89	81	84
Wild birds (%)	19	14	17
Wild berries (%)	87	94	86
Wild plant roots, shoots or greens (%)	43	54	26
Tree foods (%)	9	6	9
Mushrooms (%)	37	69	24

Source: Chan *et al.* 2011

The FNFNES study also asked participants about the benefits that they felt were associated with consumption of traditional foods. The top five benefits were: healthy/nutritious (33%); natural/safe (22%); cheap/free (14%); taste (8%); and cultural/educational (7%).

Barriers to Traditional Food Consumption

> *"We know from community participation in a number of studies that active participation in hunting, gathering and using traditional foods helps prevent chronic disease. Traditional food activities keep us physically active and spiritually grounded, and the nutrients offered by the plants and animals that we eat from our territory keep us strong. Many of us are faced with barriers in carrying out our traditional activities including lack of access to good hunting/harvesting areas, high costs for fuel and equipment, time, and concerns about contaminants."* (First Nations Health Authority 2012).

Although the dietary patterns shown in Tables 5.8-19 and 5.8-20 indicate that subsistence foods remain important for Aboriginal communities in the Fraser-Fort George/Thompson-Nicola and Fraser Valley regions, there has been a historical trend of reduced consumption of subsistence foods. Additionally, in the FNFNES survey, 91% of BC First Nations households indicated that they would prefer to eat more traditional food. The main barriers that were described in the survey as impeding the consumption of traditional foods included: lack of equipment/transportation (cited by 21% of participants); lack of availability (14%); lack of time (14%); difficulty in accessing the foods (12%); and government or firearms certificate legislation (8%) (Chan *et al.* 2011).

Food Insecurity

Food insecurity refers to an inability to secure sufficient healthy food for a family, and is linked to adverse health outcomes including hunger and nutritional inadequacy. The FNFNES study found rates of moderate food insecurity in Ecozones 3 and 7 at 33% and 32% respectively. Severe food insecurity was estimated to affect 13% of the population in both Ecozones (Chan *et al.* 2011). These figures are confirmed by a separate study of Aboriginal peoples living off-reserve in BC, which found that 33% of respondents reported being food insecure (Willows *et al.* 2009). These rates are extremely high when compared to the Alberta and BC populations as a whole. Estimates from the 2009 to 2010 Canadian Community Health Survey indicate that rates of moderate food insecurity for Alberta and BC were 4.8% and 5.2% respectively. Severe food insecurity was estimated at 2.4% and 3.2% (Health Canada 2012a).

5.8.7.3 Overall Health Status of Aboriginal Populations in the Socio-Economic RSA

Historically, there has been a gap between the health status of the Aboriginal and non-Aboriginal populations in Canada as measured by many disease, injury and mortality outcomes (Health Canada 2012b, Office of the Provincial Health Officer 2009, 2012). The information below depicts more specific health trends in Alberta and BC for Aboriginal populations. It should be noted that the level of detail of data available for First Nations communities is limited and, therefore, should not be interpreted as representative of each of the Aboriginal communities in the Socio-Economic RSA. Rather, these data provide an overall indication of the general status of First Nations population health in each province.

Alberta

A 2010 study conducted by Health Canada used a robust methodology and a close working relationship with key First Nations stakeholders and decision-makers to describe existing conditions related to health determinants and health outcomes among First Nations peoples in Alberta (Lachance *et al.* 2010). No similar document has been produced for Métis peoples in the province. Overall, the report concluded that the health status of the First Nations population in Alberta has been improving and gaining with respect to provincial averages, but that substantial disparities nonetheless remain in many areas. Some of the high-level findings from the study were as follows.

- Life expectancy and infant mortality rates for Alberta First Nations have improved considerably in the last few decades but still lag behind the Canadian average. Similarly, infant mortality rates are higher for Alberta First Nations compared to the total Alberta population.

- A lower proportion of First Nations rate their health as "excellent" or "very good" in comparison with the populations of Alberta and Canada. These results also correlate with higher rates of chronic disease, including arthritis/rheumatism, asthma, diabetes, heart disease and high blood pressure.

- Alberta's First Nations have poorer results for a number of key risk factors, including smoking, chronic conditions and addictions. Overweight and obesity rates are also high in First Nations communities in Alberta.

- Alberta First Nations populations are much more likely to abstain from alcohol consumption than non-First Nations populations both in Alberta and across Canada. However, a higher proportion of First Nations people who do consume alcohol are heavy drinkers.

- Housing conditions are poorer in First Nations communities than in other Albertan and Canadian communities. Housing conditions vary considerably between communities.

- Overall, death rates are higher for First Nations populations than for Albertans as a whole. Injury is the leading cause of death for First Nations people between the ages of 0 and 44.

A more recent report discusses specific health indicators for First Nations populations in Alberta related to three general categories: maternal health; cancer; and health protection (including infectious disease) (Health Canada 2013). Overall, this report makes similar conclusions as the report by Lachance and colleagues (2010); however, there are a few additional conclusions.

- Although the most prevalent cancers are the same between First Nations and non-First Nations communities (lung, breast, prostate and colorectal), First Nations have higher rates of cervical cancer and stomach cancer compared to non-First Nations. Survival rates for all cancers are still lower for First Nations than non-First Nations in Alberta.

- Traditional healing is an important part of cancer treatment for First Nations across Canada.

- There have been recent shigellosis and pertussis (whooping cough) outbreaks in several Alberta First Nations communities.

- Between 2001 and 2011, the rate of tuberculosis decreased almost 40% in Alberta First Nations communities. Rates of reported HIV cases also decreased by 22% between 2006 and 2011.

- Drinking water advisories have been increasing in First Nations communities since 2009; 98% of the water advisories between 2011 and 2012 were boil water advisories.

British Columbia

The First Nations RHS is a nation-wide survey that is governed by First Nations communities across the country. A recent report by the First Nations Health Authority in BC reports on the results of Phase 2 of the RHS (2008-2010) for BC First Nations (First Nations Health Authority 2012). Survey responses are amalgamated for the province as a whole and cannot be partitioned to include only areas in the Socio-Economic RSA. Table 5.8-21 presents key findings of the 2008-2010 RHS and, where possible, makes comparisons to results from the 2002-2003 RHS as well as to the non-First Nations population in BC. Overall, the results indicate that there has been improvement in some important health areas between the 2002 to 2003 and the 2008 to 2010 survey cycles for BC's First Nations populations; for example, rates of smoking are lower in both youth and adults, and binge drinking and suicide attempts decreased. However, many measures remain poor among BC First Nations survey respondents compared with the BC non-First Nations population, including: self-reported health status; several chronic health conditions such as arthritis, asthma, diabetes and heart disease; and use of tobacco.

TABLE 5.8-21

GENERAL HEALTH MEASURES FOR THE BC FIRST NATIONS POPULATION

	2008-2010 RHS	2002-2003 RHS	BC non-First Nations
OVERALL WELL-BEING			
Self-reported health status (% excellent or very good health)	43.2	45.1	60.1
Good to full functioning health (%)	53.0	N/A	N/A
Self-reported health conditions (%)			
Arthritis	26.5	N/A	17.8
Back problems	23.6	N/A	20.7
Hypertension	15.5	N/A	16.3
Asthma	12.0	N/A	7.2
Diabetes	9.0	N/A	5.7
Heart Disease	6.4	N/A	4.2
Cancer	2.2	N/A	2.1
LIFESTYLE FACTORS			
Eat fruit once a day or more - adults (%, Male/Female)	50.5/63.8	N/A	N/A
Eat vegetables once a day or more - adults (%, Male/Female)	63.3/67.2	N/A	N/A
Physically active – adults (%)	62.1	N/A	N/A
Physically active – youth (12-17 yrs) (%)	83.6	N/A	N/A
Current smoker (daily or occasional) – youth (%)	22.5	27.2	5.4
Current smoker (daily or occasional) – adult (%)	44.6	48.5	17.2
Non-smokers living in smoke-free homes (%)	85.7	74.8	N/A
Alcohol consumption in year prior to survey - adults (%)	62.8	59.7	79.8
Never used non-prescription drug in the previous year (%)			
Cannabis	65.6	N/A	N/A
Cocaine	94.1	N/A	N/A
Sedative/sleeping pill	94.3	N/A	N/A
Opioids	95.4	N/A	N/A
Amphetamine-type stimulant	97.8	N/A	N/A
MENTAL WELLNESS			
Binge drinking once a week or more in previous year – adults (%)	10.2	15.7	N/A
Ever seeking treatment for substance abuse or addiction (%)	16.1	N/A	N/A
High risk of depression (%)	7.5	N/A	N/A
Ever attempted suicide (%)	14.5	17.4	N/A

Source: First Nations Health Authority 2012

Notes: RHS – First Nations Regional Health Survey
N/A – not available

The 2008 to 2010 RHS asked participants to report on the factors that they felt were important for maintaining health. The responses included: good diet (77.4%); being happy or content (70.4%); getting regular exercise (69.9%); good sleep (68.7%); having good social supports (67.3%); being in balance physically, emotionally, mentally, and spiritually (57.9%); and reduced stress (52.4%). The RHS also reported on “community strengths” and “community issues”. Community strengths can be thought of as factors that support health, where issues represent barriers to achieving good health. The top five factors that were reported as supporting community well-being were: family values; Elders; traditional ceremonial activities; social connections; and community/health programs. The barriers that were most commonly mentioned were: alcohol and drug abuse; employment or number of jobs available; housing; funding and education; and training opportunities. These responses illustrate the broad determinants of health that govern Aboriginal health and well-being among BC First Nations.

Two relevant measures that describe health outcomes for the specific HSDAs within the Socio-Economic RSA are available: motor vehicle accidents; and prescription of antidepressants and anxiolytic medications.

Motor vehicle accidents are one of the largest contributors to potential years of life lost for Status Indian populations in BC. Rates of mortality caused by motor vehicle collisions are higher in rural regions such as Northern Interior and Thompson Cariboo Shuswap HSDAs in the Socio-Economic RSA (Fraser Health Authority 2010).

Antidepressants and anxiolytics are medications that are used for short-term relief or management of depression and anxiety. Rates of prescriptions for these medications can be used as a proxy for prevalence of stress, anxiety and depression in a population. Among the Status Indian population living in the Vancouver HDSA, rates for prescriptions of antidepressants were substantially higher than the average for the population in that area. For anxiolytics, higher than average prescription rates were seen in Vancouver and Northern Interior HSDAs. For both medications, prescription rates were lower for Status Indian populations than for other residents of BC. These lower rates may reflect lower levels of stress and anxiety among the Status Indian population; different prescribing habits of physicians; or individuals turning for treatment to healing modalities other than prescription medications.

5.8.7.4 Aboriginal Health Care Service Provision

In Canada, health care services are structured differently for the Aboriginal and non-Aboriginal populations. While Aboriginal people are able to access health care services anywhere across the province they live in, as is the case for all Canadians, health care provision on reserves in Canada falls under the jurisdiction of the federal government, whereas for non-Aboriginal populations and for Aboriginal populations off-reserve it is under provincial jurisdiction. The care of Aboriginal populations is managed slightly differently in different provinces. The responsibility and organization of health care service delivery for Aboriginal populations in Alberta and BC is described below.

Alberta

In Alberta, logistical issues have resulted in the Province taking on almost all hospital, physician and patient care services for Aboriginal populations. However, home care and public health on reserves remain the responsibility of Health Canada, through the First Nations and Inuit Health Branch. Much of this responsibility has been further devolved to individual bands.

A recent report released by the Health Council of Canada identified continued challenges in access to health care services for Aboriginal populations in Alberta and other provinces (Health Council of Canada 2012). The report stated that “Aboriginal people often feel uncomfortable, fearful, or powerless when they try to use the health care system, and some even avoid going for care when they are sick” and urged health care providers to find ways to “create culturally competent and safe environments that are free of racism and stereotypes, where Aboriginal people are treated with empathy, dignity and respect.” In response to these problems, the Alberta government has implemented an Aboriginal Health Program in an attempt to better involve Aboriginal communities in decisions around health care services, to improve access to health care in all geographic locations, to enhance cultural competencies of AHS health care staff, and to improve upon prevention and management practices of chronic disease (AHS 2013b). This has included the appointment of Aboriginal Health Liaisons charged with providing Aboriginal resources to AHS staff and working alongside Aboriginal clients and health care staff when requested (Armstrong pers. comm, Crofts and Peters 2012). There is an Aboriginal Health Liaison in the towns of Edson and Hinton in the Rural Alberta Region.

British Columbia

In BC, health care services for Aboriginal populations have undergone dramatic changes in the past few years. The changes began in 2005 with the signing of the Transformative Change Accord (Government of BC *et al.* 2005), whereby the federal and BC governments committed to closing the gap between First Nations and other British Columbians in terms of health, education, economic opportunities and housing. This was followed by the federal government signing the Tripartite First Nations Health Plan in 2007 (First

Nations Leadership Council *et al.* 2007), which ensured that First Nations were involved in decision-making about health.

In May 2011, BC First Nations adopted the Tripartite Framework Agreement on First Nations Health Governance, whereby BC First Nations agreed to take control of health care services for BC First Nations. By October 2013, the governance of health care services for BC First Nations will be completely transferred from the federal government to the First Nations Health Council and the First Nations Health Authority (First Nations Health Council and First Nations Health Authority 2013).

Currently, as in Alberta, Aboriginal residents of BC can access health care services that are available to all British Columbians. In addition, there are Aboriginal-specific health programs and Aboriginal patient liaisons that are available in all health authorities. Although changes to health care services delivery are expected to occur with the creation of the First Nations Health Authority, these changes may not be seen for several years.

Health care statistics for First Nations communities are sparse; however a report published in 2010 reports on three measures related to health care service provision: medical service plan utilization; preventable hospital admissions and follow up from mental health clients (Fraser Health Authority 2010).

Medical service plan utilization comprises the use of physician, laboratory and/or diagnostic services. Rates of medical service plan utilization from 2006 to 2007 show that Status Indians use medical services less than other residents (Table 5.8-22). This is especially the case in urban areas such as the Metro Vancouver and Fraser Valley regions.

Preventable hospital admissions are a measure of how well the primary health care system is reaching those in need. It measures hospital admissions from diseases and conditions that could be treated at the community level (*e.g.*, asthma, alcohol abuse, and diabetes). In all health authorities in the Socio-Economic RSA except for Interior Health, rates of preventable hospital admissions were greater for Status Indians than other residents. Rates were particularly high for Status Indians living in the Metro Vancouver Region and the Fraser Valley Region.

Evidence shows that the provision of early support to those patients who are discharged from a hospital or health care centre for mental health-related issues is important for stability, recovery and decreasing rates of re-admission (Fraser Health Authority 2010). In all health regions in BC in the Socio-Economic RSA, rates of follow-up were lower for Status Indian populations. The greatest differential between Status Indians and other residents in the Socio-Economic RSA was found in the Northern Interior HDSA.

TABLE 5.8-22

HEALTH CARE SERVICE STATISTICS FOR STATUS INDIANS IN THE SOCIO-ECONOMIC RSA

Socio-Economic Region	Fraser-Fort George/Thompson-Nicola Region				Fraser Valley Region		Metro Vancouver Region								British Columbia	
Provincial Health Authorities	Northern Interior HSDA		Thompson Cariboo Shuswap HSDA		Fraser East HSDA		Fraser South HSDA		Fraser North HSDA		Richmond HSDA		Vancouver HSDA			
	SI	OR	SI	OR	SI	OR	SI	OR	SI	OR	SI	OR	SI	OR	SI	OR
Medical Service Plan utilization (%)	72.2	83.8	74.2	84.2	69.5	83.4	64.2	85.1	63.7	83.2	62.5	84.0	58.2	82.2	70.8	84.4
Preventable hospital admissions (per 10,000)*	64.0	55.4	45.1	47.4	43.8	26.8	43.8	26.8	43.8	26.8	60.9	22.1	60.9	22.1	54.5	32.4
Follow up for mental health clients (%)	57.8	83.0	65.6	81.8	55.7	72.5	65.4	75.7	67.9	79.7	75.0	82.4	74.0	82.4	61.3	79.3

Source: Fraser Health Authority 2010

Notes: Data for year 2006/7

* - data reported on the level of the Health Authority

SI – Status Indian

OR – Other residents

HSDA – health service delivery area

5.9 Line Facilities

The locations of line facilities (*e.g.*, automated MLBVs, scraper traps) will be located within the permanent easement. Many automated MLBVs will be accessed by existing access roads; however, permanent access roads may be required at yet unspecified locations.

5.10 Reactivated Pipeline Segments

The reactivated segments from Hinton to Hargreaves and Darfield to Black Pines parallel the existing active TMPL system. The existing TMPL easement through Jasper National Park and Mount Robson Provincial Park is 6.1 m and 18 m wide, respectively. Outside the parks, the existing right-of-way along the two segments is generally 18 m wide. Surface disturbance along the reactivated segments will be limited to locations where automated MLBVs will be installed or where existing valves will be automated.

5.10.1 Hinton to Hargreaves Segment

The existing Hinton to Hargreaves pipeline segment extends from NW 33-49-26 W5M (RK 339.4) to 20-B/083-E-3 (RK 489.6). This segment begins in the Rural Alberta Region, extending through the Jasper National Park Region and into the northern part of the Fraser-Fort George/Thompson-Nicola Region. Table 5.10-1 provides a summary of the socio-economic elements and considerations for the reactivation of the Hinton to Hargreaves segment.

TABLE 5.10-1

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE HINTON TO HARGREAVES SEGMENT

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• The potential for undiscovered heritage resources is low given the high level of existing disturbance. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA.
Traditional Land Use and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 19 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project, including the reactivated pipeline segment: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; Sunchild First Nation; Lheidli T'enneh; Aseniwuche Winewak Nation; Simpcw First Nation; Whispering Pines (Clinton Indian Band); and Métis Nation British Columbia. • The Aboriginal communities listed above were identified to have historically used or presently use Crown lands along the proposed reactivated pipeline segment to maintain a traditional lifestyle. • Section 5.2 describes the regional TLRU setting of these communities.
Social and Cultural Well-being	• In 2011, the population of the Rural Alberta Region was approximately 29,300 and approximately 74.3% of the population was between the ages of 25 and 64 years old; the median age was 43.5 (Statistics Canada 2012). In 2011, approximately 11.5% of the Rural Alberta Region's population identified as Aboriginal (Statistics Canada 2013a). • In 2011, the Jasper National Park Region had a population of 4,085, which represents a 5% decrease since 2006. The workforce population (population between 15 and 64 years) was 84% of the total population, and the median age was 34.8 (Statistics Canada 2012). In 2011, approximately 2.2% of the region's population identified as Aboriginal (Statistics Canada 2013a). • In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region, including Electoral Area A of the RDFFG, was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013a). • In 2011, the median income within the Rural Alberta Region was approximately $34,700, in Jasper National Park Region was approximately $35,0000, and in Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although no IRs are crossed by this pipeline segment, it is located within the asserted traditional territories and areas of interest of the 19 Aboriginal communities (see TLRU above in this table). • In terms of community way-of-life, activities associated with this pipeline segment could occur in areas near the Town of Hinton (population 9,640 in 2011), the Municipality of Jasper (population 4,051 in 2011) and the Village of Valemount (population 1,020 in 2011). Hinton, Jasper and Valemount have experience with major projects, notably the TMX Anchor Loop Project, including the presence of temporary workers.

TABLE 5.10-1 Cont'd

Socio-Economic Elements	Summary of Considerations
Social and Cultural Well-being (cont'd)	• Refer also to the setting discussion of social and cultural well-being for the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions in Section 5.3. The social and cultural well-being setting for the Jasper National Park Region is described in Table 6.1-6 for the Jasper Pump Station.
Human Occupancy and Resource Use	• Most of this pipeline segment is located within Jasper National Park and Mount Robson Provincial Park, in the Jasper National Park Region. Current land use at and around this segment is primarily forested, with a portion of the right-of-way passing through urban industrial land in the Municipality of Jasper. The east portion is located in Yellowhead County in the Rural Alberta Region. The west portion is located in the RDFFG in the Fraser-Fort George/Thompson-Nicola Region. This pipeline segment is located in the Mountain View Policy Area of the Yellowhead MDP, Zone 3 (Natural Environment), Zone 5 (Park Service and the Montane Ecoregion of the Jasper National Park of Canada Management Plan and the Transportation Corridor Nature Recreation Zone, Transportation Corridor Intensive Recreation Zone and Yellowhead Pass Special Feature Zone of the Mount Robson Park Management Plan. • Although the reactivated pipeline segment does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 19 Aboriginal communities (see TLRU above). • No agricultural lands are located along the reactivated pipeline segment from Hinton to Hargreaves. • Outdoor recreational uses on the lands around this segment include hiking, wildlife viewing, mountain biking, camping, snowshoeing and skiing. The existing TMPL right-of-way is used for winter recreation activities, such as skiing, snowshoeing and walking. • Non-traditional hunting and trapping is prohibited in national parks (Alberta Guide to Hunting Regulations 2012). Fishing in National Parks requires a valid national park fishing permit, available at most park facilities and some commercial outlets. Provincial licenses are not valid inside national parks (Alberta Guide to Sportfishing Regulations 2012). • No mineral or aggregate tenures along the reactivated pipeline segment from Hinton to Hargreaves. • The reactivated pipeline segment is located in the boundaries of the Yellowhead County Noise Control Bylaw No. 21.01 and the Municipality of Jasper's Noise Bylaw No. 108. • Refer also to the setting discussion of HORU for the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions in Section 5.4. The HORU setting for the Jasper National Park Region is described in Table 6.1-6 for the Jasper Pump Station and in Section 7.0 of the Socio-Economic Technical Report (Volume 5D).
Infrastructure and Services	• Access to the reactivated pipeline segment is via Highway 16. • The reactivated pipeline segment crosses the Municipality of Jasper, which offers waste, water, housing, education and recreation amenities commensurate in size for its current population. • Refer also to setting discussion of infrastructure and services for the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions in Section 5.5. The infrastructure and services setting for the Jasper National Park Region is described in Table 6.1-6 for the Jasper Pump Station and Section 7.0 of the Socio-Economic Technical Report (Volume 5D).
Navigation and Navigation Safety	• Activities associated with reactivating this pipeline segment will not be located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• For the Rural Alberta Region in 2011, the most active industries (by industrial classification) were: mining, quarrying, and oil and gas extraction (employing approximately 16.6% of the labour force); retail trade (11.2%); construction (8.5%); and accommodation and food services (7.5%) (Statistics Canada 2013a). For the Rural Alberta Region in 2011, there was a labour force of approximately 17,000 workers, with a participation rate of about 73.2% and an unemployment rate of 5.9%. Approximately 8.5% of the regional labour force worked in the construction industry (Statistics Canada 2013a). • For the Jasper National Park Region in 2011, the most active industries (by industrial classification) were: accommodation and food services (employing approximately 28.9% of the labour force); transportation and warehousing (13.2%); healthcare and social assistance (9.6%); and retail trade (8.8%) (Statistics Canada 2013a). For the Jasper National Park Region in 2011, there was a labour force of approximately 2,490 workers, with a participation rate of about 84.3% and an unemployment rate of 1.6%. Approximately 4.6% of the regional labour force worked in the construction industry (Statistics Canada 2013a). • For the Fraser-Fort George/Thompson-Nicola Region overall in 2011, the most active industries (by industrial classification) were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013a). In the Fraser-Fort George/Thompson-Nicola Region, there is a diversity of the size of the labour force, depending on community. While the overall regional labour force is over 63,000, it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%). In 2011, approximately 7.7% of the regional labour force was experienced in the construction sector (Statistics Canada 2013a). • Refer also to the setting discussion of employment and economy for the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions in Section 5.7. The employment and economy setting for the Jasper National Park Region is described in Table 6.1-6 for the Jasper Pump Station.

TABLE 5.10-1 Cont'd

Socio-Economic Elements	Summary of Considerations
Community Health	• The Hinton to Hargreaves segment, part of the Rural Alberta, Jasper National Park and Fraser-Fort George/Thompson-Nicola regions, crosses two health zones in Alberta and BC: the North Health Zone in Alberta and the Northern Interior HSDA in BC. • Overall health in the North Zone and the Northern Interior HSDA is lower compared to the Alberta and BC provincial averages. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. • Self-perceived mental health, life satisfaction and life stress in the North Zone are comparable to the Alberta average, indicating similar levels of mental well-being. However, the Hinton area in particular has been shown to have high levels of alcohol and drug misuse. In the Northern Interior HSDA, perceived mental health and life satisfaction are slightly lower than the provincial average; the Northern Interior HSDA has been shown to have high levels of alcohol and drug misuse. • Rates of the most common STIs in both the North Zone and the Northern Interior HSDA are substantially higher than provincial averages. For both regions, rates of common notifiable respiratory and GI illnesses varied between regions and diseases with no apparent trend. • Information on cancers and other rare chronic conditions is too scant to draw conclusions about the communities in this segment. • Motor vehicle-related injuries and fatalities present a large health burden in this segment; alcohol consumption is implicated in a large proportion of collisions. • Data on health care capacity and access indicate a relative insufficiency of access to primary and tertiary health care compared to provincial averages; this trend is common to rural regions across Canada. Staff recruitment and retention has been a problem in several of the communities along the proposed reactivated pipeline segment from Hinton to Hargreaves. • Refer also to the setting discussion of community health for the Rural Alberta, Jasper National Park and Fraser-Fort George/Thompson-Nicola regions in Section 5.8.

5.10.2 Darfield to Black Pines Segment

The existing Darfield to Black Pines pipeline segment extends from 75-B/092-P-8 (RK 769.0) to 41-K/092-I-16 (RK 811.8). This pipeline segment is located in the TNRD within the Fraser-Fort George/Thompson-Nicola Region of the Socio-Economic RSA. Table 5.10-2 provides a summary of the socio-economic elements and considerations for the reactivation of the Darfield to Black Pines segment.

TABLE 5.10-2

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE DARFIELD TO BLACK PINES SEGMENT

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• The potential for undiscovered heritage resources is low given the high level of existing disturbance. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following five Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project, including the proposed reactivated pipeline segment: Simpcw First Nation; Whispering Pines (Clinton Indian Band); Tk'emlúps te Secwépemc; Skeetchestn First Nation; and Métis Nation British Columbia. • The reactivated pipeline segment crosses the Kamloops Indian Reserve 4 and the Whispering Pines Indian Reserve 4. • The Aboriginal communities listed above were identified to have historically used or presently use Crown lands along the proposed reactivated pipeline segment to maintain a traditional lifestyle. • Section 5.2 describes the regional TLRU setting of these communities.
Social and Cultural Well-being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region (including Electoral Areas A, B, O, P, J, M and N of the TNRD) was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013a). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • The existing pipeline segment crosses two IRs (Kamloops IR 4 and Whispering Pines IR 4) and lies within the asserted traditional territories and areas of interest of five Aboriginal communities (see TLRU above).

TABLE 5.10-2 Cont'd

Socio-Economic Elements	Summary of Considerations
Social and Cultural Well-being (cont'd)	• In terms of community way-of-life, this pipeline segment is located in Electoral Areas O and P of the TNRD north of the City of Kamloops (population 85,675 in 2011). Work related to pipeline reactivation is likely to draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, particularly from the City of Kamloops which is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Kamloops is a large regional service centre experienced with construction crews and with infrastructure/services capacity to absorb some temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• Current land use along and around this segment is primarily forested. • This pipeline segment is located in the Rural Resource Agricultural Zone of the Kamloops North OCP and the Agricultural (includes ALR) and Rural Resource Zones of the Barrier OCP. • The reactivated pipeline segment crosses the Kamloops Indian Reserve 4 and the Whispering Pines Indian Reserve 4 and is located within the asserted traditional territories and areas of interest of five Aboriginal communities (see TLRU above). • Agricultural land use along this segment includes some irrigated crop production and tame pasture (field crops) and woodland grazing (natural pasture and grazing). The field crop lands are mostly found in the southern part of the segment, north of Black Pines and where the pipe re-joins the proposed pipeline corridor. The natural pasture and grazing areas are located along the Westsyde Road. • Outdoor recreational use and tourism is abundant throughout the Socio-Economic RSA in this segment. Outdoor recreational uses include hunting, fishing, boating, golf, mountain biking and hiking. • The reactivated pipeline segment is located in Hunting and Trapping Region 3. Hunting and trapping season timing depends on the Management unit and the species, but most hunting occurs in September to March. Most trapping occurs October to April. • No noise bylaws exist for the TNRD. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.
Infrastructure and Services	• Access to the reactivated pipeline segment is via Highway 5. • The reactivated pipeline segment is located near to the City of Kamloops, which offers waste, water, housing, education and recreation amenities commensurate in size for its current population. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• Activities associated with reactivating the reactivated pipeline segment will not be located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall in 2011, the most active industries (by industrial classification) were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013a). In the Fraser-Fort George/Thompson-Nicola Region, there is a diversity of the size of the labour force, depending on community. While the overall regional labour force is over 63,000, it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%). In 2011, approximately 7.7% of the regional labour force was experienced in the construction sector (Statistics Canada 2013a). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.

TABLE 5.10-2 Cont'd

Socio-Economic Elements	Summary of Considerations
Community Health	• The Darfield to Black Pines segment, part of the Fraser-Fort George/Thompson-Nicola Region of the Socio-Economic RSA, is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower compared to the BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. • Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average; however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • For the Thompson Cariboo Shuswap HSDA, there is no consistent pattern with respect to infectious disease rates for notifiable STIs, respiratory or GI illnesses, compared with provincial trends. The population in the Darfield to Black Pines segment is also too small to draw conclusions about prevalence or trends in infectious diseases. • Information on cancers and other rare chronic conditions is too scant to draw conclusions about the communities in this segment. • Motor vehicle-related injuries and fatalities present a large health burden in this segment; alcohol consumption is implicated in a large proportion of collisions. • The Barriere Health Centre is located within this segment; the health centre hosts three physicians and a part-time emergency department. The Royal Inland Hospital in Kamloops comprises the closest tertiary care centre. As with many other rural regions in Canada, this area has a relative insufficiency of access to primary and tertiary health care compared to provincial averages. • Refer also to the setting discussion of community health for the Fraser-Fort George/Thompson-Nicola Region in Section 5.8.

5.11 References

5.11.1 Personal Communications

TERA wishes to acknowledge those people identified in the Personal Communications for their assistance in supplying information and comments incorporated into this report.

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6.0 SOCIO-ECONOMIC SETTING FOR FACILITIES

The following subsections present a summary of the socio-economic setting of the proposed facilities, including pump stations and associated power lines, tank terminals, Westridge Marine Terminal, pump stations to be reactivated, and temporary facilities pursuant to Guide A.2.4 and Table A-3 of the NEB *Filing Manual*. A summary of the proposed activities at these facilities is provided in Section 2.0, while a detailed description is provided in Volume 2. The following elements from the NEB *Filing Manual* (NEB 2013) are discussed in the tables below: heritage resources; traditional land and resource use (TLRU); social and cultural well-being; human occupancy and resource use (HORU); infrastructure and services; navigation and navigation safety; employment and economy; community health; and human health (where applicable). The socio-economic setting was compiled based on the following sources:

- heritage resources, TLRU, traditional marine resource use, socio-economic, community health and economic studies conducted for the Project;
- existing published literature including topographic maps, aerial photography, scientific papers and reference books, as well as municipal, provincial and federal government maps, reports, interactive websites, guides, information letters, fact sheets and databases; and
- consultation and engagement with Aboriginal communities (including ATK and TEK), landowners, regulatory authorities, stakeholders and the general public.

Methods of obtaining resource material included searching libraries, internet searches and documents from regulatory authorities. References used in the preparation of the socio-economic setting are cited in Section 6.5. Detailed methodology for the collection of information on existing conditions is provided in the applicable supporting studies in Volume 5D. The potential Project-related effects and mitigation are presented in Section 7.0.

The settings for each element are discussed by the socio-economic regions that have been designated for the purposes of this assessment, rather than by technical pipeline segments used by the biophysical elements in Volume 5A. A breakdown of the six socio-economic regions of the Project, including their boundaries and the specific pipeline segments and facilities located in each region, is provided in Section 5.3.

The settings pertaining to social and cultural well-being, infrastructure and services, employment and economy, and community health discuss existing conditions within the Socio-economic RSA, as defined in Section 5.0. Element-specific spatial boundaries for heritage resources, TLRU, HORU, navigation and navigation safety and human health risk assessment (HHRA) are defined in Sections 5.1, 5.2 and 5.4, respectively.

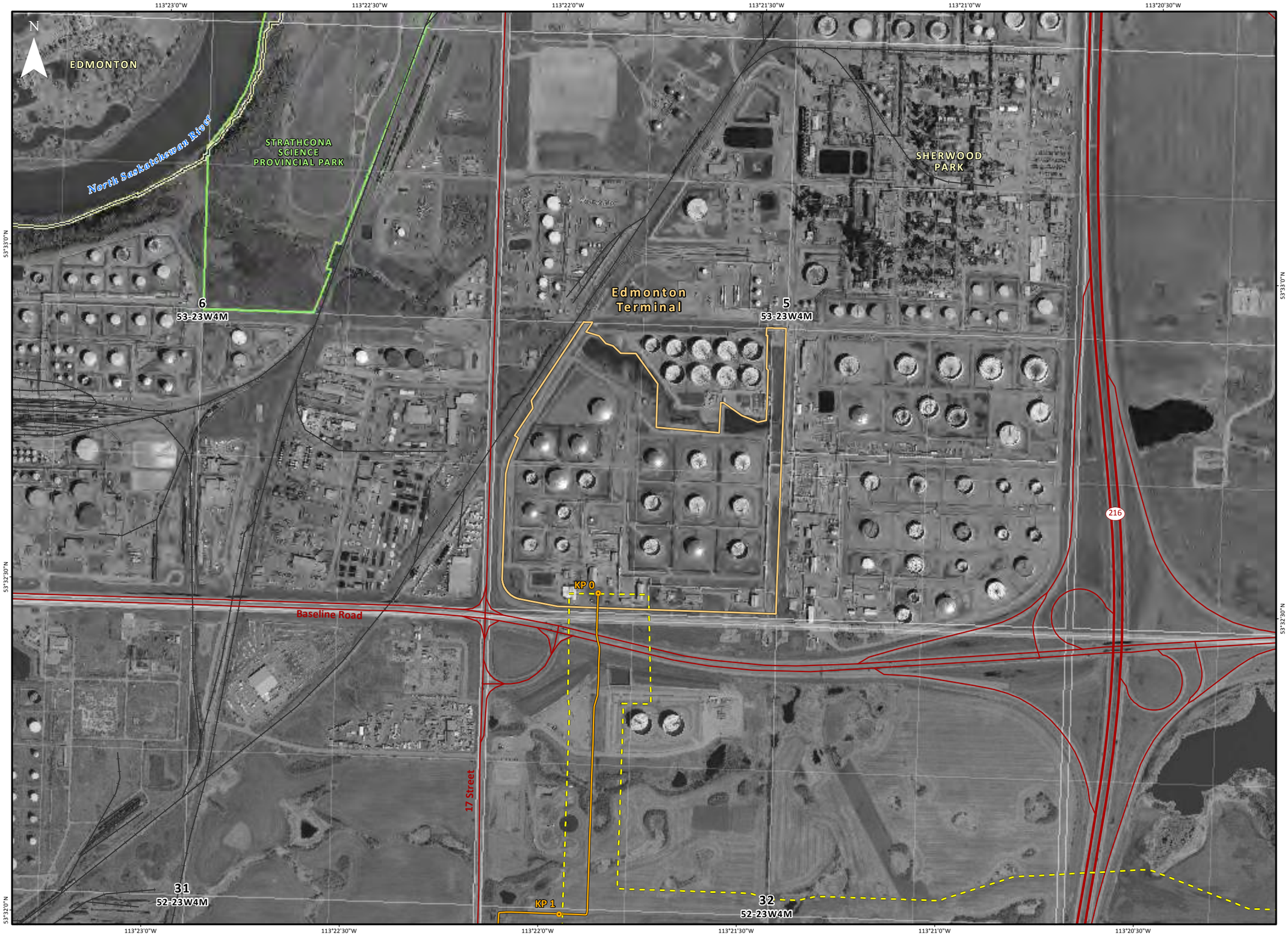
6.1 Pump Stations and Tank Terminals

Pump stations are positioned along the length of the existing Trans Mountain pipeline to maintain pressure, move the product along the line and monitor flow. To accommodate expansion activities, the Project will include construction and operation of new pump stations, and modification and/or replacement of existing pumps. In addition, 20 new storage tanks will be constructed at the Edmonton (5), Sumas (1) and Burnaby (14) terminals, respectively.

6.1.1 Edmonton Terminal

The existing Edmonton Terminal is located at SW 5-53-23 W4M at RK 0.0. The Edmonton Terminal is located on lands owned by Trans Mountain within Strathcona County and adjacent to the City of Edmonton within the Edmonton Region of the Socio-economic RSA. Adjacent lands are privately owned by various industrial companies. No disturbance of previously undisturbed lands is proposed at the Edmonton Terminal and all work will be conducted within the existing disturbed fenced area. Four 5,000 HP pump units will be added to the site, as well as one spare 5,000 HP pump unit. A new substation at the Edmonton Terminal will require a new power line. At the time of writing, the routing of the power line had yet to be determined by the Alberta Electric System Operator (AESO). Two new 34,980 m^3 (220,000 bbl) storage tanks, two new 63,600 m^3 (400,000 bbl) storage tanks and one new

11,920 m^3 (75,000 bbl) storage tank will be installed at the Edmonton Terminal. An existing 12,720 m^3 (80,000 bbl) storage tank will be dismantled and replaced by the new 11,920 m^3 (75,000 bbl) tank. Access to the Edmonton Terminal is via Baseline Road and 17th Street. Table 6.1-1 provides a summary of the socio-economic elements and considerations for the Edmonton Terminal. The location of the Edmonton Terminal is shown on Figure 6.1-1.



TRANS MOUNTAIN

FIGURE 6.1-1

EDMONTON TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- City / Town
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 12N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

tera ENVIRONMENTAL CONSULTANTS

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_01		PAGE: SHEET 1 OF 16
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:10,000	PAGE SIZE: 11x17	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

201311_MAP_TERA_ESA_00482_Rev0_01.mxd

TABLE 6.1-1

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE EDMONTON TERMINAL

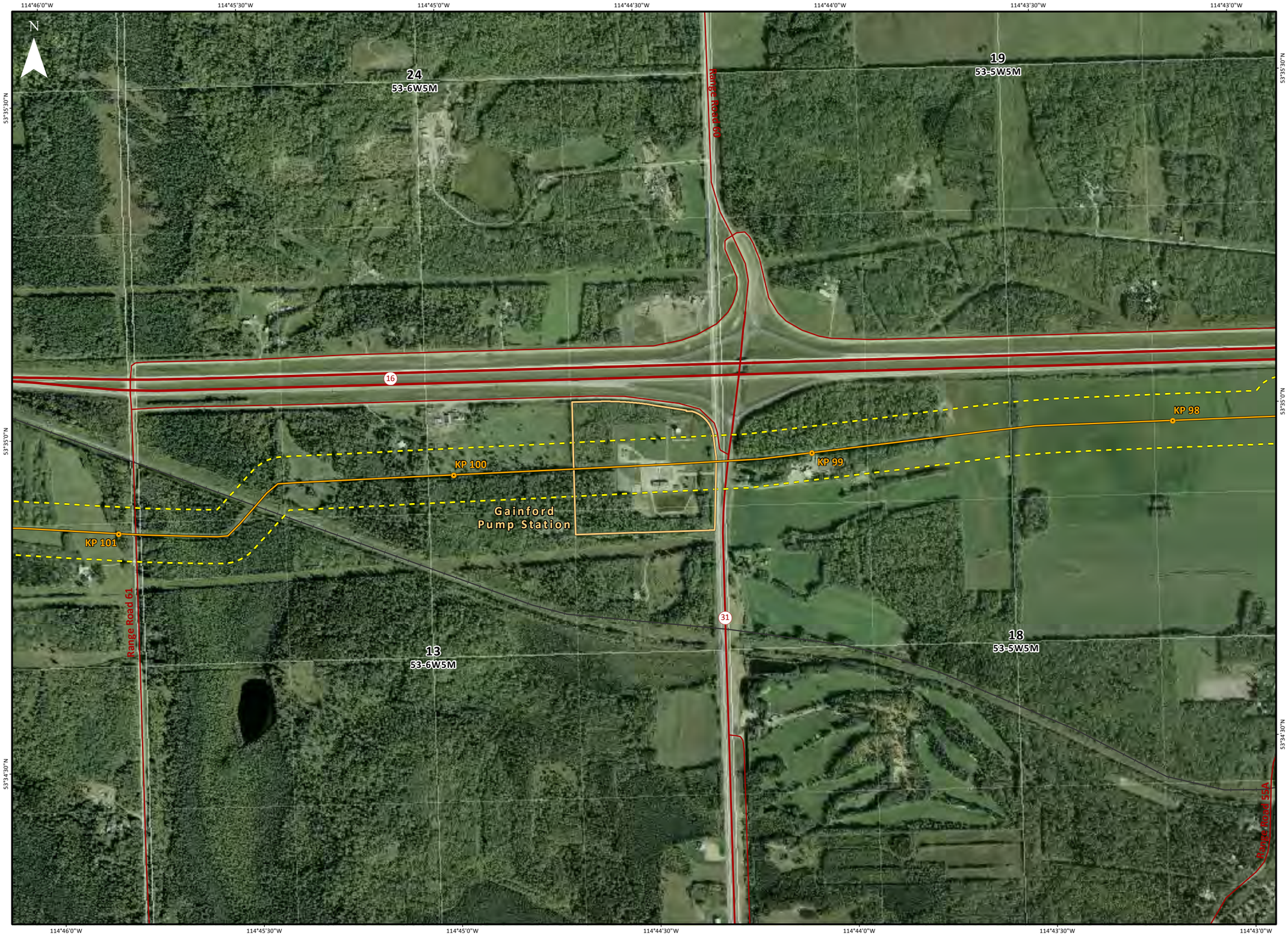
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• Three known archaeological sites are located within SW 5-53-23 W4M (FjPi-97, FjPi-96 and FjPi-95) (Alberta Culture 2013). • There is no heritage resources potential (archaeological, historic or palaeontological) within the existing Edmonton Terminal because of the high level of existing disturbance. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA. • Refer also to the setting discussion of heritage resources for the Edmonton Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 14 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Edmonton Terminal: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; and Sunchild First Nation. • Enoch Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Alexis Nakota Sioux First Nation, Paul First Nation and Nakcowinewak Nation of Canada conducted TERA-facilitated TLU studies for the Project, including map reviews, interviews, helicopter overflights, ground reconnaissance and results reviews. • O'Chiese First Nation and Sunchild First Nation are conducting independent TLU studies for the Project. • Métis Nation of Alberta (Region 4) is preparing an engagement report for the Project. • Interest in TLU studies will be determined by Saddle Lake Cree Nation and Louis Bull Tribe through ongoing engagement with Trans Mountain. • Foothills Ojibway Society declined TLU study participation, instead electing to identify preliminary interests in the Project to Trans Mountain on June 5, 2013. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Edmonton Terminal. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton Segment in Section 5.2.
Social and Cultural Well-Being	• The Edmonton Terminal is located within Strathcona County and adjacent to the City of Edmonton within the Edmonton Region of the Socio-economic RSA. In 2011, the population of the Edmonton Region, including Strathcona County, was approximately 1.2 million and approximately 77.3% of the population was between the ages of 25 and 64 years old; the median age was 37 (Statistics Canada 2012). In 2011, approximately 5.5% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Edmonton Region was approximately $39,800. • Although the Edmonton Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • In terms of community way of life, given the high level of industrial activity in the Edmonton area, various communities in the Region have experienced major projects, including the City of Edmonton, have experience with temporary workers, and have community infrastructure and services capacity to absorb temporary workers. The City of Edmonton area is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Edmonton Region in Section 5.3.
Human Occupancy and Resource Use	• Lands adjacent to the Edmonton Terminal are privately owned by various industrial companies. The area is known as Knightsbridge Industrial Park and is zoned as a Heavy Industrial Area (Strathcona County 2012). The proposed developments at the Edmonton Terminal are compatible with zoning at this site. • The Edmonton Terminal does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is the Strathcona Science Provincial Park which is located approximately 1.1 km northwest of the Edmonton Terminal. • Although the Edmonton Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • The Edmonton Terminal is not located in the vicinity of a residential neighbourhood. The nearest residences are located approximately 1.9 km northwest and southeast of the property boundary. • No agricultural lands are located at the Edmonton Terminal. • Recreational use of the lands around this location is limited due to the large proportion of land in private ownership and under industrial use surrounding the Edmonton Terminal. • No non-traditional hunting, trapping or fishing occurs at the Edmonton Terminal because of the surrounding industrial land use. Similarly, there are no managed forest tenures, mineral tenures or aggregate tenures at the site. • The Edmonton Terminal is subject to Noise Control Bylaw No. 66-99, outlining noise legislation within Strathcona County. • Refer also to the setting discussion of HORU for the Edmonton Region in Section 5.4.

TABLE 6.1-1 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Edmonton Terminal is via Baseline Road and 17th Street. Major highways near the terminal include Highway 14/216 (Anthony Henday Drive) and Highway 16. • Power facilities currently service the Edmonton Terminal. However, a new power line is required for Project upgrades to the existing substation. At the time of writing, the routing of the power line has yet to be determined by AESO. • The Edmonton Waste Management Centre is the nearest solid waste facility to the Edmonton Terminal. • The City of Edmonton has a large private housing market and a wide range of commercial accommodation, including hotels, motels, inns and campgrounds. • The City of Edmonton offers a range of educational services from Kindergarten to Grade 12 as well as post-secondary institutions such as the University of Alberta, Concordia University College of Alberta, Grant McEwan College and Northern Alberta Institute of Technology. • Trans Mountain has established emergency response plans and programs at all facilities, including the Edmonton Terminal. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Edmonton Region in Section 5.5.
Navigation and Navigation Safety	• The Edmonton Terminal is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Edmonton Region's economic base is diverse and has expanded from a provincial government and regional commercial centre to include agriculture, biofuels, chemicals and petrochemicals, commercial/retail, residential, forestry and related industries, infrastructure, institutional, mining, oil and gas, oil sands, other industrial, pipelines, power, and tourism and recreation. • In 2011 in the Edmonton Region, the most active industries (by industrial classification) were: retail trade (employing approximately 11.1% of the labour force); health care and social assistance (10.5%); and construction (9.8%). Public administration was another key industry (employing 8.1% of the labour force), as well as professional, scientific and technical services (6.9%) and educational services (7.4%) (Statistics Canada 2013). • For the Edmonton Region overall within in the Socio-economic RSA, there was a labour force of approximately 696,600 workers in 2011, with a participation rate of about 73.2% and an unemployment rate of 5.6%. • In 2011, approximately 55.7% of the Edmonton Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 11% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Edmonton Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Edmonton Terminal. • The Edmonton Terminal is located within Alberta Health Services' Edmonton Health Zone. • Overall health in the Edmonton Health Zone is very similar to provincial averages for Alberta, including such measures as self-rated health, functional health and life expectancy as well as risk factors such as smoking, heavy drinking and obesity. • Self-perceived mental health and life satisfaction in the Edmonton Health Zone are also comparable to provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • Compared to Alberta as a whole, health care services are robust in the Edmonton Region. There is a high physician-to-population ratio and almost 80% of people have a regular physician. Edmonton houses a large number of primary health centres, regional and tertiary hospitals and ancillary services, and acts as the referral centre for all of the Edmonton Health Zone as well as for the North Health Zone. • There are numerous EMS responders (*i.e.*, ambulance) in the Edmonton Region.
Human Health	• An assessment of the potential health risks associated with routine operations at the Edmonton Terminal is provided in the Screening Level Human Health Risk Assessment (HHRA) of Pipelines and Facilities of Volume 5D. • The Edmonton Terminal is located within the Edmonton Health Zone of Alberta Health Services. • The community health setting in Section 5.8 describes the current health status of people residing in the Edmonton Health Zone with respect to general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health. • The information on two of the health indices (*i.e.*, cancer incidence and respiratory health) provided in Section 5.8 was examined as part of the HHRA of Volume 5D. This information served as one benchmark for assessing the potential health effects that might occur among people in the area from exposure to the chemical emissions from the Edmonton Terminal.

6.1.2 Gainford Pump Station

The existing Gainford Pump Station is located at NE 13-53-6 W5M at RK 117.5. The Gainford Pump Station is located on lands owned by Trans Mountain in Parkland County within the Edmonton Region of the Socio-economic RSA. Current land use at this facility site is industrial and the surrounding land is forested. Some treed lands will be disturbed within the existing boundary of the Gainford Pump Station. Three 5,000 HP pump units will be installed at the site. Upgrades to the existing power supply are proposed. Access to the Gainford Pump Station is via Highway 16. Table 6.1-2 provides a summary of the socio-economic elements and considerations for the Gainford Pump Station. The location of the Gainford Pump Station is shown on Figure 6.1-2.



TRANS MOUNTAIN

FIGURE 6.1-2

GAINFORD PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-2

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE GAINFORD PUMP STATION

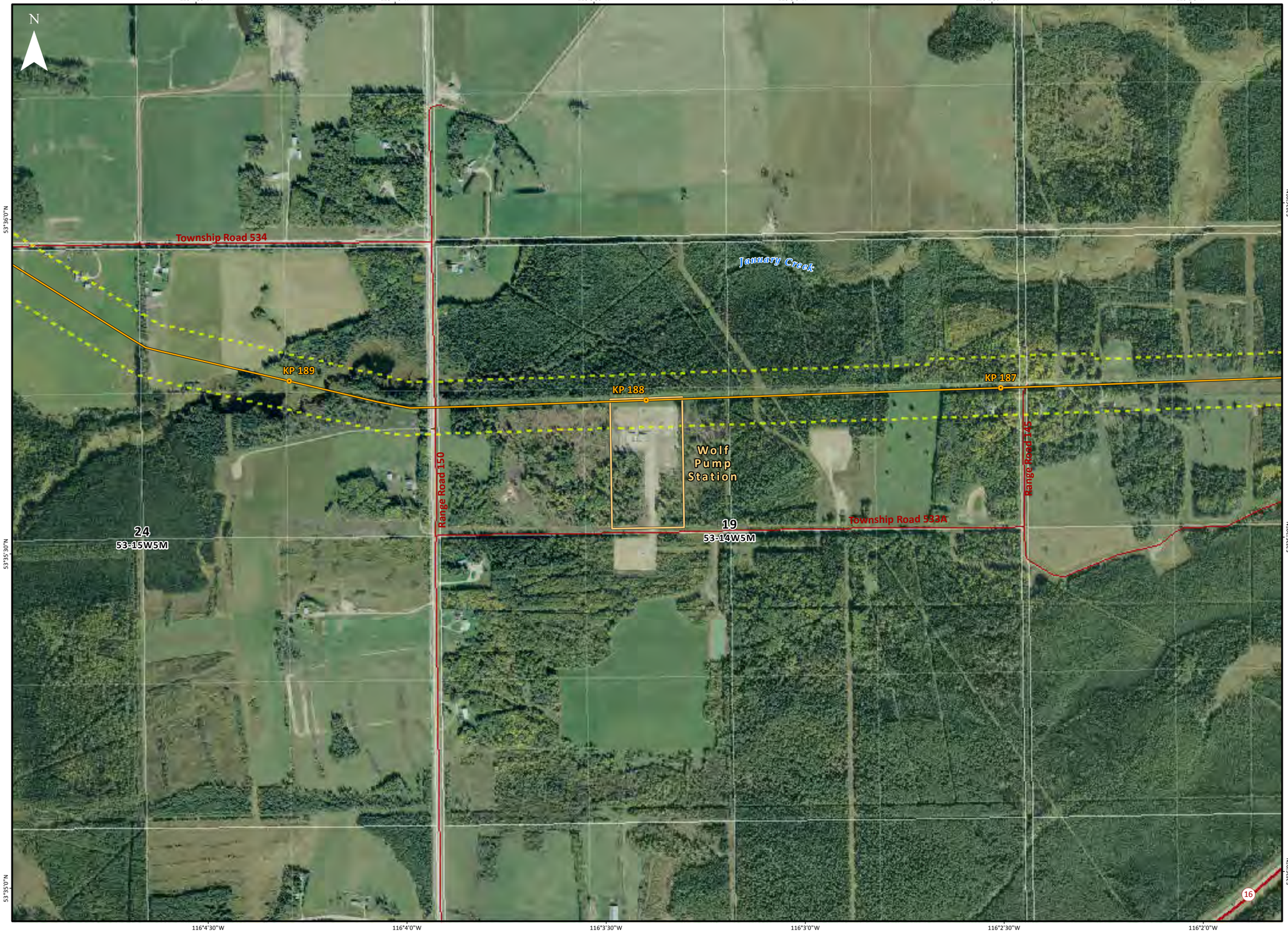
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• According to Alberta Culture (2013), there are no known historical resources located within NE 13-53-6 W5M. • Although additional new lands are required northwest of the existing facility, there is low heritage resource (archaeological, historic or palaeontological) potential because of existing disturbance in the area and no HRV. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA. • Refer also to the setting discussion of heritage resources for the Edmonton Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 14 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Gainford Pump Station: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; and Sunchild First Nation. • Enoch Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Alexis Nakota Sioux First Nation, Paul First Nation and Nakcowinewak Nation of Canada conducted TERA-facilitated TLU studies for the Project, including map reviews, interviews, helicopter overflights, ground reconnaissance and results reviews. • O'Chiese First Nation and Sunchild First Nation are conducting independent TLU studies for the Project. • Métis Nation of Alberta (Region 4) is preparing an engagement report for the Project. • Interest in TLU studies will be determined by Saddle Lake Cree Nation and Louis Bull Tribe through ongoing engagement with Trans Mountain. • Foothills Ojibway Society declined TLU study participation, instead electing to identify preliminary interests in the Project to Trans Mountain on June 5, 2013. • To date, TLU studies have not revealed any TLU sites requiring mitigation adjacent to the Gainford Pump Station. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Edmonton Region, including Parkland County, was approximately 1.2 million and approximately 77.3% of the population was between the ages of 25 and 64 years old; the median age was 37 (Statistics Canada 2012). In 2011, approximately 5.5% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Edmonton Region was approximately $39,800. • Although the Gainford Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • In terms of community way of life, the Gainford Pump Station is located in a rural area of Parkland County east of the Village of Wabamun. While it will likely draw on labour from the Edmonton Region as a whole, its setting is less industrialized and more rural in nature. While the Edmonton area has a high level of industrial activity and experience with major projects, smaller communities such as the Village of Wabamun and the Hamlet of Entwhistle have less capacity to absorb temporary workers. The Edmonton area is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Edmonton Region in Section 5.3.
Human Occupancy and Resource Use	• The Gainford Pump Station is located on land within the jurisdiction of Parkland County. Land use in the vicinity is governed by the Parkland County Municipal Development Plan (MDP), and the pump station is located in an area zoned as a Highway Commercial Cluster. • Current land use at and around the Gainford Pump Station is industrial and forested. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is the Wabamun Lake Provincial Park which is located approximately 20 km east of the pump station. • Although the Gainford Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • The nearest residence is located approximately 140 m east of the property boundaries. • No agricultural lands are located at the Gainford Pump Station. • Outdoor recreational use on the lands around this location include swimming, boating and fishing at Wabamun Lake (approximately 1.8 km west). Pineridge Golf Resort is located approximately 200 m southeast of the pump station. • The Gainford Pump Station is located in the Parkland WMU 248, Fur Management Zone 4, Fish Management Zone 2, and Watershed Unit Parkland Prairie 2 Zone 2. • The Gainford Pump Station is located in the boundaries of Parkland County's Community Standards Bylaw No. 03-2012, outlining noise legislation within Parkland County. • Refer also to the setting discussion of HORU for the Edmonton Region in Section 5.4.

TABLE 6.1-2 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Gainford Pump Station is via Highway 16. • The facility is located near to the Village of Wabamun. The closest community with services is the Town of Stony Plain, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Edmonton area is anticipated to be the construction hub for activities related to this facility, including worker accommodation. • The Town of Stony Plain has emergency and protective services, including an RCMP detachment and the Stony Plain Fire Service. The Village of Wabamun also has a volunteer fire department. • Trans Mountain has established emergency response plans and programs at all facilities, including the Gainford Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Edmonton Region in Section 5.5.
Navigation and Navigation Safety	• The Gainford Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Edmonton Region's economic base is diverse and has expanded from a provincial government and regional commercial centre to include agriculture, biofuels, chemicals and petrochemicals, commercial/retail, residential, forestry and related industries, infrastructure, institutional, mining, oil and gas, oil sands, other industrial, pipelines, power, and tourism and recreation. • The most active industries in the Edmonton Region (by industrial classification) in 2011 were: retail trade (employing approximately 11.1% of the labour force); health care and social assistance (10.5%); and construction (9.8%). Public administration was another key industry (employing 8.1% of the labour force), as well as professional, scientific and technical services (6.9%) and educational services (7.4%) (Statistics Canada 2013). • For the Edmonton Region overall within in the Socio-economic RSA, there was a labour force of approximately 696,600 workers in 2011, with a participation rate of about 73.2% and an unemployment rate of 5.6% (Statistics Canada 2013). • In 2011, approximately 55.7% of the Edmonton Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 11% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Edmonton Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Gainford Pump Station. • The Gainford Pump Station is located within Alberta Health Services' Edmonton Health Zone. • Overall health in the Edmonton Health Zone is very similar to provincial averages for Alberta, including such measures as self-rated health, functional health and life expectancy as well as risk factors such as smoking, heavy drinking and obesity. • Self-perceived mental health and life satisfaction in the Edmonton Health Zone are also comparable to provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • Compared to Alberta as a whole, health care services are robust in the Edmonton Region. There is a high physician-to-population ratio and almost 80% of people have a regular physician. Edmonton houses a large number of primary health centres, regional and tertiary hospitals and ancillary services, and acts as the referral centre for all of the Edmonton Health Zone as well as for the North Health Zone. • Proximate EMS responders (*i.e.*, ambulance) are located in the City of Spruce Grove and the towns of Onoway, Mayerthorpe and Drayton Valley.

6.1.3 Wolf Pump Station

The existing Wolf Pump Station is located at NW 19-53-14 W5M at RK 206.2. The Wolf Pump Station is located on lands owned by Trans Mountain in Yellowhead County within the Rural Alberta Region of the Socio-economic RSA. Current land use at and around this facility site is industrial and forested. No disturbance of previously undisturbed lands is proposed at the Wolf Pump Station (*i.e.*, no native vegetation would be directly disturbed within the site boundaries). Two 5,000 HP pump units will be added at the site. The existing pump building will be deactivated. Access to the Wolf Pump Station is via Highway 16. Table 6.1-3 provides a summary of the socio-economic elements and considerations for the Wolf Pump Station. The location of the Wolf Pump Station is shown on Figure 6.1-3.



TRANS MOUNTAIN

FIGURE 6.1-3

WOLF PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-3

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE WOLF PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• According to Alberta Culture (2013) there are no known historical resources located within NW 19-53-14 W5M. • There is no heritage resources (archaeological, historic or palaeontological) potential in NW 19-53-14 W5M since the land is previously disturbed and cleared for industry. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA. • Refer also to the setting discussion of heritage resources for the Rural Alberta Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 14 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Wolf Pump Station: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; and Sunchild First Nation. • Enoch Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Alexis Nakota Sioux First Nation, Paul First Nation and Nakcowinewak Nation of Canada conducted TERA-facilitated TLU studies for the Project, including map reviews, interviews, helicopter overflights, ground reconnaissance and results reviews. • O'Chiese First Nation and Sunchild First Nation are conducting independent TLU studies for the Project. • Métis Nation of Alberta (Region 4) is preparing an engagement report for the Project. • Interest in TLU studies will be determined by Saddle Lake Cree Nation and Louis Bull Tribe through ongoing engagement with Trans Mountain. • Foothills Ojibway Society declined TLU study participation, instead electing to identify preliminary interests in the Project to Trans Mountain on June 5, 2013. • To date, TLU studies have not revealed any TLU sites requiring mitigation adjacent to the Wolf Pump Station. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Rural Alberta Region, including Yellowhead County, was approximately 29,300 and approximately 74.3% of the population was between the ages of 25 and 64 years old; the median age was 43.5 (Statistics Canada 2012). In 2011, approximately 11.5% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Rural Alberta Region was approximately $34,700. • Although the Wolf Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • In terms of community way of life, the Wolf Pump Station is located in a rural area of Yellowhead County east of the Town of Edson. It is likely to draw on labour from the Rural Alberta Region as a whole, particularly workers from the Town of Edson. The Town of Edson has experience with major projects and temporary workers. Edson is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Rural Alberta Region in Section 5.3.
Human Occupancy and Resource Use	• The Wolf Pump Station is located on land within the jurisdiction of Yellowhead County. Land use in the vicinity is governed by the Yellowhead County MDP, and the pump station is located in the Rural Policy Area. • Current land use at and around the Wolf Pump Station is industrial and forested. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Yates Natural Area approximately 16 km west of the pump station. • Although the Wolf Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • The nearest residence is located approximately 600 m west-southwest of the property boundaries. • No agricultural lands are located at the Wolf Pump Station. • Outdoor recreational use on the lands around this location includes snowmobiling, cross-country skiing, mountain biking and camping. • The Wolf Pump Station is located in Foothills WMU 346, Fur Management Zone 4, Fish Management Zone 1, and Watershed Unit Eastern Slopes 3. • The Wolf Pump Station is located in the boundaries of Noise Control Bylaw 21.01, outlining noise legislation within Yellowhead County. This noise bylaw only applies to Hamlets within Yellowhead County; therefore, it does not apply to this pump station. • Refer also to the setting discussion of HORU for the Rural Alberta Region in Section 5.4.

TABLE 6.1-3 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Wolf Pump Station is via Highway 16. • Power facilities currently servicing the pump station are sufficient for the Project's needs. • The facility is located near to the Town of Edson, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Town of Edson is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The Town of Edson offers emergency and protective services, including an RCMP detachment and the Edson Fire Department (2 career and 38 volunteer firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Wolf Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and service for the Rural Alberta Region in Section 5.5.
Navigation and Navigation Safety	• The Wolf Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Rural Alberta Region's economy is diverse and is more resource-based than the Edmonton Region. Key sectors include forestry, coal, oil and gas, agriculture and tourism. Forestry and coal mining are in flux, but the oil and gas industry is a steady contributor to the economy within Yellowhead County (Lyons pers. comm.). • For the Rural Alberta Region, the most active industries (by industrial classification) in 2011 were: mining, quarrying, and oil and gas extraction (employing approximately 16.6% of the labour force); retail trade (11.2%); construction (8.5%); and accommodation and food services (7.5%) (Statistics Canada 2013). • In 2011, there was a labour force of approximately 17,000 workers in the Rural Alberta Region, with a participation rate of about 73.2% and an unemployment rate of 5.9% (Statistics Canada 2013). • In 2011, approximately 42.9% of the Rural Alberta Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 16.1% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Rural Alberta Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Wolf Pump Station. • The facility is located within Alberta Health Services' North Health Zone. • Overall health in the North Zone is lower compared to the Alberta provincial average. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. • Self-perceived mental health, life satisfaction and life stress in the North Zone are comparable to the Alberta average, indicating similar levels of mental well-being. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Edson Healthcare Centre is the closest location for primary care and emergency medical response and treatment, with Edmonton acting as the closest referral centre. Data on health care capacity and access indicate a relative insufficiency of access to primary and tertiary health care compared to provincial averages; this trend is common in rural regions across Canada. • Proximate EMS responders (*i.e.*, ambulance) are located in the Town of Edson.

6.1.4 Edson Pump Station

The existing Edson Pump Station is located at SW 18-53-18 W5M at RK 247.1. The Edson Pump Station is located on lands owned by Trans Mountain in Yellowhead County within the Rural Alberta Region of the Socio-economic RSA. Current land use at and around this facility site is industrial. All work will be conducted within the existing disturbed fenced area at the Edson Pump Station. No native vegetation would be directly disturbed within the site boundaries. Three 5,000 HP pump units will be added at the site. A new power line will be required to service Project upgrades to the existing substation at the Edson Pump Station. At the time of writing, the routing of the power line had yet to be determined by the AESO. Access to the Edson Pump Station is via Highway 16. Table 6.1-4 provides a summary of the socio-economic elements and considerations for the Edson Pump Station. The location of the Edson Pump Station is shown on Figure 6.1-4.

116°40'0"W 116°39'30"W 116°39'0"W 116°38'30"W 116°38'0"W 116°37'30"W

53°35'0"N

53°34'30"N

53°34'0"N

N

Edson
Pump Station

13
53-19W5M

18
53-18W5M

Range Road 185

KP 228

KP 227

KP 229

Range Road 185A

16

KP 230

Township Road 532B

Township Road 532

Sundance Creek

Little Sundance Creek

TRANS MOUNTAIN

FIGURE 6.1-4

EDSON PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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MAP NUMBER		PAGE
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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-4

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE EDSON PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• According to Alberta Culture (2013) there are no known historical resources located within SW 18-53-18 W5M. • There is no heritage resources (archaeological, historic or palaeontological) potential in SW 18-53-18 W5M since the land is previously disturbed for industry. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA. • Refer also to the setting discussion of heritage resources for the Rural Alberta Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 14 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Edson Pump Station: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; and Sunchild First Nation. • Enoch Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Alexis Nakota Sioux First Nation, Paul First Nation and Nakcowinewak Nation of Canada conducted TERA-facilitated TLU studies for the Project, including map reviews, interviews, helicopter overflights, ground reconnaissance and results reviews. • O'Chiese First Nation and Sunchild First Nation are conducting independent TLU studies for the Project. • Métis Nation of Alberta (Region 4) is preparing an engagement report for the Project. • Interest in TLU studies will be determined by Saddle Lake Cree Nation and Louis Bull Tribe through ongoing engagement with Trans Mountain. • Foothills Ojibway Society declined TLU study participation, instead electing to identify preliminary interests in the Project to Trans Mountain on June 5, 2013. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use limits the practice of traditional activities on lands within and adjacent to the Edson Pump Station. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Rural Alberta Region, including the Town of Edson, was approximately 29,300 and approximately 74.3% of the population was between the ages of 25 and 64 years old; the median age was 43.5 (Statistics Canada 2012). In 2011, approximately 11.5% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Rural Alberta Region was approximately $34,700. • Although the Edson Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • In terms of community way of life, the Edson Pump Station is located in a rural area of Yellowhead County west of the Town of Edson. It is likely to draw on labour from the Rural Alberta Region as a whole, particularly workers from the Town of Edson. The Town of Edson has experience with major projects and temporary workers. Edson is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Rural Alberta Region in Section 5.3.
Human Occupancy and Resource Use	• The Edson Pump Station is located on land within the jurisdiction of Yellowhead County. Land use in the vicinity is governed by the Yellowhead County MDP, and the pump station is located in the Foothills Policy Area. • Current land use at and around the Edson Pump Station is industrial. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest parks are Hornbeck Creek Provincial Recreation Area and Little Sundance Creek Provincial Recreation Area (both approximately 2.5 km from the pump station). • Although the Edson Pump Station does not lie within any IRs, it does lie within the areas of interest of 14 Aboriginal communities (see TLRU above). • The nearest residence is located approximately 360 m west of the property boundaries. • No agricultural lands are located at the Edson Pump Station. • Outdoor recreational uses on the lands around this location include hiking, snowmobiling, camping, canoeing and mountain biking. • The Edson Pump Station is located in the Foothills WMU 346, Fur Management Zone 4, Fish Management Zone 1, and Watershed Unit Eastern Slopes 3. • The Edson Pump Station is located in the boundaries of Noise Control Bylaw 21.01, outlining noise legislation within Yellowhead County. This noise bylaw only applies to Hamlets within Yellowhead County; therefore, it does not apply to this pump station. • Refer also to the setting discussion of HORU for the Rural Alberta Region in Section 5.4.

TABLE 6.1-4 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Edson Pump Station is via Highway 16. • The existing substation will be replaced with a 20/26.6/33.3 MVA transformer substation. A new power line will be required. At the time of writing, the routing of the power line has yet to be determined by AESO. • The facility is located near to the Town of Edson, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Town of Edson is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The Town of Edson offers emergency and protective services, including an RCMP detachment and the Edson Fire Department (2 career and 38 volunteer firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Edson Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Rural Alberta Region in Section 5.5.
Navigation and Navigation Safety	• The Edson Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Rural Alberta Region's economy is diverse and is more resource-based than the Edmonton Region. Key sectors include forestry, coal, oil and gas, agriculture and tourism. Forestry and coal mining are in flux, but the oil and gas industry is a steady contributor to the economy within Yellowhead County (Lyons pers. comm.). • For the Rural Alberta Region, the most active industries (by industrial classification) in 2011 were: mining, quarrying, and oil and gas extraction (employing approximately 16.6% of the labour force); retail trade (11.2%); construction (8.5%); and accommodation and food services (7.5%) (Statistics Canada 2013). • In 2011, there was a labour force of approximately 17,000 workers in the Rural Alberta Region, with a participation rate of about 73.2% and an unemployment rate of 5.9%. Approximately 8.5% of the regional labour force worked in the construction industry (Statistics Canada 2013). • In 2011, approximately 42.9% of the Rural Alberta Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 16.1% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the employment and economy for the Rural Alberta Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Edson Pump Station. • The facility is located within Alberta Health Services' North Health Zone. • Overall health in the North Zone is lower compared to the Alberta provincial average. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. • Self-perceived mental health, life satisfaction and life stress in the North Zone are comparable to the Alberta average, indicating similar levels of mental well-being. • Alcohol and drug misuse are substantially higher in the Edson area than the province as a whole. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Edson Healthcare Centre is the closest location for primary care and emergency medical response and treatment, with Edmonton acting as the closest referral centre. Data on health care capacity and access indicate a relative insufficiency of access to primary and tertiary health care compared to provincial averages; this trend is common in rural regions across Canada. • Proximate EMS responders (*i.e.*, ambulance) are located in the Town of Edson.

6.1.5 Hinton Pump Station

The existing Hinton Pump Station is located at NW 33-49-26 W5M at RK 339.4. The Hinton Pump Station is located on lands owned by Trans Mountain in Yellowhead County within the Rural Alberta Region of the Socio-economic RSA. Expansion of the Hinton Pump Station will require acquisition of approximately 0.32 ha of new Crown land to the west of and adjacent to existing Trans Mountain lands. Three 5,000 HP pump units will be added at the site. Access to the Hinton Pump Station is via Highway 16. Table 6.1-5 provides a summary of the socio-economic elements and considerations for the Hinton Pump Station. The location of the Hinton Pump Station is shown on Figure 6.1-5.

TRANS MOUNTAIN

FIGURE 6.1-5

HINTON PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-5

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE HINTON PUMP STATION

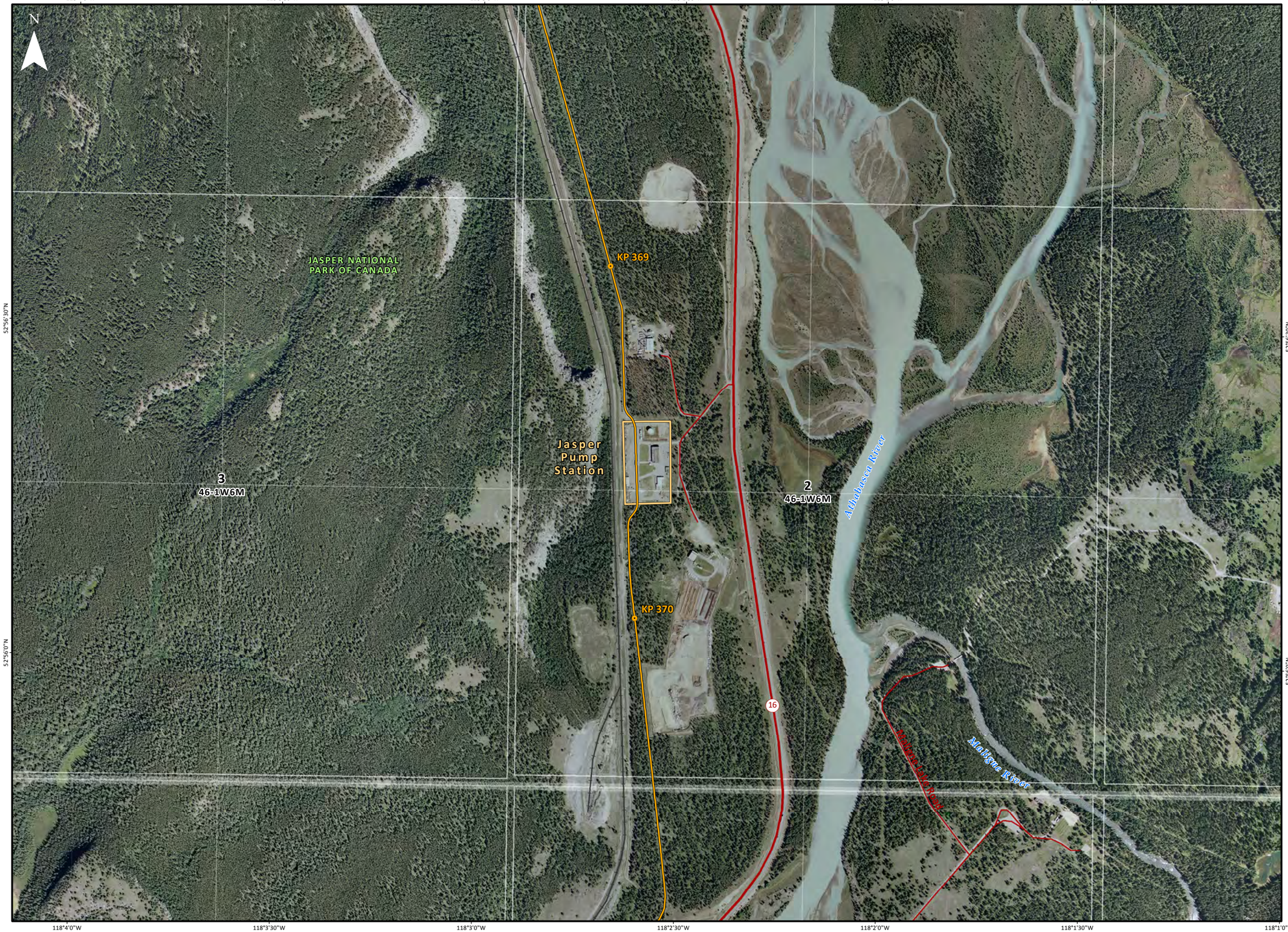
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• According to Alberta Culture (2013) there is one known archaeological site (FhQk-3) located within NW 33-49-26 W5M. There are no anticipated effects to this site as the result of the Project. • Although this pump station will be on new lands, there is low heritage resource (archaeological, historic or palaeontological) potential because of existing disturbance in the area. Surrounding lands have an HRV value of 5a (Alberta Culture 2013). • *Historical Resources Act* clearance will be obtained as part of the Project HRIA. • Refer also to the setting discussion of heritage resources for the Rural Alberta Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 15 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Hinton Pump Station: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; Sunchild First Nation; and Aseniwuche Winewak Nation. • Enoch Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Alexis Nakota Sioux First Nation, Paul First Nation and Nakcowinewak Nation of Canada conducted TERA-facilitated TLU studies for the Project, including map reviews, interviews, helicopter overflights, ground reconnaissance and results reviews. • O'Chiese First Nation, Sunchild First Nation, and Aseniwuche Winewak Nation are conducting independent TLU studies for the Project. • Métis Nation of Alberta (Region 4) is preparing an engagement report for the Project. • Interest in TLU studies will be determined by Saddle Lake Cree Nation and Louis Bull Tribe through ongoing engagement with Trans Mountain. • Foothills Ojibway Society declined TLU study participation, instead electing to identify preliminary interests in the Project to Trans Mountain on June 5, 2013. • O'Chiese First Nation identified two plant species of importance near the Hinton Pump Station, located at RK 320. • To date, TLU studies have not revealed any TLU sites requiring mitigation adjacent to the Hinton Pump Station. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Rural Alberta Region, including the Town of Hinton, was approximately 29,300 and approximately 74.3% of the population was between the ages of 25 and 64 years old; the median age was 43.5 (Statistics Canada 2012). In 2011, approximately 11.5% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Rural Alberta Region was approximately $34,700. • Although the Hinton Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 15 Aboriginal communities (see TLRU above). • In terms of community way of life, the Hinton Pump Station is located in a rural area of Yellowhead County west of the Town of Hinton (population 9,640 in 2011). It is likely to draw on labour from the Rural Alberta Region as a whole, particularly workers from the Town of Hinton. The Town of Hinton has experience with major projects and temporary workers. Hinton is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Rural Alberta Region in Section 5.3.
Human Occupancy and Resource Use	• The expansion of the Hinton Pump Station will require acquisition of approximately 0.32 ha of additional land adjacent to the western boundary of the existing property. This Crown land has some existing disturbance including the existing TMPL right-of-way. • The existing Hinton Pump Station is located on land within the jurisdiction of Yellowhead County. Land use in the vicinity is governed by the Yellowhead County MDP, and the pump station is located in the Mountain View Policy Area. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Wildhorse Lake Provincial Recreation Area approximately 2.5 km west of the pump station. • Although the Hinton Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 15 Aboriginal communities (see TLRU above). • The nearest residence is located approximately 820 m southwest of the property boundaries • No agricultural lands are located at the Hinton Pump Station. • Outdoor recreational uses on the lands around this location includes hiking, snowmobiling, camping, canoeing and mountain biking. • The Hinton Pump Station is located in the Mountain WMU 438, Fur Management Zone 4, Fish Management Zone 1, and Watershed Unit Eastern Slopes 3.

TABLE 6.1-5 Cont'd

Socio-Economic Elements	Summary of Considerations
Human Occupancy and Resource Use (cont'd)	• The Hinton Pump Station is located in the boundaries of Noise Control Bylaw 21.01, outlining noise legislation within Yellowhead County. This noise bylaw only applies to Hamlets within Yellowhead County; therefore, it does not apply to this pump station. • Refer also to the setting discussion of HORU for the Rural Alberta Region in Section 5.4.
Infrastructure and Services	• Access to the Hinton Pump Station is via Highway 16. • Power facilities that currently service the pump station are sufficient for the Project's needs. • The facility is located near to the Town of Hinton, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Town of Hinton is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The Town of Hinton offers emergency and protective services, including an RCMP detachment and the Hinton Fire/Rescue Department (2 career and 33 on-call firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Hinton Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Rural Alberta Region in Section 5.5.
Navigation and Navigation Safety	• The Hinton Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Rural Alberta Region's economy is diverse and is more resource-based than the Edmonton Region. Key sectors include forestry, coal, oil and gas, agriculture and tourism. Forestry and coal mining are in flux, but the oil and gas industry is a steady contributor to the economy within Yellowhead County (Lyons pers. comm.). • For the Rural Alberta Region, the most active industries (by industrial classification) in 2011 were: mining, quarrying, and oil and gas extraction (employing approximately 16.6% of the labour force); retail trade (11.2%); construction (8.5%); and accommodation and food services (7.5%) (Statistics Canada 2013). • In 2011, there was a labour force of approximately 17,000 workers in the Rural Alberta Region, with a participation rate of about 73.2% and an unemployment rate of 5.9% (Statistics Canada 2013). • In 2011, approximately 42.9% of the Rural Alberta Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 16.1% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Rural Alberta Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Hinton Pump Station. • The facility is located within Alberta Health Services' North Health Zone. • Overall health in the North Zone is lower compared to the Alberta provincial average. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. • Self-perceived mental health, life satisfaction and life stress in the North Zone are comparable to the Alberta average, indicating similar levels of mental well-being. • Alcohol and drug misuse are substantially higher in the Hinton area than the province as a whole. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Hinton Healthcare Centre is the closest location for primary care and emergency medical response and treatment, with Edmonton acting as the closes referral centre. Data on health care capacity and access indicate a relative insufficiency of access to primary and tertiary health care compared to provincial averages; this trend is common to rural regions across Canada. • Proximate EMS responders (*i.e.*, ambulance) are located in the Town of Hinton.

6.1.6 Jasper Pump Station

The existing Jasper Pump Station is located at NW 2-46-1 W6M. This facility is located on lands leased by Trans Mountain in the Jasper National Park Region, and within the boundary of the Municipality of Jasper. Current land use at and around this facility site is primarily industrial and forested. No disturbance of previously undisturbed lands is proposed at the Jasper Pump Station; all activities are confined to the existing station boundaries. Two existing 2,500 HP pump units at the Jasper Pump Station will be relocated within the station. Access to the Jasper Pump Station is via Highway 16. Table 6.1-6 provides a summary of the socio-economic elements and considerations for the Jasper Pump Station. The location of the Jasper Pump Station is shown on Figure 6.1-6.



TRANS MOUNTAIN

FIGURE 6.1-6

JASPER PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- City / Town
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-6

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE JASPER PUMP STATION

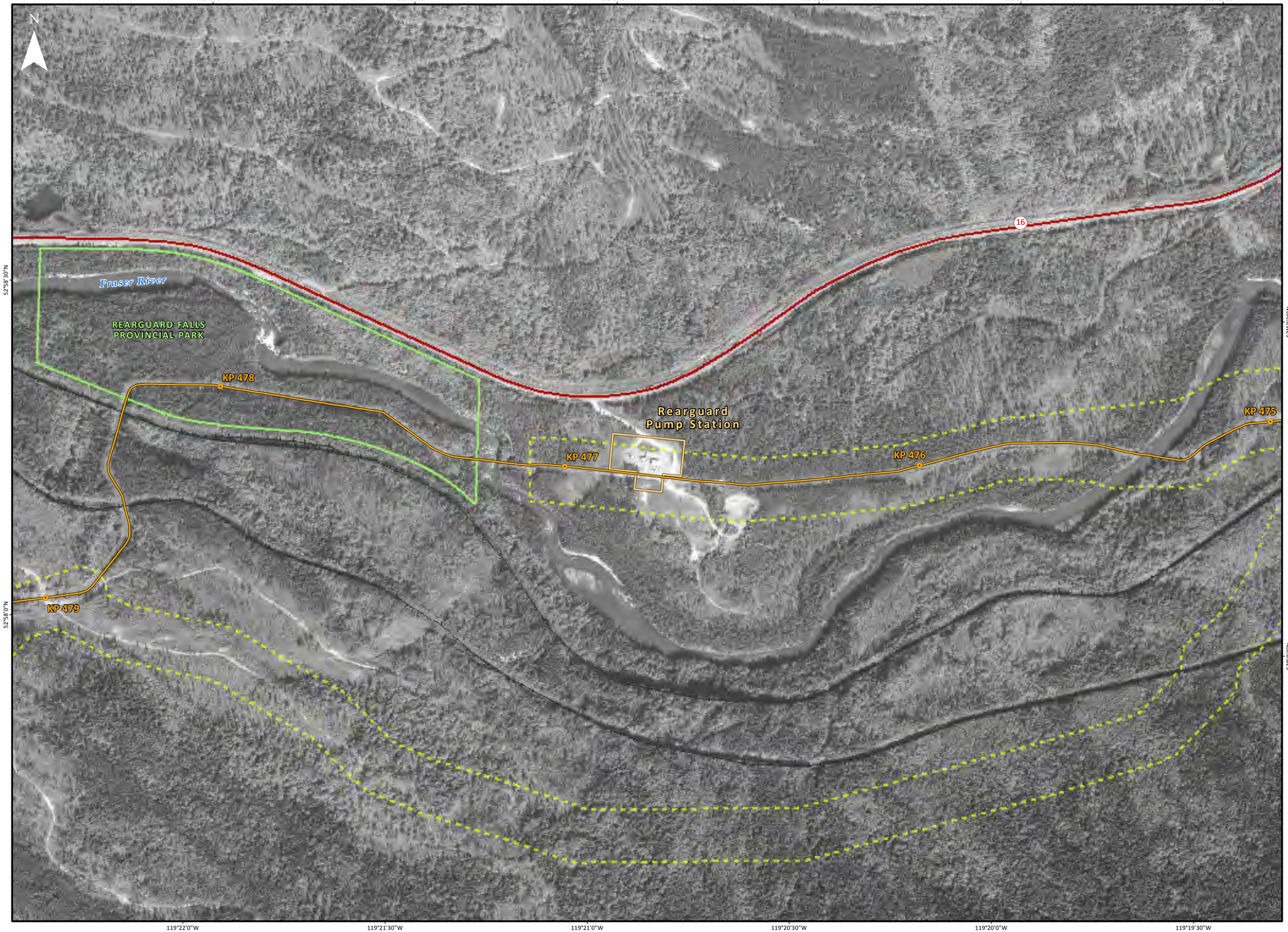
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• According to Alberta Culture (2013) there are no known historical resources located within NW 2-46-1 W6M. • There is no heritage resources (archaeological, historic or palaeontological) potential in NW 2-46-1 W6M since the land is previously disturbed for industry. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 18 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Jasper Pump Station: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; Sunchild First Nation; Lheidli T'enneh; Aseniwuche Winewak Nation; Simpcw First Nation; and Whispering Pines (Clinton Indian Band). • The Aboriginal communities listed above were identified to have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use limits the practice of traditional activities on lands within and adjacent to the Jasper Pump Station. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton and Hargreaves to Darfield segments in Section 5.2.
Social and Cultural Well-Being	• In 2011, the Jasper National Park Region had a population of approximately 4,085, which represents a 5% decrease since 2006. The workforce population (between 15 and 64 years old) was 84% of the total population, and the median age was 34.8 (Statistics Canada 2012). In 2011, approximately 2.2% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income of the Jasper National Park Region was approximately $35,000. • Although the Jasper Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 18 Aboriginal communities (see TLRU above). • In terms of community way of life, the Jasper Pump Station lies within the boundaries of the Municipality of Jasper. The Municipality of Jasper is a world-renowned vacation and recreational destination, and summer is the busiest tourist season. The Town of Hinton is anticipated to be a potential construction hub for the staging of construction activity and housing of workers.
Human Occupancy and Resource Use	• The Jasper Pump Station is located on land within the jurisdiction of the Municipality of Jasper. Land use in the vicinity is governed by the Jasper National Park Management Plan, and the pump station is located in Zone 4 – Outdoor Recreation. • Current land use at and around the Jasper Pump Station is primarily forested. • Although the Jasper Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 18 Aboriginal communities (see TLRU above). • The Jasper Pump Station is not located in the vicinity of a residential neighbourhood. The nearest residence is located approximately 1.3 km southeast of the property boundaries. • No agricultural lands are located at the Jasper Pump Station. • Outdoor recreational use on the lands around this location include hiking, wildlife viewing, mountain biking, camping, snowshoeing and skiing. The existing TMPL right-of-way is used for winter recreation activities, such as skiing, snowshoeing and walking. • Non-traditional hunting and trapping is prohibited in National Parks (Alberta Guide to Hunting Regulations 2013). Fishing in National Parks requires a valid National Park Fishing Permit. Provincial licenses are not valid inside National Parks (Alberta Guide to Sportfishing Regulations 2013). • No mineral or aggregate tenures exist at the Jasper Pump Station. • The Jasper Pump Station is located in the boundaries of the Municipality of Jasper's Noise Bylaw No. 108. • Refer to Section 7.0 of the Socio-Economic Technical Report of Volume 5D for a full description of HORU in the Jasper National Park Region.

TABLE 6.1-6 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Jasper Pump Station is via Highway 16. • CN maintains rail lines in the vicinity of the Jasper Pump Station. There is one rail station located in the Municipality of Jasper. • Solid waste is collected at the Jasper transfer station and is hauled to the West Yellowhead Regional Landfill located in the Town of Hinton. To accommodate the summer tourist population, the Municipality of Jasper has waste capacity for over 25,000 people. Waste infrastructure capacity in the Municipality of Jasper is good (Read pers. comm.). • The Municipality of Jasper has approximately 20 hotels/motels and 1,500 rooms. Hotels are often at full capacity in the summer months (Waterworth pers. comm.). During the winter months, hotels typically have availability (Jenkins pers. comm.). • The Municipality of Jasper offers emergency and protective services, including an RCMP detachment and the Jasper Fire Department (2 career professionals and 30 volunteer firefighters) (RCMP 2013, Municipality of Jasper 2012). • Trans Mountain has established emergency response plans and programs at all facilities, including the Jasper Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Outdoor recreation amenities include baseball diamonds, soccer pitches, picnic areas, a skate park and tennis courts. The municipality offers an arena, activity centre and a fitness and aquatic centre that was renovated in 2011 (Municipality of Jasper 2012).
Navigation and Navigation Safety	• The Jasper Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Jasper National Park Region's economy relies primarily on tourism, taking advantage of its status as a world-renowned vacation destination. • For the Jasper National Park Region, the most active industries (by industrial classification) in 2011 were: accommodation and food services (employing approximately 28.9% of the labour force); transportation and warehousing (13.2%); healthcare and social assistance (9.6%); and retail trade (8.8%) (Statistics Canada 2013). • For the Jasper National Park Region in 2011, there was a labour force of approximately 2,500 workers, with a participation rate of about 84.3% and an unemployment rate of 1.6%. Approximately 4.6% of the regional labour force worked in the construction industry (Statistics Canada 2013). • In 2011, approximately 54.5% of the Jasper National Park Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 12.2% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013).
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Jasper Pump Station. • The facility is located within Alberta Health Services' North Health Zone. • Overall health in the North Zone is lower compared to the Alberta provincial average. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. • Self-perceived mental health, life satisfaction and life stress in the North Zone are comparable to the Alberta average, indicating similar levels of mental well-being. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Jasper Healthcare Centre is the closest location for primary care and emergency medical response and treatment. Data on health care capacity and access indicate a relative insufficiency of access to primary and tertiary health care compared to provincial averages; this trend is common in rural regions across Canada. • Proximate EMS responders (*i.e.*, ambulance) are located in the Municipality of Jasper.

6.1.7 Rearguard Pump Station

The existing Rearguard Pump Station is located at d-068-K/083-D-14 at RK 498.3 on lands owned by Trans Mountain in the RDFFG within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. The expansion of the Rearguard Pump Station will require the acquisition of approximately 0.7 ha of new Crown land adjacent to and to the east of existing Trans Mountain lands. Two 5,000 HP pump units will be added at the site. The existing access road to the Rearguard Pump Station will be modified for the Project. Table 6.1-7 provides a summary of the socio-economic elements and considerations for the Rearguard Pump Station. The location of the Rearguard Pump Station is shown on Figure 6.1-7.



TRANS MOUNTAIN

FIGURE 6.1-7

REARGUARD PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_07		PAGE: SHEET 7 OF 16
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SCALE: 1:10,000	PAGE SIZE: 11x17	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

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ALL LOCATIONS APPROXIMATE

201311_MAP_TERA_ESA_00482_Rev0_07.mxd

TABLE 6.1-7

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE REARGUARD PUMP STATION

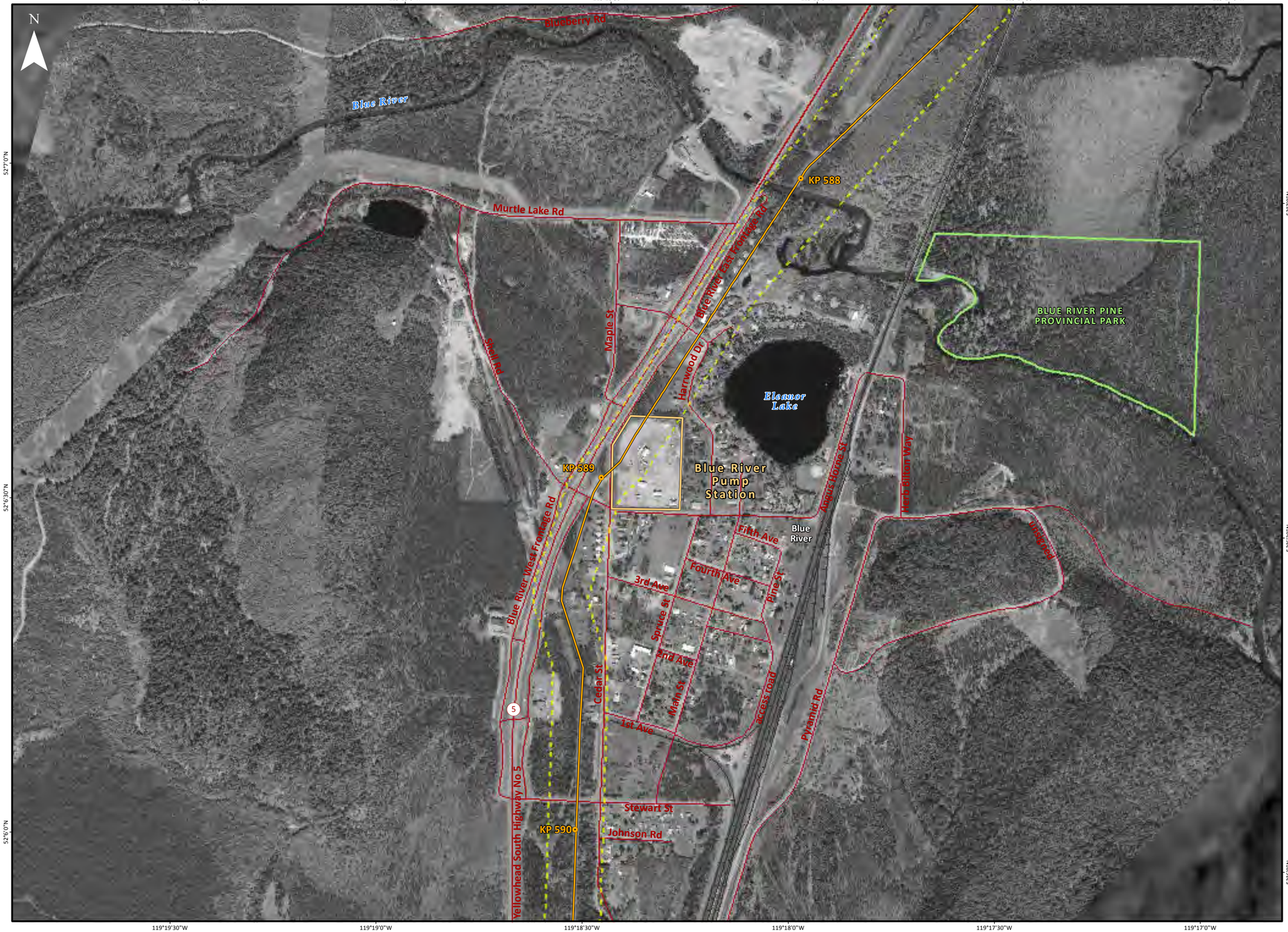
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within d-068-K/083-D-14 (BC MFLNRO 2013). • Although additional new lands are required to the east of the existing fenced area, there is low heritage resource (archaeological, historic or palaeontological) potential in d-068-K/083-D-14 because of existing disturbance in the area. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following five Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Rearguard Pump Station: Aseniwuche Winewak Nation, Lheidli T'enneh; Simpcw First Nation; Whispering Pines (Clinton Indian Band); and Métis Nation British Columbia. • Whispering Pines (Clinton Indian Band) completed a TERA-facilitated TLU study map review for the Project. • Aseniwuche Winewak Nation, Simpcw First Nation and Lheidli T'enneh are conducting independent TLU studies for the Project. • Métis Nation British Columbia is preparing an engagement report for the Project. • Aseniwuche Winewak Nation identified plant gathering sites near the Rearguard Pump Station, located at RK 499, at RK 500 and at RK 505.7. • To date, TLU studies have not revealed any TLU sites requiring mitigation adjacent to the Rearguard Pump Station. • Refer also to the setting discussion of TLRU for the Hargreaves to Darfield Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region, including Electoral Area A of the RDFFG (where the Rearguard Pump Station is located), was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the Rearguard Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of five Aboriginal communities (see TLRU above). • In terms of community way of life, the Rearguard Pump Station is located in a rural area of RDFFG north of the Village of Valemount (population 1,020 in 2011). The Village of Valemount is a tourism destination with abundant outdoor recreation opportunities. Work related to the pump station expansion is likely to draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, particularly from the Village of Valemount which is anticipated to be a construction hub for the staging of construction activity and housing of workers. The Village of Valemount has experience with major projects and temporary workers, notably the TMX Anchor Loop Project. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The expansion of the Rearguard Pump Station will require the acquisition of approximately 0.7 ha of additional land adjacent to the eastern boundary of the existing property. The new land required is Crown land. • The existing pump station is located on land within the jurisdiction of the RDFFG. Land use in the vicinity is governed by the Robson Valley-Canoe Upstream Official Community Plan, and the pump station is located in an area zoned as Resource Aggregate. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Rearguard Falls Provincial Park which is located approximately 0.5 km from the pump station. • Although the Rearguard Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of four Aboriginal communities (see TLRU above). • The Rearguard Pump Station does not lie in the vicinity of a residential neighbourhood. There are no residences located within 2 km of the property boundaries. • The pump station is adjacent to lands used for agricultural purposes. • The Rearguard Pump Station is partially located within a placer tenure and entirely within a guide-outfitter area. • The Rearguard Pump Station is located in an Aggregate Resource area, designated by the Fraser-Fort George Regional District Robson Valley-Canoe Upstream OCP (RDFFG 2006). • The Rearguard Pump Station is approximately 200 m from two commercial recreation tenures for guided freshwater recreation (Mount Robson White Water Rafting Co. Ltd. and Maligne Rafting Adventures Ltd.). • There is one registered trap line tenure crossed by the pump station (IHS Inc. 2012). • The VQO for the Rearguard Pump Station area are partial retention and retention. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.

TABLE 6.1-7 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Rearguard Pump Station is via Highway 16. A new access road (connecting with the existing access road) will be constructed to the north and east of the expanded station. • The facility is located near to the Village of Valemount, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Village of Valemount is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The Village of Valemount offers emergency and protective services, including an RCMP detachment and the Valemount Fire Department (1 career and 25 volunteer firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Rearguard Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The Rearguard Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies with the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%) (Statistics Canada 2013). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Rearguard Pump Station. • The facility is located within the Northern Interior HSDA. • Overall health in the Northern Interior HSDA is lower than the BC provincial average. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. Similarly, self-perceived mental health and life satisfaction are lower than the provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Valemount Community Health Centre is the closest major health care centre to the Rearguard Pump Station. The facility sometimes experiences staff shortages and in the past has had to transfer all after-hours care to the McBride hospital, 45 minutes north. • Proximate EMS responders (*i.e.*, ambulance) are located in the Village of Valemount.

6.1.8 Blue River Pump Station

The existing Blue River Pump Station is located at a-035-F/083-D-03 at RK 614.7 on lands owned by Trans Mountain in the TNRD within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. Current land use at and around this facility site is industrial. All work will be conducted within the existing disturbed fenced area and no native vegetation would be directly disturbed within the site boundaries. No disturbance of previously undisturbed lands is proposed at the Blue River Pump Station. Three new 5,000 HP pump units will be added and the existing pump building at the Blue River Pump Station will be deactivated. Access to the Blue River Pump Station is via Highway 5. Table 6.1-8 provides a summary of the socio-economic elements and considerations for the Blue River Pump Station. The location of the Blue River Pump Station is shown on Figure 6.1-8.



TRANS MOUNTAIN

FIGURE 6.1-8

BLUE RIVER PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012, NASA Geospatial Interoperability Program 2005.

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MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_08		PAGE: SHEET 8 OF 16
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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-8

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE BLUE RIVER PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within a-035-F/083-D-03 (BC MFLNRO 2013). • There is low heritage resources (archaeological, historic or palaeontological) potential in a-035-F/083-D-03 since the land is previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following four Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Blue River Pump Station: Lheidli T'enneh; Simpcw First Nation; Whispering Pines (Clinton Indian Band); and Métis Nation British Columbia. • Whispering Pines (Clinton Indian Band) completed a TERA-facilitated TLU study map review for the Project. • Lheidli T'enneh and Simpcw First Nation are conducting independent TLU studies for the Project. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above were identified to have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Blue River Pump Station. • Refer also to the setting discussion of TLRU for the Hargreaves to Darfield Segment in Section 5.2.
Social and Cultural Well-being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region — including Electoral Areas A, B, O and P of the TNRD — was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the Blue River Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of four Aboriginal communities (see TLRU above). • In terms of community way of life, the Blue River Pump Station is located in Electoral Area B of the TNRD (population 283 in 2011) near the unincorporated community of Blue River. Blue River is a small community with an outdoor tourism focus. Work related to the pump station is likely to draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, particularly from the Village of Valemount, District of Clearwater, and smaller unincorporated communities such as Blue River, Albreda, Avola and Vavenby in the TNRD. Blue River and Clearwater are anticipated to be potential construction hubs for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The Blue River Pump Station is located on land within the jurisdiction of the TNRD. Land use in the vicinity is governed by the Blue River Official Community Plan (OCP). The pump station is located in an area zoned for industrial use. • Current land use at and around the Blue River Pump Station is industrial. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Blue River Pine Provincial Park located approximately 0.7 km northeast of the pump station. • Although the Blue River Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of four Aboriginal communities (see TLRU above). • The nearest residences lie approximately 30 m east and south of the property boundaries. • No agricultural lands are located at the Blue River Pump Station. • Outdoor recreational uses on the lands around this location include golf, boating, mountain biking, skiing and skating. • The Blue River Pump Station is located in BC Management Unit Region 3 (hunting and fishing management). There are no guide outfitters operating in the vicinity of the pump station. • No noise legislation exists for the TNRD. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.

TABLE 6.1-8 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Blue River Pump Station is via Highway 5 (Southern Yellowhead Highway). • The facility is located near the Community of Blue River. The region as a whole offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Community of Blue River is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The closest emergency and protective services are located in the Village of Valemount and the District of Clearwater. The Village of Valemount has an RCMP detachment and the Valemount Fire Department (1 career and 25 volunteer firefighters). The District of Clearwater has an RCMP detachment and the Clearwater Fire Department (1 part-time career and 20 volunteer firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Blue River Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.,* spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The Blue River Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies with the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%). In 2011, approximately 7.7% of the regional labour force was experienced in the construction sector (Statistics Canada 2013). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion for employment and economy in the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Blue River Pump Station. • The facility is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower than the BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. • Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average; however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Blue River Health Centre is the closest health care centre; it suffers from chronic staff shortages and has no emergency department capability. Other proximate hospitals are the Dr. Helmcken Memorial Hospital located in the District of Clearwater and the Royal Inland Hospital in the City of Kamloops. • Proximate EMS responders (*i.e.*, ambulance) are located in the Village of Valemount and the District of Clearwater.

6.1.9 Blackpool Pump Station

The existing Blackpool Pump Station is located at c-073-B/092-P-09 at RK 736.8 on lands owned by Trans Mountain in the TNRD within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. Current land use at and around this facility site is industrial. No disturbance of previously undisturbed lands is proposed at the Blackpool Pump Station. Three 5,000 HP pump units will be added at the site. Access to the Blackpool Pump Station is via Highway 5. Table 6.1-9 provides a summary of the socio-economic elements and considerations for the Blackpool Pump Station. The location of the Blackpool Pump Station is shown on Figure 6.1-9.

TRANS MOUNTAIN

FIGURE 6.1-9

BLACKPOOL PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-9

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE BLACKPOOL PUMP STATION

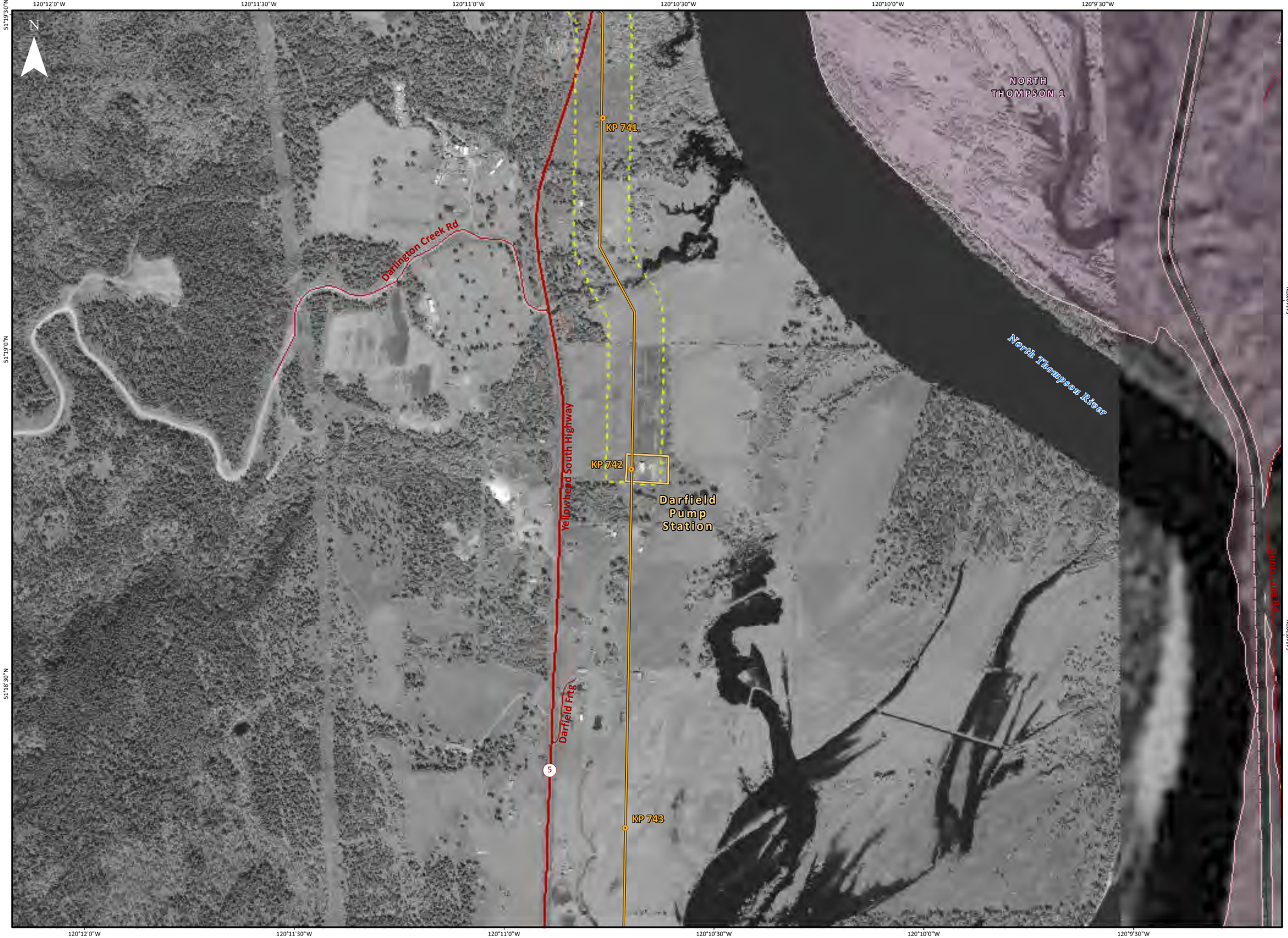
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within c-073-B/092-P-09 (BC MFLNRO 2013). • There is low heritage resource (archaeological, historic or palaeontological) potential in c-073-B/092-P-09 since the land is previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following three Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Blackpool Pump Station: Simpcw First Nation; Whispering Pines (Clinton Indian Band); and Métis Nation British Columbia. • Whispering Pines (Clinton Indian Band) completed a TERA-facilitated TLU study map review for the Project. • Simpcw First Nation is currently conducting an independent TLU study for the Project. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above were identified to have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Blackpool Pump Station. • Refer also to the setting discussion of TLRU for the Hargreaves to Darfield Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region — including Electoral Areas A, B, O, P, J, M, and N of the TNRD — was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the Blackpool Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of three Aboriginal communities (see TLRU above). • In terms of community way of life, the Blackpool Pump Station is located in Electoral Area A of the TNRD just northwest of the District of Clearwater (population 2,331 in 2011). The District of Clearwater is a small rural community with a focus on recreational opportunities related to its proximity to Wells Gray Provincial Park. Work related to the pump station is likely to draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, particularly from the District of Clearwater, District of Barriere, and smaller unincorporated communities such as Blue River, Albreda, Avola and Vavenby in the TNRD. Clearwater is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The Blackpool Pump Station is located on land within the jurisdiction of the TNRD. Land use in the vicinity is governed by the TNRD Zoning Bylaw No. 2400, and the pump station is located in the General Industrial Zone. • Current land use at and around the Blackpool Pump Station is industrial. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is North Thompson River Provincial Park approximately 12 km from the pump station. • Although the Blackpool Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of three Aboriginal communities (see TLRU above). • The nearest residence to the Blackpool Pump Station lies approximately 150 m north-northwest of the property boundaries. • No agricultural lands are located at the Blackpool Pump Station. • Outdoor recreational use on the lands around this location include hiking, mountain biking, skiing, fishing and hunting. • The Blackpool Pump Station is located in BC Management Unit Region 3 (hunting and fishing management). There are no guide outfitters operating in the vicinity of the pump station. • No noise legislation exists for the TNRD. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.

TABLE 6.1-9 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Blackpool Pump Station is via Highway 5 (Southern Yellowhead Highway). • Power facilities that currently service the pump station will be upgraded to 15/20/25 MVA. • The facility is located near the District of Clearwater, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. Clearwater/Vavenby is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The District of Clearwater offers emergency and protective services, including an RCMP detachment and the Clearwater Fire Department (1 part-time career and 20 volunteer firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Blackpool Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The potential for one navigable wetland has been identified at the Blackpool Pump station, but it will not be affected by construction works at the facility. Review of the preliminary construction plan showed that the expansion at the facility will occur to the east of the existing station. The wetland in question is located to the north and outside the proposed work area.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies with the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Blackpool Pump Station. • The facility is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower than BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average; however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Dr. Helmcken Memorial Hospital located in the District of Clearwater is the closest medical facility; it hosts a 24-hour emergency department. • Proximate EMS responders (*i.e.*, ambulance) are located in the District of Clearwater.

6.1.10 Darfield Pump Station

The existing Darfield Pump Station is located at d-075-B/092-P-08 at RK 769 on lands owned by Trans Mountain in the TNRD within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. Current land use at and around this facility site is industrial and agricultural. The expansion of the Darfield Pump Station will be both within the existing disturbed fenced area and west onto cultivated agricultural lands and require a small amount (0.07 ha) of land. New scraper facilities (receiving) will be installed at the site. Access to the Darfield Pump Station is via Highway 5. Table 6.1-10 provides a summary of the socio-economic elements and considerations for the Darfield Pump Station. The location of the Darfield Pump Station is shown on Figure 6.1-10.



TRANS MOUNTAIN

FIGURE 6.1-10

DARFIELD PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- Indian Reserve / Métis Settlement

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012, NASA Geospatial Interoperability Program 2005.

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MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_10		PAGE: SHEET 10 OF 16
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DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-10

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE DARFIELD PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within d-075-B/092-P-08 (BC MFLNRO 2013). • Although new lands will be required, there is low heritage resource (archaeological, historic or palaeontological) potential in d-075-B/092-P-08 since lands in the area are previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following three Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Darfield Pump Station: Simpcw First Nation; Whispering Pines (Clinton Indian Band); and Métis Nation British Columbia. • Whispering Pines (Clinton Indian Band) completed a TERA-facilitated TLU study map review for the Project. • Simpcw First Nation is currently conducting an independent TLU study for the Project. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Darfield Pump Station. • Refer also to the setting discussion of TLRU for the Hargreaves to Darfield Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region — including Electoral Areas A, B, O, P, J, M and N of the TNRD — was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the Darfield Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of three Aboriginal communities (see TLRU above). • In terms of community way of life, the Darfield Pump Station is located in Electoral Area O of the TNRD north of the District of Barriere (population 1,173 in 2011) and the City of Kamloops (population 85,675 in 2011). Work related to the pump station is likely to draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, particularly from the District of Barriere and the City of Kamloops. Kamloops is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Kamloops is a large regional service centre experienced with construction crews and with capacity to absorb some temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The Darfield Pump Station is located on land within the jurisdiction of the TNRD. Land use in the vicinity is governed by the TNRD Zoning Bylaw No. 2400, and the pump station is located in the Rural Zone and the ALR. The Rural Zone permits activities associated with agricultural, forestry, recreational and resource uses (TNRD 2012). • Current land use at and around the Darfield Pump Station is industrial and agricultural. • The expansion of the Darfield Pump Station will require a small amount of land that extends beyond the existing facility site. A total of approximately 0.07 ha of additional land will be required adjacent to the northern boundary of the existing property. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Chu Chua Cottonwood Provincial Park which is located approximately 4 km from the pump station. • Although the Darfield Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of three Aboriginal communities (see TLRU above). • The closest residence is located approximately 150 m south of the property boundaries. • Darfield Pump Station is located on lands in the ALR. • Outdoor recreational uses on the lands around this location include hiking and camping. The North Thompson River is located approximately 800 m from the pump station. Activities such as fishing and canoeing occur on the North Thompson River. • The Darfield Pump Station is located in BC Management Unit Region 3 (hunting and fishing management). One registered trap line tenure is crossed by the pump station (IHS Inc. 2012). • No noise legislation exists for the TNRD. • The VQO for the Darfield Pump Station area is modification. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.

TABLE 6.1-10 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Darfield Pump Station is via Highway 5. • The facility is located near to the City of Kamloops, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The City of Kamloops is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Kamloops offers emergency and protective services, including an RCMP detachment (with additional municipal employees) and Kamloops Fire Rescue (86 career professional firefighters). The District of Barriere also has a volunteer fire department. • Trans Mountain has established emergency response plans and programs at all facilities, including the Darfield Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The Darfield Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within in the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies with the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%). In 2011, approximately 7.7% of the regional labour force was experienced in the construction sector (Statistics Canada 2013). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion for employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Darfield Pump Station. • The facility is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower compared to the BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. • Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average, however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Barriere Health Centre is the closest health care centre; it suffers from chronic staff shortages and has no emergency department capability. Other proximate hospitals are the Dr. Helmcken Memorial Hospital located in the District of Clearwater and the Royal Inland Hospital in the City of Kamloops. • Proximate EMS responders (*i.e.*, ambulance) are located in the District of Barriere.

6.1.11 Black Pines Pump Station

The proposed Black Pines Pump Station is a new site located on forested and pasture lands at d-041-K/092-I-16 at RK 811.9. The Black Pines Pump Station is located in the TNRD within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. The Black Pines Pump Station will require a new land base of approximately 150 m x 150 m (approximately 2.3 ha) for the pump station and substation. The new land is privately-owned, treed and within the ALR. Two 2,500 HP pump units and two 5,000 HP pump units will be added at the site. A new 138 kV power line approximately 2.2 km long in a 50 m wide right-of-way will also be installed at the proposed Black Pines site. A short new access road to the site will be constructed. Table 6.1-11 provides a summary of the socio-economic elements and considerations for the Black Pines Pump Station. The location of the proposed Black Pines Pump Station and associated power line are shown on Figure 6.1-11.

TRANS MOUNTAIN

FIGURE 6.1-11

BLACK PINES PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Proposed Power Line
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- Indian Reserve / Métis Settlement

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor VG: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community.

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ALL LOCATIONS APPROXIMATE

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TABLE 6.1-11

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE BLACK PINES PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1. Pump Station and Power Line • There are no known historical resources located within d-041-K/092-I-16 (BC MFLNRO 2013). • Although this pump station will be on new lands, there is low heritage resource (archaeological, historic or palaeontological) potential in d-041-K/092-I-16 because of its distance from water sources, and its location within undulating terrain.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following five Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the proposed Black Pines Pump Station and associated power line: Simpcw First Nation; Whispering Pines (Clinton Indian Band); Tk'emlúps te Secwepemc; Skeetchestn First Nation; and Métis Nation British Columbia. • Whispering Pines (Clinton Indian Band) completed a TERA-facilitated TLU study map review for the Project. • Simpcw First Nation is currently conducting an independent TLU study for the Project. • Interest in TLU studies will be determined by Tk'emlúps te Secwepemc and Skeetchestn First Nation through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use limits, to an extent, the practice of traditional activities on lands within and adjacent to the proposed Black Pines Pump Station as well as along the proposed power line that will bring power to the pump station. • To date, TLU studies have not revealed TLU sites requiring mitigation within and adjacent to the proposed Black Pines Pump Station as well as along the proposed power line. • Refer also to the setting discussion of TLRU for the Black Pines to Hope Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region — including Electoral Areas A, B, O, P, J, M, and N of the TNRD — was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the proposed Black Pines Pump Station and associated power line do not lie within any IRs, they do lie within the areas of interest of five Aboriginal communities (see TLRU above). • In terms of community way of life, the proposed Black Pines Pump Station and power line are located in Electoral Area P of the TNRD north of the City of Kamloops (population 85,675 in 2011). Work related to the pump station and power line are likely to draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, particularly from the City of Kamloops which is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Kamloops is a large regional service centre experienced with construction crews and with infrastructure/services capacity to absorb some temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The proposed Black Pines Pump Station will require a new land base of approximately 150 m x 150 m (approximately 2.3 ha) to construct the pump station and substation. The new land is privately-owned, with no visible or known structures or regular use. • The existing pump station is located on land within the jurisdiction of the TNRD. Land use in the vicinity is governed by the Kamloops North Official Community Plan. The pump station is located in an area zoned for agricultural use and the associated power line crosses areas zoned for agricultural and rural resource use. • The pump station and associated power line will not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is the North Thompson Oxbows Jensen Island Provincial Park approximately 8.2 km from the pump station. • Although the proposed Black Pines Pump Station will not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of five Aboriginal communities (see TLRU above). • The nearest residence is located approximately 600 m south of the property boundaries. • Land in this area is treed (*i.e.*, previously undisturbed) and is within the ALR (considered a woodland grazing area). • Outdoor recreational uses on the lands around this location include hiking and camping. The North Thompson River is located approximately 500 m from the pump station. Activities such as fishing and canoeing occur on the North Thompson River.

TABLE 6.1-11 Cont'd

Socio-Economic Elements	Summary of Considerations
Human Occupancy and Resource Use (cont'd)	• The proposed Black Pines Pump Station and associated power line will be located in BC Management Unit Region 3 (hunting and fishing management). The pump station and associated power line cross two known trap line tenures (IHS Inc. 2012). • No noise legislation exists for the TNRD. The VQO for the proposed Black Pines Pump Station is partial retention. • A new electrical substation rated at 15/20/25 MVA will be required, as well as a 138 kV power line to bring power to the pump station. Trans Mountain anticipates the new line will tie into an existing power line on the east side of Highway 5, which is to the east of the proposed Black Pines Pump Station site. The power line crosses approximately 1.8 km of ALR lands; of this, it will cross grazing woodland agricultural use for approximately 720 m and field crop area for approximately 1.1 km. The power line crosses partial retention and modification VQOs. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.
Infrastructure and Services	• Access to the proposed Black Pines Pump Station is via Westsyde Road. The pump station will require a new access road (6 m wide) off of Westsyde Road. • A new electrical substation rated at 15/20/25 MVA will be required, as well as a 138 kV power line to bring power to the pump station. • The facility is located near to the City of Kamloops, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The City of Kamloops is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Kamloops offers emergency and protective services, including an RCMP detachment (with additional municipal employees) and Kamloops Fire Rescue (86 career professional firefighters). • The proposed Black Pines Pump Station will require the development of a pump station operating manual and emergency response guidelines. These guidelines follow the well established emergency management system and will be compatible with existing emergency response plans. Trans Mountain will equip the Pump Station with appropriate emergency response equipment similar to other pump stations. Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The proposed Black Pines Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland. The new power line will cross the North Thompson River.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within in the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies with the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%) (Statistics Canada 2013). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the proposed Black Pines Pump Station and associated power line. • The facility is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower compared to the BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. • Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average; however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Royal Inland Hospital in the City of Kamloops is the closest health care facility; it is a tertiary care hospital providing full emergency and inpatient services. • Proximate EMS responders (*i.e.*, ambulance) are located in the District of Barriere and the City of Kamloops.

6.1.12 Kamloops Pump Station

The existing Kamloops Pump Station is located at d-094-E/092-I-09 at RK 850.8 within the Kamloops Terminal on lands owned by Trans Mountain in the municipal boundaries of City of Kamloops within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. Current land use at this site is industrial. No disturbance of previously undisturbed lands is proposed at the Kamloops Pump Station. Three 5,000 HP pump units and one spare 5,000 HP pump unit will be installed at the site. Access to the Kamloops Pump Station is via Highway 5. Table 6.1-12 provides a summary of the socio-economic elements and considerations for the Kamloops Pump Station. The location of the Kamloops Pump Station is shown on Figure 6.1-12.

TRANS MOUNTAIN

FIGURE 6.1-12

KAMLOOPS PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- City / Town

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_12		PAGE: SHEET 12 OF 16
DATE: December 2013	TERA REF.: 7894	REVISION: 0
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0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

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TABLE 6.1-12

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE KAMLOOPS PUMP STATION

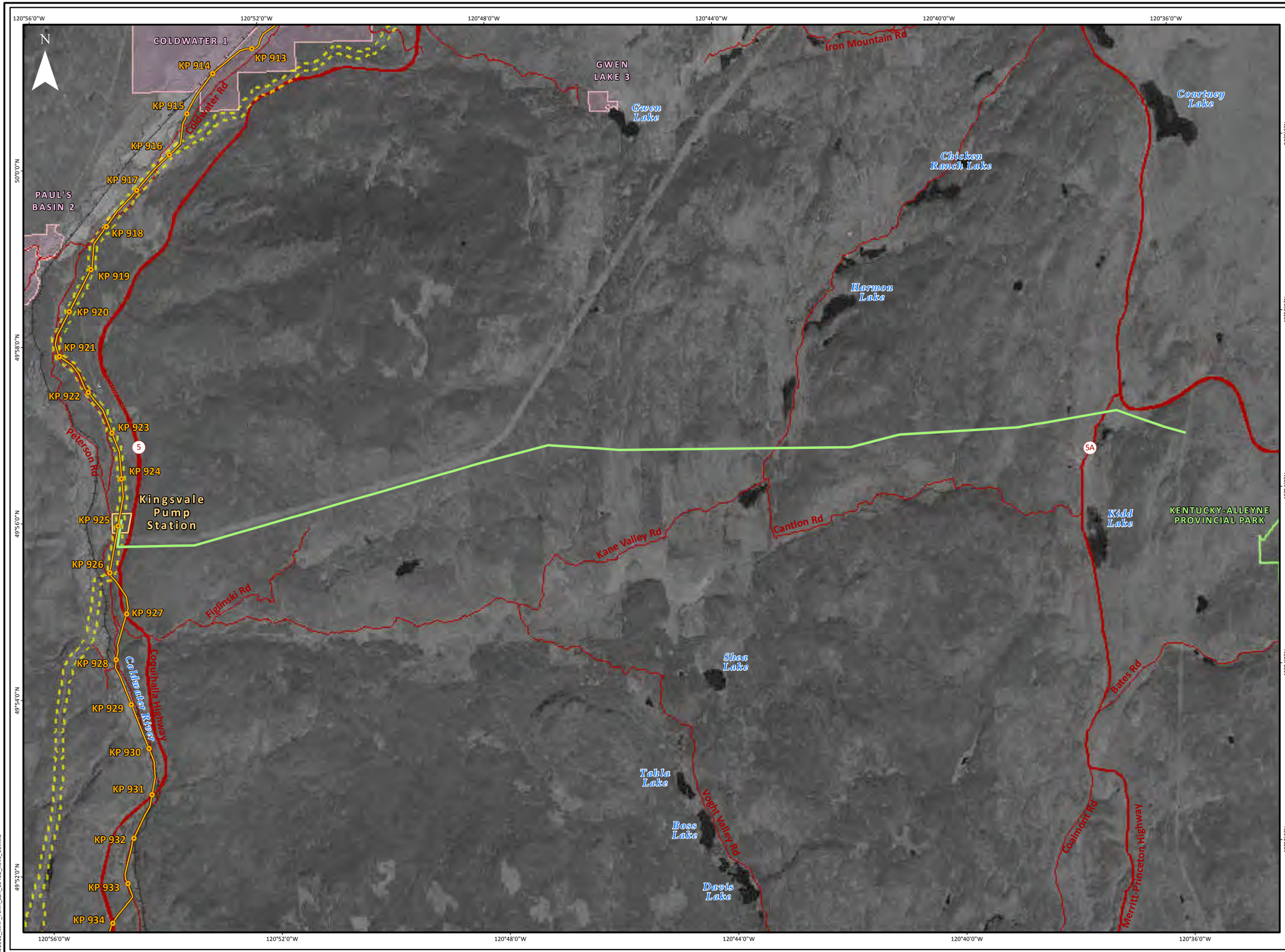
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within d-094-E/092-I-09 (BC MFLNRO 2013). • There is low heritage resource (archaeological, historic or palaeontological) potential in d-094-E/092-I-09 since the land is previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following four Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Kamloops Pump Station: Whispering Pines (Clinton Indian Band); Tk'emlúps te Secwepemc; Skeetchestn First Nation; and Métis Nation British Columbia. • Whispering Pines (Clinton Indian Band) completed a TERA-facilitated TLU study map review for the Project. • Interest in TLU studies will be determined by Tk'emlúps te Secwepemc and Skeetchestn First Nation through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Kamloops Pump Station. • Refer also to the setting discussion of TLRU for the Black Pines to Hope Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region, including the City of Kamloops, was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the Kamloops Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of four Aboriginal communities (see TLRU above). • In terms of community way of life, the Kamloops Pump Station is located in the City of Kamloops (population 85,675 in 2011). Work related to the pump station may draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, but particularly from the City of Kamloops which is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Kamloops is a large regional service centre experienced with construction crews and with capacity to absorb some temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The Kamloops Pump Station is located on land within the jurisdiction of the City of Kamloops. Land use in the vicinity is governed by the Kamloops OCP, and the pump station is located in an area zoned for industrial use. • Current land use at the Kamloops Pump Station is industrial. No new land is required for this facility. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Pineview Valley Municipal Park approximately 1 km from the pump station. • Although the Kamloops Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of four Aboriginal communities (see TLRU above). • The nearest residence lies approximately 520 m southeast of the property boundaries. • No agricultural lands are located at the Kamloops Pump Station. • Land use around the pump station is industrial. Outdoor recreation does not occur on the lands around this location. • The Kamloops Pump Station located in BC Management Unit Region 3(hunting and fishing management). • The Kamloops Pump Station is located in the boundaries of the Noise Control Bylaw No. 24-42, outlining noise legislation within the City of Kamloops. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4.

TABLE 6.1-12 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Kamloops Pump Station is via Highway 5. • Although a new substation will be installed at the Kamloops Pump Station, no new power lines are required. • The facility is located in the City of Kamloops, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The City of Kamloops is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Kamloops offers emergency and protective services, including an RCMP detachment (with additional municipal employees) and Kamloops Fire Rescue (86 career professional firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Kamloops Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The Kamloops Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within in the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, there is a diversity in the size of the labour force, depending on the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%) (Statistics Canada 2013). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer to the setting discussion of employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Kamloops Pump Station. • The facility is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower than the BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. • Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average; however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries, including those from motor vehicle collisions. • The Royal Inland Hospital in the City of Kamloops is the closest health care facility; it is a tertiary care hospital providing full emergency and inpatient services. • EMS responders (*i.e.*, ambulance) are located in the City of Kamloops.

6.1.13 Kingsvale Pump Station

The existing Kingsvale Pump Station is located at b-023-L/092-H-15 at RK 956 on land owned by Trans Mountain, within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. Current land use at this site is industrial. Some forested lands will be disturbed within the existing boundary of the Kingsvale Pump Station. Two 5,000 HP pump units will be installed at the site. A new 138 kV power line approximately 23.5 km long in a 50 m wide right-of-way will also be installed at the site. Access to the Kingsvale Pump Station is via Highway 5. Table 6.1-13 provides a summary of the socio-economic elements and considerations for the Kingsvale Pump Station. The location of the Kingsvale Pump Station and proposed power line are shown on Figure 6.1-13.



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TRANS MOUNTAIN

FIGURE 6.1-13

KINGSVALE PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Proposed Power Line
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- National Park / Provincial Park / Protected Area
- Indian Reserve / Métis Settlement

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: NASA Geospatial Interoperability Program 2005.

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0 500 1,000 1,500 2,000 2,500 m

ALL LOCATIONS APPROXIMATE

TABLE 6.1-13

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE KINGSVALE PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Fort George/Thompson-Nicola Region in Section 5.1. Pump Station and Power Line • There are no known historical resources located within b-023-L/092-H-15 (BC MFLNRO 2013). • There is low heritage resource (archaeological, historic or palaeontological) potential in b-023-L/092-H-15 because of existing disturbance in the area. • The potential for undiscovered heritage resources is low because of the high level of existing disturbance.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following six Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Kingsvale Pump Station and associated 138 kV power line: Penticton Indian Band; Upper Nicola Indian Band; Lower Similkameen Indian Band; Upper Similkameen Indian Band; Lower Nicola Indian Band; and Métis Nation British Columbia. • Lower Nicola Indian Band is currently conducting an independent TLU study for the Project. • Interest in TLU studies will be determined by Penticton Indian Band, Upper Nicola Indian Band, Lower Similkameen Indian Band and Upper Similkameen Indian Band through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use limits, to an extent, the practice of traditional activities on lands within and adjacent to the Kingsvale Pump Station as well as along the 138 kV power line that will bring power to the pump station. • Refer also to the setting discussion of TLRU for the Black Pines to Hope Segment in Section 5.2.
Social and Cultural Well-Being	• The Kingsvale Pump Station and associated power line are located in the TNRD Electoral Area N within the Fraser-Fort George/Thompson-Nicola Region of the Socio-economic RSA. • In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region — including Electoral Areas A, B, O, P, J, M and N of the TNRD — was approximately 129,000 and approximately 73.9% of the population was between the ages of 25 and 64 years old; the median age was 45 (Statistics Canada 2012). In 2011, approximately 10.6% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately $24,400. • Although the Kingsvale Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of six Aboriginal communities (see TLRU above). • In terms of community way of life, the Kingsvale Pump Station is located south of the City of Merritt (population 7,115 in 2011). Work related to the pump station may draw on labour from the Fraser-Fort George/Thompson-Nicola Region as a whole, but particularly from the City of Merritt which is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Merritt is experienced with construction crews, has capacity to absorb some temporary workers, and would anticipate economic benefits associated with the presence of temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Fraser-Fort George/Thompson-Nicola Region in Section 5.3.
Human Occupancy and Resource Use	• The Kingsvale Pump Station and associated power line are located on land within the jurisdiction of the TNRD. Land use in the vicinity is governed by the TNRD Zoning Bylaw No. 2400. The pump station is located in the Rural Zone, and the power line is located in the Rural Zone and the ALR. • Refer also to the setting discussion of HORU for the Fraser-Fort George/Thompson-Nicola Region in Section 5.4. Pump Station • Current land use at the Kingsvale Pump Station is industrial. No new land is required for this facility. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. • Although the Kingsvale Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of six Aboriginal communities (see TLRU above). • The nearest residence is located approximately 300 m northwest of the property boundaries. • No agricultural lands are located at the Kingsvale Pump Station. • Outdoor recreational uses on the lands around this location include hiking, skiing and snowmobiling. • The Kingsvale Pump Station is located in BC Management Unit Region 3 (hunting and fishing management). • No noise legislation exists for the TNRD.

TABLE 6.1-13 Cont'd

Socio-Economic Elements	Summary of Considerations
Human Occupancy and Resource Use (cont'd)	Power Line • A new 138 kV power line will be required to provide electricity to this new substation. The power line crosses: - approximately 11 km of ALR lands and will cross grazing wood land area; - two Old Growth Management Areas for approximately 800 m; - five mineral tenures for approximately 10.5 km; - Kane Valley Road, which provides recreational access to Harrison Lake Recreation Reserve, Harmon Lake Forest Interpretive Trail and Forest, Harmon Lake West and East Recreation Sites and Kane Lake Recreation Site; - retention, partial retention and modification VQOs; - Highway 5A (Princeton–Kamloops Highway) near the Highway 5A–Highway 97C (Okanagan Connector) junction; and - three known trap line tenures (IHS Inc. 2012).
Infrastructure and Services	• Access to the Kingsvale Pump Station is via Highway 5. • The existing substation will be replaced with a 15/20/25 MVA transformer and a new 138 kV power line. • The facility is located near to the City of Merritt, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The City of Merritt is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Merritt offers emergency and protective services, including an RCMP detachment and the Merritt Fire Rescue Department (2 career, 27 paid on-call, and 5 work experience firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Kingsvale Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser-Fort George/Thompson-Nicola Region in Section 5.5.
Navigation and Navigation Safety	• The Kingsvale Pump Station is not located in, on, over, under, through or across a navigable watercourse. The new power line crosses nine potentially navigable wetlands.
Employment and Economy	• The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. • For the Fraser-Fort George/Thompson-Nicola Region overall within in the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12.5% of the labour force); health care and social assistance (12.3%); accommodation and food services (8.4%); and construction (7.7%) (Statistics Canada 2013). • In the Fraser-Fort George/Thompson-Nicola Region, the size of the labour force varies with the community. While the overall regional labour force is approximately 63,200 (with an unemployment rate of 9.4%), it ranges from a high of about 46,700 workers in the City of Kamloops (with an unemployment rate of 8.5%) to approximately 470 workers in the Village of Valemount (with an unemployment rate of 8.5%) (Statistics Canada 2013). • In 2011, approximately 50.1% of the Fraser-Fort George/Thompson-Nicola Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 13.7% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Fraser-Fort George/Thompson-Nicola Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Kingsvale Pump Station and associated power line. • The facility is located within the Thompson Cariboo Shuswap HSDA. • Overall health in the Thompson Cariboo Shuswap HSDA is lower than the BC provincial averages. Self-rated health, functional health and life expectancy are all slightly lower than the provincial averages but risk factors such as smoking, heavy drinking and obesity are substantially higher. • Self-perceived mental health and life satisfaction in the Thompson Cariboo Shuswap HSDA are slightly lower than the provincial average; however, perceived life stress is also lower. Data indicate that the Thompson Cariboo Shuswap HSDA has higher-than-average levels of alcohol and drug misuse. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Nicola Valley Hospital and Health Centre in the City of Merritt and the Fraser Canyon Hospital in Hope are the closest health care facilities. • Proximate EMS responders (*i.e.*, ambulance) are located in the City of Merritt.

6.1.14 Sumas Pump Station

The existing Sumas Pump Station is located at c-073-B/092-G-01 at RK 1114.2 on lands owned by Trans Mountain in the municipal boundary of the City of Abbotsford within the Fraser Valley Region of the Socio-economic RSA. Current land use at this facility site is industrial. All work will be conducted within the existing disturbed fenced area. No disturbance of previously undisturbed lands is proposed at the Sumas Pump Station. One new 2,500 HP pump unit will be installed at the site serving the Puget Sound line. Access to the Sumas Pump Station is via Highway 1ds. Table 6.1-14 provides a summary of the socio-economic elements and considerations for the Sumas Pump Station. The location of the Sumas Pump Station is shown on Figure 6.1-14.

122°10'30"W 122°10'0"W 122°9'30"W 122°9'0"W 122°8'30"W

49°4'30"N

49°4'0"N

49°3'30"N

N

No 4 Rd

Sumas River

North Parallel Rd

KP 1083

KP 1082

KP 1081

Sumas Pump Station

1

Atkinson Rd

Eldridge Rd

TCPL Canada (NPS 30)

Canada Parallel Rd

McDermott Rd

No 5 Rd

Marion Rd

Cole Rd

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TRANS MOUNTAIN

FIGURE 6.1-14

SUMAS PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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MAP NUMBER		PAGE
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0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

TABLE 6.1-14

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE SUMAS PUMP STATION

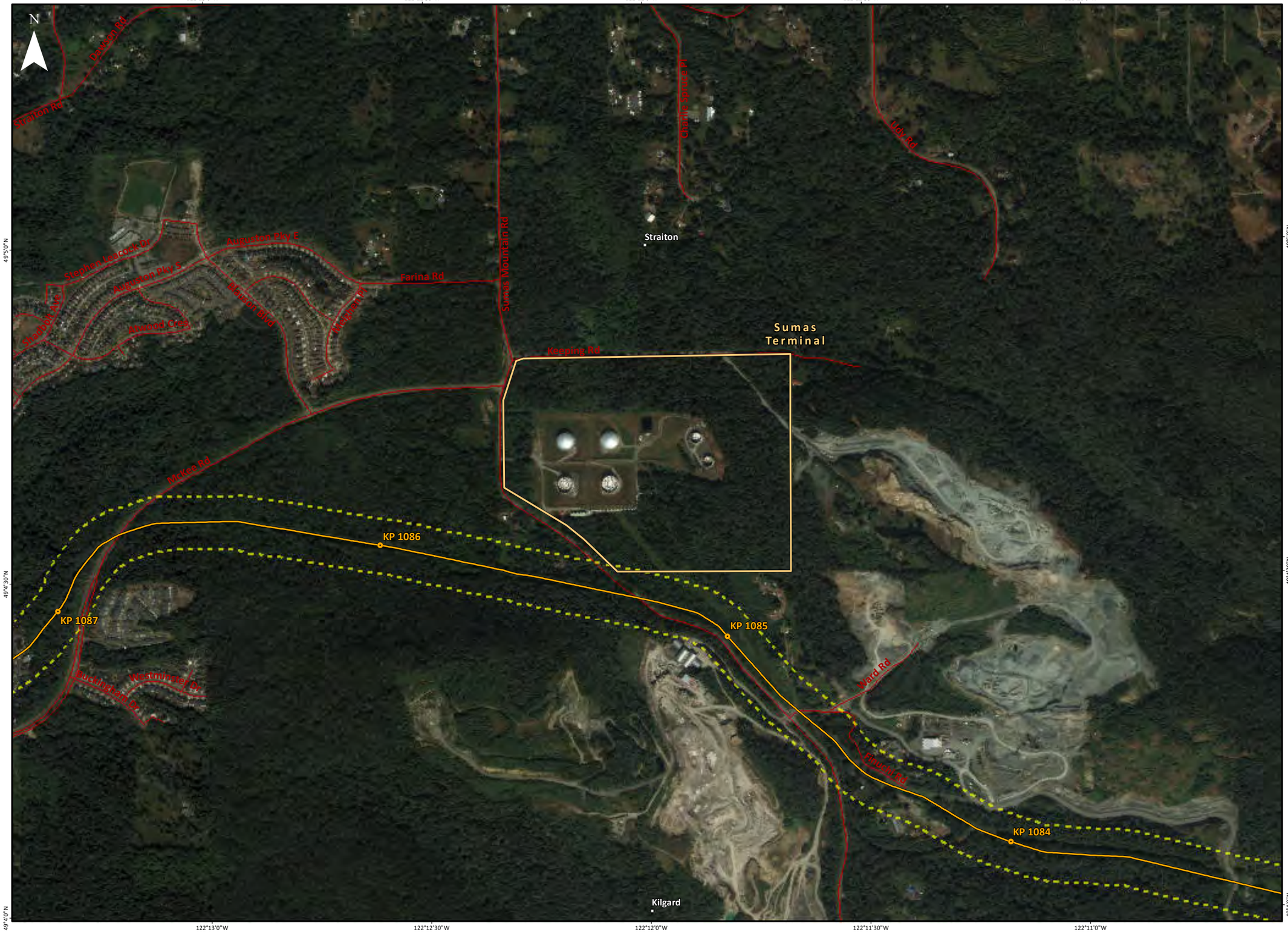
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within c-073-B/092-G-01 (BC MFLNRO 2013). • There is low heritage resource (archaeological, historic or palaeontological) potential in c-073-B/092-G-01 since lands in the area have been previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Fraser-Valley Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 11 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Sumas Pump Station: Sumas First Nation; Scowlitz First Nation; Skowkale First Nation; Yakweakwioose First Nation; Aitchelitz First Nation; Shxwha:y Village; Tzeachten First Nation; Squiala First Nation; Matsqui First Nation; Kwantlen First Nation; and Métis Nation British Columbia. • Scowlitz First Nation completed a TERA-facilitated TLU study map review and interviews for the Project. • Sumas First Nation, Aitchelitz First Nation, Shxwha:y Village, Skowkale First Nation, Squila First Nation, Tzeachten First Nation and Yakweakwioose First Nation are conducting a joint third-party Integrated Cultural Assessment (ICA) led by Ts'elxweyeqw Tribe Management Limited. • Interest in TLU studies will be determined by Matsqui First Nation and Kwantlen First Nation through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Sumas Pump Station. • Refer also to the setting discussion of TLRU for the Hope to Burnaby Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser Valley Region, including the City of Abbotsford, was approximately 274,400 and approximately 72.8% of the population was between the ages of 25 and 64 years old; the median age was 42.6 (Statistics Canada 2012). In 2011, approximately 6.4% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser Valley Region was approximately $23,400. • Although the Sumas Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 11 Aboriginal communities (see TLRU above). • In terms of community way of life, the Sumas Pump Station is located in the City of Abbotsford (population 133,497 in 2011). Work related to the pump station may draw on labour from the Fraser Valley Region as a whole, but particularly from the City of Abbotsford which is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Abbotsford is experienced with temporary workers related to seasonal farm labour. It also hosts the Abbotsford Airshow every August. • Refer also to the setting discussion of social and cultural well-being for the Fraser Valley Region in Section 5.3.
Human Occupancy and Resource Use	• The Sumas Pump Station is located on land within the jurisdiction of the City of Abbotsford. Land use in the vicinity is governed by the Abbotsford OCP, and the pump station is located in an area zoned for industrial use. • Current land use at the Sumas Pump Station is industrial. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Callaghan Municipal Park approximately 4 km from the pump station. • Although the Sumas Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 13 Aboriginal communities (see TLRU above). • The nearest residence is located approximately 110 m southeast of the property boundaries. • The Sumas Pump Station is located adjacent to agricultural lands. • Outdoor recreational uses on the lands around this location include hiking, fishing, rafting and camping. • The Sumas Pump Station is located in BC Management Unit Region 2 (Lower Mainland) (hunting and fishing management). • The Sumas Pump Station is located in the boundaries of the Good Neighbour Bylaw No. 1256, outlining noise legislation within the City of Abbotsford. • Refer also to the setting discussion of HORU for the Fraser Valley Region in Section 5.4.

TABLE 6.1-14 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Sumas Pump Station is via Highway 1. • The existing substation will be upgraded. • The pump station is located in the City of Abbotsford, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The City of Abbotsford is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Abbotsford offers emergency and protective services, including the Abbotsford Police Department and the Abbotsford Fire Rescue Service (both paid on-call and career firefighters). • Trans Mountain has established emergency response plans and programs at all facilities, including the Sumas Pump Station. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser Valley Region in Section 5.5.
Navigation and Navigation Safety	• The Sumas Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The economy of the Fraser Valley Region is based primarily on agriculture, manufacturing and construction. Historically, the predominant sectors have been agriculture and resource development, but the economy is diversifying based on growth in the manufacturing, services, aerospace and technology sectors (FVRD 2010). • For the Fraser Valley Region in 2011, the most active industries (by industrial classification) were: retail trade (employing approximately 11.6% of the labour force); health care and social assistance (10%); construction (9.9%); and manufacturing (8.5%) (Statistics Canada 2013). • For the Fraser Valley Region overall within the Socio-economic RSA, there was a labour force of approximately 138,500 workers in 2011, with a participation rate of about 64.7% and an unemployment rate of 8% (Statistics Canada 2013). • In 2011, approximately 47.3% of the Fraser Valley Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 12.6% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussions of employment and economy for the Fraser Valley Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Sumas Pump Station. • The facility is located within the Fraser East HSDA. • Overall health in the Fraser East HSDA is slightly lower than provincial averages for BC. Smoking and heavy drinking rates are lower; the number of overweight people is higher. Self-perceived mental health and life satisfaction in the Fraser East HSDA are close to provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Abbotsford Hospital is the closest major health care centre to the Sumas Pump Station. The Abbotsford Hospital, along with many other facilities across the Fraser Health Authority, has been facing severe bed shortages. • Proximate EMS responders (*i.e.*, ambulance) are located in the City of Abbotsford.

6.1.15 Sumas Terminal

The existing Sumas Terminal is located at a-097-B/092-G-01 at RK 1117.5 on lands owned by Trans Mountain in the municipal boundaries of the City of Abbotsford within the Fraser Valley Region of the Socio-economic RSA. Current land use at this facility site is industrial and undisturbed forested lands. The proposed activities are within the existing Sumas Terminal property boundary; however, the existing fenceline will be moved approximately 20 m north (0.7 ha of new disturbance). One new 27,820 m^3 (175,000 bbl) storage tank will be installed at the Sumas Terminal. Access to the Sumas Terminal is via Highway 1. Table 6.1-15 provides a summary of the socio-economic elements and considerations for the Sumas Terminal. The location of the Sumas Terminal is shown on Figure 6.1-15.



TRANS MOUNTAIN

FIGURE 6.1-15

SUMAS TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Village / Hamlet / Community
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_15		PAGE: SHEET 15 OF 16
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:10,000	PAGE SIZE: 11x17	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

201311_MAP_TERA_ESA_00482_Rev0_15.mxd

TABLE 6.1-15

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE SUMAS TERMINAL

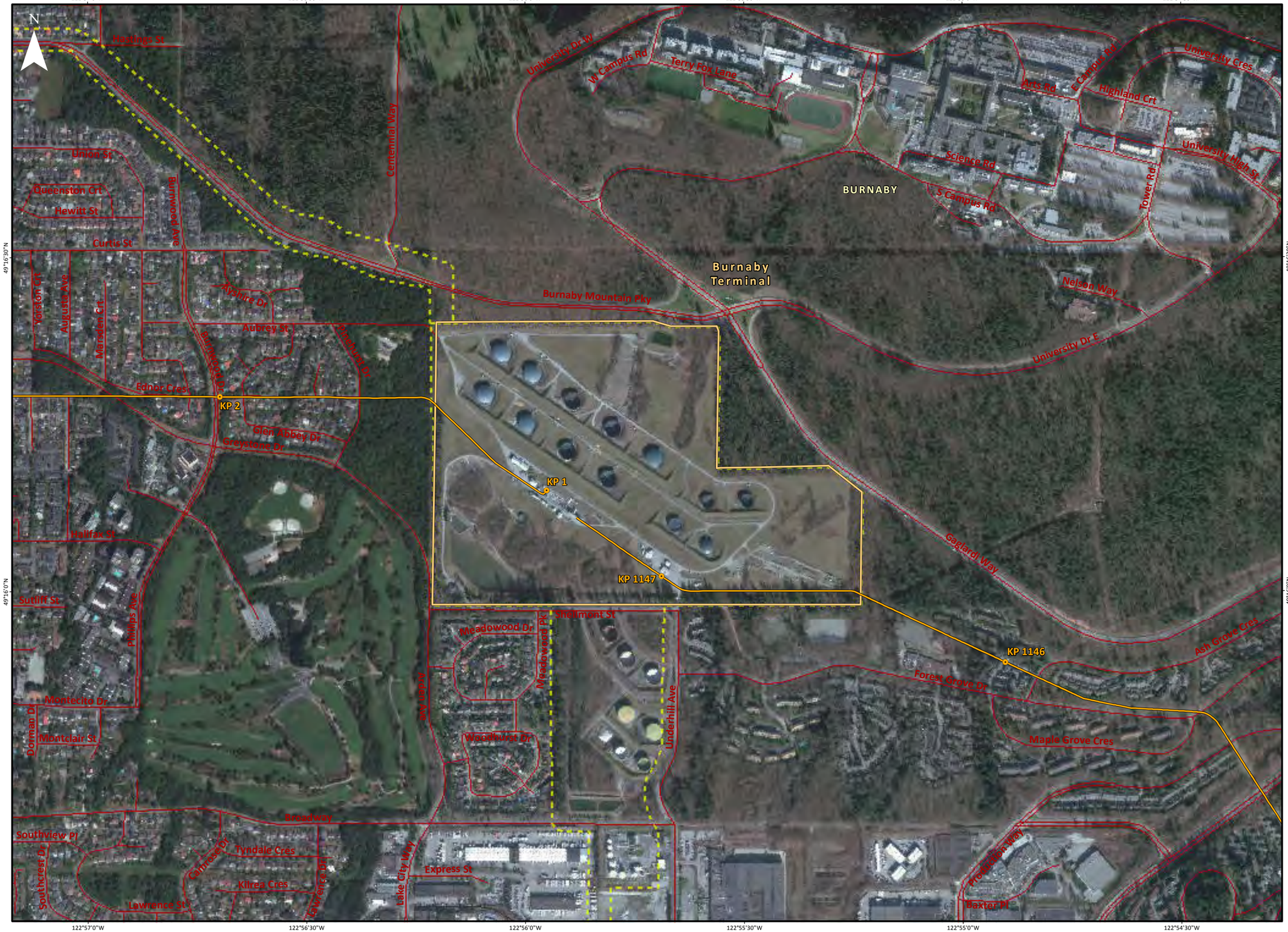
Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within a-097-B/092-G-01 (BC MFLNRO 2013). • There is low heritage resource (archaeological, historic or palaeontological) potential in a-097-B/092-G-01 since the land is previously disturbed for industry as well as human occupation. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion for heritage resources for the Fraser-Valley Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 11 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Sumas Terminal: Sumas First Nation; Scowlitz First Nation; Skowkale First Nation; Yakweakwioose First Nation; Aitchelitz First Nation; Shxwha:y Village; Tzeachten First Nation; Squiala First Nation; Matsqui First Nation; Kwantlen First Nation; and Métis Nation British Columbia. • Scowlitz First Nation completed a TERA-facilitated TLU study map review and interviews for the Project. • Sumas First Nation, Aitchelitz First Nation, Shxwha:y Village, Skowkale First Nation, Squila First Nation, Tzeachten First Nation and Yakweakwioose First Nation are conducting a joint third-party ICA led by Ts'elxweyeqw Tribe Management Limited. • Interest in TLU studies will be determined by Matsqui First Nation and Kwantlen First Nation through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Sumas Terminal. • Refer also to the setting discussion of TLRU for the Hope to Burnaby Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Fraser Valley Region, including the City of Abbotsford, was approximately 274,400 and approximately 72.8% of the population was between the ages of 25 and 64 years old; the median age was 42.6 (Statistics Canada 2012). In 2011, approximately 6.4% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Fraser Valley Region was approximately $23,400. • Although the Sumas Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 11 Aboriginal communities (see TLRU above). • In terms of community way of life, the Sumas Terminal is located in the City of Abbotsford (population 133,497 in 2011). Work related to the terminal may draw on labour from the Fraser Valley Region as a whole, but particularly from the City of Abbotsford which is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. The City of Abbotsford is experienced with temporary workers related to seasonal farm labour. It also hosts the Abbotsford Airshow every August. • Refer also to the setting discussion of social and cultural well-being for the Fraser Valley Region in Section 5.3.
Human Occupancy and Resource Use	• The Sumas Terminal is located on land within the jurisdiction of the City of Abbotsford. Land use in the vicinity is governed by the Abbotsford OCP, and the pump station is located in an area zoned for industrial use. • Current land use at the Sumas Terminal is industrial and undisturbed forested lands. • The terminal does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Callaghan Municipal Park approximately 0.5 km from the terminal. • Although the Sumas Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 13 Aboriginal communities (see TLRU above). • The nearest residence is located approximately 60 m south of the property boundaries. • No agricultural lands are located at the Sumas Terminal. • Outdoor recreational uses on the lands around this location include hiking, fishing, rafting and camping. • The Sumas Terminal is located in BC Management Unit Region 2 (Lower Mainland) (hunting and fishing management). • The Sumas Terminal is located in the boundaries of the Good Neighbour Bylaw No. 1256, outlining noise legislation within the City of Abbotsford. • Refer also to the setting discussion of HORU for the Fraser Valley Region in Section 5.4.
Infrastructure and Services	• Access to the Sumas Terminal is via Highway 1. • The existing power line, approximately 20 m north of the terminal, will need to be moved. Additional power load at the terminal will be accommodated with existing service. • The facility is located in the City of Abbotsford, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The City of Abbotsford is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Abbotsford offers emergency and protective services, including the Abbotsford Police Department and the Abbotsford Fire Rescue Service (both paid on-call and career firefighters).

TABLE 6.1-15 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services (cont'd)	• Trans Mountain has established emergency response plans and programs at all facilities, including the Sumas Terminal. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Fraser Valley Region in Section 5.5.
Navigation and Navigation Safety	• The Sumas Terminal is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The economy of the Fraser Valley Region is based primarily on agriculture, manufacturing and construction. Historically, the predominant sectors have been agriculture and resource development, but the economy is diversifying based on growth in the manufacturing, services, aerospace and technology sectors (FVRD 2010). • For the Fraser Valley Region in 2011, the most active industries (by industrial classification) were: retail trade (employing approximately 11.6% of the labour force); health care and social assistance (10%); construction (9.9%); and manufacturing (8.5%) (Statistics Canada 2013). • For the Fraser Valley Region overall within in the Socio-economic RSA, there was a labour force of approximately 138,500 workers in 2011, with a participation rate of about 64.7% and an unemployment rate of 8% (Statistics Canada 2013). • In 2011, approximately 47.3% of the Fraser Valley Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 12.6% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Fraser Valley Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Sumas Terminal. • The facility is located within the Fraser East HSDA. • Overall health in the Fraser East HSDA is slightly lower than provincial averages for BC. Smoking and heavy drinking rates are lower; the number of overweight people is higher. Self-perceived mental health and life satisfaction in the Fraser East HSDA are close to provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Abbotsford Hospital is the closest major health care centre to the Sumas Terminal. The Abbotsford Hospital, along with many other facilities across the Fraser Health Authority, has been facing severe bed shortages. • Proximate EMS responders (*i.e.*, ambulance) are located in the City of Abbotsford.
Human Health	• An assessment of the potential health risks associated with routine operations at the Sumas Terminal is provided in the HHRA of Volume 5D. • The Sumas Terminal is located within the Fraser Health Authority (FHA) that operates under the auspices of the BC MOH. • The community health setting in Section 5.8 describes the current health status of people residing in the FHA with respect to general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health. • The information on two of the health indices (*i.e.*, cancer incidence and respiratory health) provided in Section 5.8 was examined as part of the HHRA of Volume 5D. This information served as one benchmark for assessing the potential health effects that might occur among people in the FHA from exposure to the chemical emissions from the Sumas Terminal.

6.1.16 Burnaby Terminal

The existing Burnaby Terminal is located at a-025-D/092-G-07 at RK 1179.8 on lands owned by Trans Mountain in the municipal boundaries of the City of Burnaby within the Metro Vancouver Region of the Socio-economic RSA. Current land use at this facility site is industrial. The proposed activities are within the existing Burnaby Terminal property boundary on previously disturbed industrial lands. Two new 39,750 m^3 (250,000 bbl) storage tanks, ten new 45,310 m^3 (285,000 bbl) storage tanks and two new 53,260 m^3 (335,000 bbl) storage tanks will be installed at the Burnaby Terminal. One existing 12,720 m^3 (80,000 bbl) tank will be dismantled and replaced by one of the 45,310 m^3 (285,000 bbl) tanks. Access to the terminal is via Shellmont Street. Table 6.1-16 provides a summary of the socio-economic elements and considerations for the Burnaby Terminal. The location of the Burnaby Terminal is shown on Figure 6.1-16.



TRANS MOUNTAIN

FIGURE 6.1-16

BURNABY TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER 201311_MAP_TERA_ESA_00482_REV0_16		PAGE SHEET 16 OF 16
DATE December 2013	TERA REF. 7894	REVISION 0
SCALE 1:10,000	PAGE SIZE 11x17	DISCIPLINE ESA
DRAWN AJS	CHECKED TGG	DESIGN TGG

0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

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TABLE 6.1-16

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE BURNABY TERMINAL

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within a-025-D/092-G-07 (BC MFNLRO 2013). • There is low heritage resource (archaeological, historic or palaeontological) potential in a-025-D/092-G-07 since the land is previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Metro Vancouver Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following nine Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Burnaby Terminal: Métis Nation British Columbia; Semiahmoo First Nation; Katzie First Nation; Kwikwetlem First Nation; Qayqayt First Nation; Tsleil-Waututh Nation; Squamish First Nation; Musqueam First Nation; and Tsawwassen First Nation. • Semiahmoo First Nation is conducting an independent TLU study for the Project. • Interest in TLU studies will be determined by Katzie First Nation, Kwikwetlem First Nation, Qayqayt First Nation, Tsleil-Waututh Nation, Squamish First Nation, Musqueam First Nation and Tsawwassen First Nation through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands and waters in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Burnaby Terminal. • Refer also to the setting discussion of TLRU for the Hope to Burnaby and Burnaby to Westridge segments in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Metro Vancouver Region, including the City of Burnaby, was approximately 2.3 million and approximately 77.4% of the population was between the ages of 25 and 64 years old; the median age was 41 (Statistics Canada 2012). In 2011, approximately 2.4% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Metro Vancouver Region was approximately $32,400. • Although the Burnaby Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of nine Aboriginal communities (see TLRU above). • In terms of community way of life, the Burnaby Terminal is located in the City of Burnaby (population 468,251 in 2011). Work related to the terminal is likely to draw on labour from the Metro Vancouver Region as a whole, which is anticipated to be a construction hub for the staging of construction activity and housing of workers. The Metro Vancouver Region has a high level of commercial and urban activity, and various communities in the region have experienced major projects, have experience with temporary workers, and have community infrastructure and services capacity to absorb temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Metro Vancouver Region in Section 5.3.
Human Occupancy and Resource Use	• The Burnaby Terminal is located on land within the jurisdiction of the City of Burnaby. Land use in the vicinity is governed by the Burnaby OCP, and the pump station is located in an area zoned for industrial use. • Current land use at the Burnaby Terminal is industrial. • The terminal does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is the Burnaby Mountain Municipal Conservation Area which is located approximately 500 m from the pump station. • Although the Burnaby Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of eight Aboriginal communities (see TLRU above). • The nearest residence is located approximately 50 m south of the property boundaries. • No agricultural lands are located at the Burnaby Terminal. • Outdoor recreational uses on the lands around this location include walking, hiking and cycling. • The Burnaby Terminal is located in BC Management Unit Region 2 (Lower Mainland) (hunting and fishing management). • The Burnaby Terminal is located in the boundaries of the Noise or Sound Abatement Bylaw No. 1979, outlining noise legislation within the City of Burnaby. • Refer also to the setting discussion of HORU for the Metro Vancouver Region in Section 5.4.
Infrastructure and Services	• Access to the Burnaby Terminal is via Shellmont Street. • Power supply will be increased by approximately 5 MW. • The facility is located in the City of Burnaby, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Metro Vancouver Region as a whole is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The City of Burnaby offers emergency and protective services, including an RCMP detachment (plus four RCMP community policing offices) and the City of Burnaby Fire Department.

TABLE 6.1-16 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services (cont'd)	• Trans Mountain has established emergency response plans and programs at all facilities, including the Burnaby Terminal. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates it will increase the amount of available emergency equipment (*e.g.*, spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and service for the Metro Vancouver Region in Section 5.5.
Navigation and Navigation Safety	• The Burnaby Terminal is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Metro Vancouver Region's economic base is diverse and includes trade and commerce, manufacturing, goods distribution, professional services, tourism, education and agriculture. • For the Metro Vancouver Region overall within in the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 10.4% of the labour force); health care and social assistance (9.6%); professional, scientific and technical services (9.2%); and accommodation and food services (8.1%) (Statistics Canada 2013). • In 2011, the total labour force in the Metro Vancouver Region was about 1.3 million workers, representing a participation rate of 66.1%. The workforce ranged from a high of about 349,000 workers in the City of Vancouver to a low of about 360 workers in the Village of Belcarra. The regional unemployment rate was 7.1% (Statistics Canada 2013). Approximately 6.4% of the regional labour force was experienced in the construction industry. • In 2011, approximately 58.6% of the Metro Vancouver Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 8.1% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Metro Vancouver Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Burnaby Terminal. • The facility is located within the Fraser North HSDA. • Overall health in the Fraser North HSDA is similar to provincial averages for BC. Smoking rates are lower; rates of heavy drinking and overweight people are higher. Self-perceived mental health and life satisfaction in the Fraser North HSDA are close to provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • Burnaby Hospital is the closest major health care centre to the Burnaby Terminal. Burnaby Hospital now has the third-busiest emergency department in BC, receiving over 70,000 emergency department visits per year; much beyond its capacity. In addition to the Burnaby Hospital, there are numerous other hospitals and health care centres in close proximity to the Burnaby Terminal, including the Royal Columbian Hospital in New Westminster and the Lions Gate Hospital in North Vancouver. • EMS responders (*i.e.*, ambulance) are located in the City of Burnaby as well as surrounding communities.
Human Health	• An assessment of the potential health risks associated with routine operations at the Burnaby Terminal is provided in the HHRA of Volume 5D. • The Burnaby Terminal is located within the FHA that operates under the auspices of the BC MOH. • The community health setting in Section 5.8 describes the current health status of people residing in the FHA with respect to general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health. • The information on two of the health indices (*i.e.*, cancer incidence and respiratory health) provided in Section 5.8 was examined as part of the HHRA of Volume 5D. This information served as one benchmark for assessing the potential health effects that might occur among people in the FHA from exposure to the chemical emissions from the Burnaby Terminal.

6.2 Westridge Marine Terminal

The existing Westridge Marine Terminal is located at d-047-D/092-G-07 at RK 3.6 on reclaimed foreshore lands. The Westridge Marine Terminal is located in the municipal boundary of the City of Burnaby within the Metro Vancouver Region of the Socio-economic RSA. It is located on approximately 6.2 ha of land owned by Trans Mountain, with the exception of a small portion of land located between the railway and the shoreline, which is leased from CPR. The facility also extends into Burrard Inlet. The expansion of the existing Westridge Marine Terminal will include the construction of one dock with three operational berths, as well as a utility dock. The existing water lease will need to be expanded to accommodate the new docks. Existing access to the Westridge Marine Terminal via Barnet Highway will be used. Table 6.2-1 provides a summary of the socio-economic elements and considerations for the Westridge Marine Terminal. The location of the Westridge Marine Terminal is shown on Figure 6.2-1.

122°58'30"W 122°58'0"W 122°57'30"W 122°57'0"W 122°56'30"W 122°56'0"W

N

49°17'30"N

49°17'0"N

Burrard Inlet

Westridge Marine Terminal

KP 5

KP 4

Westridge

BURNABY

Bayview Dr
Malibu Dr
Sierra Dr
Belcarra Dr
N Cliff Ave
Barnet Rd
Riverside Dr
Ridge Dr
Pandora Dr
Cliff Ave
Lake Dr
Duthie Ave
Pandora St
Ridgeview Dr
Maureen Cres
Trudy Crt
Calvin Crt
Burnaby Mountain Pkwy
Centennial Way
University Dr W
Jesse Ot Barnet Hwy
N Stratford Ave
N Fell Ave
Dundas St
Stratford Ave
Fell Ave
Hastings St
7A
Kensington Ave
Hammarskjold Dr
Georgia St
Grove Ave
Frances St
Sperling Ave
Clare Ave
Duncan Ave
Union St

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TRANS MOUNTAIN

FIGURE 6.2-1

WESTRIDGE MARINE TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Village / Hamlet / Community
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway
- City / Town

Projection: NAD 1983 UTM Zone 10N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_17		PAGE: SHEET 1 OF 1
DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:10,000	PAGE SIZE: 11x17	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

TABLE 6.2-1

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE WESTRIDGE MARINE TERMINAL

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• There are no known historical resources located within d-047-D/092-G-07 on land or in the marine area (BC MFLNRO 2013). • There is low heritage resource (archaeological, historical or palaeontological) potential in d-047-D/092-G-07 since the land is previously disturbed for industry. • *Heritage Conservation Act* approval will be obtained as part of the Project AIA. • Refer also to the setting discussion of heritage resources for the Metro Vancouver Region in Section 5.1.
Traditional Land and Resource Use/Traditional Marine Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following nine Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Westridge Marine Terminal: Métis Nation British Columbia; Semiahmoo First Nation; Katzie First Nation; Kwikwetlem First Nation; Qayqayt First Nation; Tsleil-Waututh Nation; Squamish First Nation; Musqueam First Nation; and Tsawwassen First Nation. • Semiahmoo First Nation is conducting an independent TLU/TMRU study for the Project. • Interest in TLU/TMRU studies will be determined by Katzie First Nation, Kwikwetlem First Nation, Qayqayt First Nation, Tsleil-Waututh Nation, Squamish First Nation, Musqueam First Nation and Tsawwassen First Nation through ongoing engagement with Trans Mountain. • Métis Nation British Columbia is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands and waters in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Westridge Marine Terminal. • Refer also to the setting discussion of TLRU for the Burnaby to Westridge Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Metro Vancouver Region, including the City of Burnaby, was approximately 2.3 million and approximately 77.4% of the population was between the ages of 25 and 64 years old; the median age was 41 (Statistics Canada 2012). In 2011, approximately 2.4% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Metro Vancouver Region was approximately $32,400. • Although the Westridge Marine Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of nine Aboriginal communities (see TLRU above). • In terms of community way of life, the Westridge Marine Terminal is located in the City of Burnaby (population 468,251 in 2011). Work related to the terminal is likely to draw on labour from the Metro Vancouver Region as a whole, which is anticipated to be a construction hub for the staging of construction activity and housing of workers. The Metro Vancouver Region has a high level of commercial and urban activity, and various communities in the Region have experienced major projects, have experience with temporary workers, and have community infrastructure and services capacity to absorb temporary workers. • Refer also to the setting discussion of social and cultural well-being for the Metro Vancouver Region in Section 5.3.
Human Occupancy and Resource Use	• The Westridge Marine Terminal is located on land within the jurisdiction of the City of Burnaby. Land use in the vicinity is governed by the Burnaby OCP, and the pump station is located in an area zoned for industrial use. • Westridge Marine Terminal is located on approximately 6.2 ha of land owned by Trans Mountain, with the exception of a small portion of land located between the railway and the shoreline, which is leased from CPR. • The facility also extends into Burrard Inlet. The water lot is leased from PMV and covers approximately 13.8 ha of lands underlying Burrard Inlet. Trans Mountain expects some expansion of the existing water lot will be required to accommodate the expanded dock facilities. • The Westridge Marine Terminal does not lie within any terrestrial parks or protected areas as described in Section 5.4.1. The nearest park is the Burnaby Mountain Conservation Area adjacent to the Westridge Marine Terminal. Barnet Marine Park is located west of the Westridge Marine Terminal. Nearby marine protected areas include the Eastern Burrard Inlet Rockfish Conservation Area located around the Westridge Marine Terminal. Marine recreation in Burrard Inlet is both intense and diverse, including fishing, boating, kayaking, paddle boarding, windsurfing and kite boarding, swimming, and scuba diving. Recreational users also access major destinations through Burrard Inlet; notably Indian Arm, where provincial and regional parks cover much of the shoreline. • Although the Westridge Marine Terminal does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of eight Aboriginal communities (see TLRU above). • The nearest residence is located approximately 75 m south of the property boundaries. • No agricultural lands are located at the Westridge Marine Terminal. • The Westridge Marine Terminal is located in BC Management Unit Region 2 (hunting and fishing management). • The Westridge Marine Terminal is located in the boundaries of Noise or Sound Abatement Bylaw No. 1979, outlining noise legislation within the City of Burnaby. • Refer also to the setting discussion of HORU for the Metro Vancouver Region in Section 5.4.

TABLE 6.2-1 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Westridge Marine Terminal is via Barnet Highway in Burnaby. • The existing electrical substation and electricity supply line within the Westridge Marine Terminal will be upgraded as required. Electrical upgrades will be determined through a study to be conducted by BC Hydro. At this time, it is anticipated that an additional 3 MW of power will be required at this facility. • The facility is located in the City of Burnaby, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. Metro Vancouver (City of Burnaby) is anticipated to the construction hub for activities related to this facility, including worker accommodation. • The City of Burnaby offers emergency and protective services, including an RCMP detachment (plus four RCMP community policing offices) and the City of Burnaby Fire Department. • Various levels of government are involved in marine or coastal emergency response services, including PMV, BC Ministry of Environment, Canadian Coast Guard and Western Canada Marine Response Corporation. • Trans Mountain has established emergency response plans and programs at all facilities, including the Westridge Marine Terminal. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain anticipates increasing the amount of available emergency equipment (*e.g.,* spill, fire, water/foam systems) to reflect the expansion of facilities. • Refer also to the setting discussion of infrastructure and services for the Metro Vancouver Region in Section 5.5.
Navigation and Navigation Safety	• The Westridge Marine Terminal is located on the marine waters of Burrard Inlet. Burrard Inlet is the location of the PMV and is a key navigable watercourse. • PMV is responsible for oversight of all marine traffic within Burrard Inlet, and operates harbour patrol vessels and services including emergency response, harbour monitoring and support services. There are 23 major cargo and container terminals in Burrard Inlet, which are overseen by PMV (PMV 2013). • Commercial vessel traffic in Burrard Inlet includes cargo ships (forest products, steel products, machinery, grains, coal, chemicals, potash and sulphur); oil tankers (petroleum products); cruise ships; and container ships (household goods) (PMV 2013). • Fishing vessels use Burrard Inlet to berth, fuel, and to access fishing grounds. Commercial fishers in Burrard Inlet mainly harvest Dungeness crab, prawn and shrimp. • Burrard Inlet is used intensively for recreational navigation, including fishing, boating, kayaking, paddle boarding, windsurfing and kite boarding. • Marine tourism use includes cruise ships, boat charters, sport fishing, kayak tours, and whale-watching tours. • Refer also to the Metro Vancouver Region in the HORU setting in Section 5.4 (under marine commercial, recreational and tourism use).
Employment and Economy	• The Metro Vancouver Region's economic base is diverse and includes trade and commerce, manufacturing, goods distribution, professional services, tourism, education and agriculture. • For the Metro Vancouver Region overall within in the Socio-economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 10.4% of the labour force); health care and social assistance (9.6%); professional, scientific and technical services (9.2%); and accommodation and food services (8.1%) (Statistics Canada 2013). • In 2011, the total labour force in the Metro Vancouver Region was about 1.3 million workers, representing a participation rate of 66.1%. The workforce ranged from a high of about 349,000 workers in the City of Vancouver to a low of about 360 workers in the Village of Belcarra. The regional unemployment rate was 7.1% (Statistics Canada 2013). Approximately 6.4% of the regional labour force was experienced in the construction industry. • In 2011, approximately 58.6% of the Metro Vancouver Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 8.1% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Metro Vancouver Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Westridge Marine Terminal. • The facility is located within the Fraser North HSDA. • Overall health in the Fraser North HSDA is similar to provincial averages for BC. Smoking rates are lower; rates of heavy drinking and overweight people are higher. Self-perceived mental health and life satisfaction in the Fraser North HSDA are close to provincial averages. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • Burnaby Hospital is the closest major health care centre to the Westridge Marine Terminal. Burnaby Hospital now has the third-busiest emergency department in BC, receiving over 70,000 emergency department visits per year; much beyond its capacity. In addition to the Burnaby Hospital, there are numerous other hospitals and health care centres in close proximity to the Westridge Marine Terminal, including the Royal Columbian Hospital in New Westminster and the Lions Gate Hospital in North Vancouver. • EMS responders (*i.e.*, ambulance) are located in the City of Burnaby as well as in surrounding communities.

TABLE 6.2-1 Cont'd

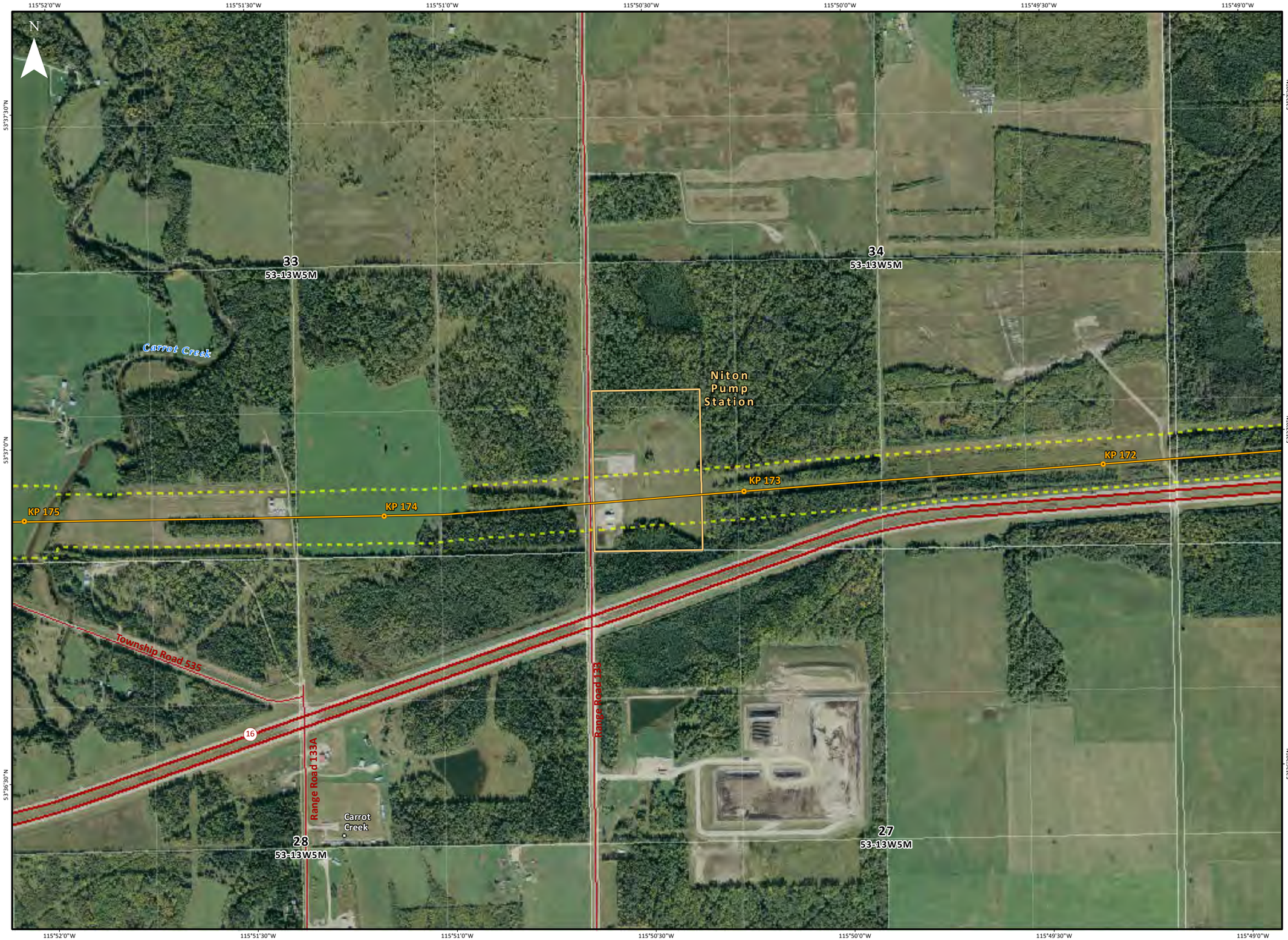
Socio-Economic Elements	Summary of Considerations
Human Health	• An assessment of the potential health risks associated with routine operations at the Westridge Marine Terminal is provided in the Screening Level Human Health Risk Assessment of Pipeline and Facilities of Volume 5D. • The Westridge Marine Terminal is located within the FHA that operates under the auspices of the BC MOH. • The community health setting in Section 5.8 describes the current health status of people residing in the FHA with respect to general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health. • The information on two of the health indices (*i.e.*, cancer incidence and respiratory health) provided in Section 5.8 was examined as part of the Screening Level Human Health Risk Assessment of Pipeline and Facilities of Volume 5D. This information served as one benchmark for assessing the potential health effects that might occur among people in the FHA from exposure to the chemical emissions from the Westridge Marine Terminal.

6.3 Reactivated Pump Stations

As an outcome of the pipeline expansion, the Niton Pump Station will be reactivated (currently deactivated) to serve the existing pipeline. Reactivation activities will be conducted within the current fenced areas and no new disturbance will be required.

6.3.1 Niton Pump Station

The existing Niton Pump Station is located at SW 34-53-13 W5M at RK 191.4 on lands owned by Trans Mountain in Yellowhead County within the Rural Alberta Region of the Socio-economic RSA. Current land use at and around this facility site is industrial. Access to the Niton Pump Station is via Highway 16. Table 6.3-1 provides a summary of the socio-economic elements and considerations for the Niton Pump Station. The location of the Niton Pump Station is shown on Figure 6.3-1.



TRANS MOUNTAIN

FIGURE 6.3-1

NITON PUMP STATION

TRANS MOUNTAIN EXPANSION PROJECT

- Village / Hamlet / Community
- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Subject Property Boundary
- Highway
- Paved Road
- Railway

Projection: NAD 1983 UTM Zone 11N.
Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, Altalis, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013; Parks and Protected Areas: Natural Resources Canada, 2013, Altalis, 2013, Alberta Tourism, Parks and Recreation, 2012, BC FLNRO, 2008; Hydrology: IHS Inc., 2004; Imagery: Provided by KMC, 2012.

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MAP NUMBER: 201311_MAP_TERA_ESA_00482_REV0_18		PAGE: SHEET 1 OF 1
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SCALE: 1:10,000	PAGE SIZE: 11x17	DISCIPLINE: ESA
DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

0 100 200 300 400 m

ALL LOCATIONS APPROXIMATE

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TABLE 6.3-1

SUMMARY OF SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE NITON PUMP STATION

Socio-Economic Elements	Summary of Considerations
Heritage Resources	• According to Alberta Culture (2013) there are no known historical resources located within SW 34-53-13 W5M. • There is no heritage resources (archaeological, historical or palaeontological) potential in SW 34-53-13 W5M since the land is previously disturbed for industry. • *Historical Resources Act* clearance will be obtained as part of the Project HRIA. • Refer also to the setting discussion of the heritage resources for the Rural Alberta Region in Section 5.1.
Traditional Land and Resource Use	• Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated effects of the Project on their assertion of traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. • The following 14 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project that include the Niton Pump Station: Saddle Lake Cree Nation; Enoch Cree Nation; Alexander First Nation; Samson Cree Nation; Métis Nation of Alberta (Region 4); O'Chiese First Nation; Ermineskin First Nation; Montana First Nation; Louis Bull Tribe; Alexis Nakota Sioux First Nation; Foothills Ojibway Society; Paul First Nation; Nakcowinewak Nation of Canada; and Sunchild First Nation. • Enoch Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Alexis Nakota Sioux First Nation, Paul First Nation and Nakcowinewak Nation of Canada conducted TERA-facilitated TLU studies for the Project, including map reviews, interviews, helicopter overflights, ground reconnaissance and results reviews. • O'Chiese First Nation and Sunchild First Nation are conducting independent TLU studies for the Project. • Interest in TLU studies will be determined by Saddle Lake Cree Nation and Louis Bull Tribe through ongoing engagement with Trans Mountain. • Foothills Ojibway Society declined TLU study participation, instead electing to identify preliminary interests in the Project to Trans Mountain on June 5, 2013. • Métis Nation of Alberta (Region 4) is preparing an engagement report for the Project. • The Aboriginal communities listed above have historically used or presently use Crown lands in the region to maintain a traditional lifestyle; however, the current land tenure and land use precludes the practice of traditional activities on lands within and adjacent to the Niton Pump Station. • Refer also to the setting discussion of TLRU for the Edmonton to Hinton Segment in Section 5.2.
Social and Cultural Well-Being	• In 2011, the population of the Rural Alberta Region, including Yellowhead County, was approximately 29,300 and approximately 74.3% of the population was between the ages of 25 and 64 years old; the median age was 43.5 (Statistics Canada 2012). In 2011, approximately 11.5% of the region's population identified as Aboriginal (Statistics Canada 2013). • In 2011, the median income within the Rural Alberta Region was approximately $34,700. • Although the Niton Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • In terms of community way of life, the Niton Pump Station is located in a rural area of Yellowhead County east of the Town of Edson. Work on the facility may draw on labour from the Rural Alberta Region as a whole, particularly workers from the Town of Edson. The Town of Edson has experience with major projects and temporary workers. Edson is anticipated to be a potential construction hub for the staging of construction activity and housing of workers. • Refer also to the setting discussion of social and cultural well-being for the Rural Alberta Region in Section 5.3.
Human Occupancy and Resource Use	• The Niton Pump Station is located on land within the jurisdiction of Yellowhead County. Land use in the vicinity is governed by the Yellowhead County MDP, and the pump station is located in the Rural Policy Area. • Current land use at and around the Niton Pump Station is industrial. • The pump station does not lie within any parks or protected areas as described in Section 5.4.1. The nearest park is Nojack Campground/Provincial Recreation Area approximately 15 km from the pump station. • Although the Niton Pump Station does not lie within any IRs, it does lie within the asserted traditional territories and areas of interest of 14 Aboriginal communities (see TLRU above). • The closest residence is located approximately 1 km southwest of the site. • Niton Pump Station is located adjacent to agricultural lands. • Outdoor recreational uses on the lands around this location include hiking, camping and snowmobiling. • The Niton Pump Station is located in the Foothills WMU 348, Fur Management Zone 4, Fish Management Zone 1, and Watershed Unit Eastern Slopes 3. • The Niton Pump Station is located in the boundaries of Noise Control Bylaw 21.01, outlining noise legislation within Yellowhead County. This noise bylaw only applies to Hamlets within Yellowhead County; therefore, it does not apply to this pump station. • Refer also to the setting discussion of HORU for the Rural Alberta Region in Section 5.4.

TABLE 6.3-1 Cont'd

Socio-Economic Elements	Summary of Considerations
Infrastructure and Services	• Access to the Niton Pump Station is via Highway 16. • The facility is located near the Town of Edson, which offers waste, water, housing, education and recreation amenities commensurate in size to its current population. The Town of Edson is anticipated to be a construction hub for activities related to this facility, including worker accommodation. • The Town of Edson offers emergency and protective services, including an RCMP detachment and the Edson Fire Department (2 career and 38 volunteer firefighters). • Trans Mountain has established emergency response plans and programs at all active facilities. These plans and programs are continually reviewed and updated. The response management system will not require change to accommodate the expanded operating system. Trans Mountain will establish new emergency plans and programs at new or reactivated facilities, or adjust plans and programs where necessary at deactivated facilities. • Refer also to the setting discussion of infrastructure and services for the Rural Alberta Region in Section 5.5.
Navigation and Navigation Safety	• The Niton Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.
Employment and Economy	• The Rural Alberta Region's economy is diverse and is more resource-based than the Edmonton Region. Key sectors include forestry, coal, oil and gas, agriculture and tourism. Forestry and coal mining are in flux, but the oil and gas industry is a steady contributor to the economy within Yellowhead County (Lyons pers. comm.). • For the Rural Alberta Region in 2011, the most active industries (by industrial classification) were: mining, quarrying, and oil and gas extraction (employing approximately 16.6% of the labour force); retail trade (11.2%); construction (8.5%); and accommodation and food services (7.5%) (Statistics Canada 2013). • In 2011, there was a labour force of approximately 17,000 workers, with a participation rate of about 73.2% and an unemployment rate of 5.9% in the Rural Alberta Region (Statistics Canada 2013). • In 2011, approximately 42.9% of the Rural Alberta Region labour force had completed a post-secondary certificate, diploma or degree as their highest level of educational attainment. Approximately 16.1% had achieved an apprenticeship or trades certificate or diploma as their highest level of educational attainment (Statistics Canada 2013). • Refer also to the setting discussion of employment and economy for the Rural Alberta Region in Section 5.7.
Community Health	• The discussion of general health, socio-economic health effects, infectious diseases, environmental health effects, public safety, health care service provision and Aboriginal health is provided in the community health setting in Section 5.8 for the Project as a whole and, consequently, includes the Niton Pump Station. • The facility is located within Alberta Health Services' North Health Zone. • Overall health in the North Zone is lower than the Alberta provincial average. Self-rated health, functional health and life expectancy are all lower than the provincial averages and risk factors such as smoking, heavy drinking and obesity are higher. Self-perceived mental health, life satisfaction and life stress in the North Zone are comparable to the Alberta average, indicating similar levels of mental well-being. • As in other areas of Canada, health issues that form a substantial part of the burden of disease in this area include chronic conditions, infectious diseases and injuries including those from motor vehicle collisions. • The Edson Healthcare Centre is the closest location for primary care and emergency medical response and treatment, with Edmonton acting as the closest referral centre. Data on health care capacity and access indicate a relative insufficiency of access to primary and tertiary health care compared to provincial averages; this trend is common in rural regions across Canada. • Proximate EMS responders (*i.e.*, ambulance) are located in the Town of Edson.

6.4 Temporary Facilities

The locations of potential temporary facilities (*e.g.*, staging and stockpile sites, equipment storage sites, construction work camps) will be determined as far in advance of construction as practical to allow adequate time to choose and evaluate any alternate sites. Wherever practical, the temporary facilities will be located on previously disturbed areas to minimize overall Project disturbance. All temporary facility sites will be reviewed from a socio-economic perspective prior to their use.

6.5 References

6.5.1 Personal Communications

TERA wishes to acknowledge those people identified in the Personal Communications for their assistance in supplying information and comments incorporated into this report.

Jenkins, C. Manager Municipal and Realty Services, Parks Canada. Jasper, AB.

Lyons, B. Director of Corporate & Planning Services. Yellowhead County. Edson, AB.

Read, C. Inspiration Manager (Recreation), Municipality of Jasper. Jasper, AB.

Stanton, J. Manager, Long Range Planning, City of Chilliwack. Chilliwack, BC.

Waterworth, P. Chief Administrative Officer, Municipality of Jasper. Jasper, AB.

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7.0 SOCIO-ECONOMIC EFFECTS ASSESSMENT

The description of the socio-economic setting (current state of the socio-economic environment) within the Project area (Sections 5.0 and 6.0), is compared against the project description (Section 2.0) to assess potential socio-economic effects that might be caused by the Project. The socio-economic effects assessment uses the information provided in the socio-economic setting and Project description to:

- evaluate the socio-economic elements of importance in the Project area;
- identify and evaluate potential Project effects associated with each socio-economic element of importance; and
- develop appropriate technically and economically feasible site-specific mitigation and, where warranted, enhancement measures that are technically and economically feasible.

In addition, the socio-economic effects assessment determines the significance of potential residual effects resulting from construction and operations activities after taking into consideration proposed mitigation measures. Trans Mountain has informed TERA that it will adopt the recommendations herein.

7.1 Methodology

The assessment evaluates the socio-economic effects of the construction (including reactivation/modification), operations, decommissioning and abandonment phases of each component of the Project. The assessment method includes the following steps.

1. Describe the socio-economic setting.
2. Identify key socio-economic elements that could be affected.
3. Define the indicators and measurement endpoints to be used to assess each element.
4. Determine spatial and temporal boundaries for each element.
5. Identify potential socio-economic effects for each indicator.
6. Develop appropriate technically and economically feasible site-specific mitigation and, where warranted, enhancement/restitution measures that are technically and economically feasible.
7. Predict anticipated residual effects.
8. Determine the significance of residual effects.

Steps 2 to 8 are described below in the applicable Methodology subsection. This socio-economic effects assessment methodology is based on:

- *The Responsible Authority's Guide to the Canadian Environmental Assessment Act*: *Part II The Practitioner's Guide* (Federal Environmental Assessment Review Office [FEARO] 1994a);
- FEARO's *A Reference Guide for the Canadian Environmental Assessment Act: Addressing Cumulative Environmental Effects* (FEARO 1994b);
- FEARO's *A Reference Guide for the Canadian Environmental Assessment Act: Determining Whether a Project is Likely to Cause Significant Environmental Effects* (FEARO 1994c);
- the Canadian Environmental Assessment (CEA) Agency *Cumulative Effects Assessment Practitioners Guide* (Hegmann *et al.* 1999);
- CEA Agency's *Incorporating Climate Change Considerations in Environmental Assessment* (CEA Agency 2003);

- CEA Agency's *Addressing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2013);
- the *CEA Act, 2012*; and
- the NEB *Filing Manual* (NEB 2013a).

Subsequent steps of an effects assessment include a cumulative effects assessment (Section 8.0), inspection and monitoring during construction and post-construction (Volume 6A) and follow-up monitoring (Section 10.0).

An ESA Approach Summary document was released to stakeholders, Aboriginal communities and potentially interested regulatory authorities in March 2013 by Trans Mountain. The intent of the document was to provide an overview of Trans Mountain's understanding of the environmental and socio-economic context of the Project at that time. The methods, indicators and spatial boundaries for the socio-economic elements were reviewed based on feedback received on the ESA Approach Summary document from participants of the ESA Workshops, consultation with regulatory authorities and engagement with Aboriginal communities.

The socio-economic effects assessment of the Project is a collaborative effort of several qualified professionals with element-specific expertise, under the guidance of representatives of TERA. Table 7.1-1 acknowledges the contribution of these experts and professionals by socio-economic element.

TABLE 7.1-1

SOCIO-ECONOMIC EFFECTS ASSESSMENT TEAM

Socio-economic Element	Assessor
Heritage Resources	TERA Steppe Consulting Inc. L.V. Hills
Traditional Land and Resource Use/Traditional Marine Resource Use	TERA
Social and Cultural Well-Being	Vista Strategy Corp. and TERA
Human Occupancy and Resource Use	Vista Strategy Corp., TERA, B.A. Blackwell & Associates Ltd. and McTavish Resource & Management Consultants
Infrastructure and Services	Vista Strategy Corp. and TERA
Navigation and Navigation Safety	Vista Strategy Corp. and TERA
Employment and Economy	Vista Strategy Corp., TERA and Decision Economics Consulting Group
Community Health	Habitat Health Impact Consulting Corp
Human Health Risk Assessment (HHRA)	Intrinsik Environmental Sciences Inc.
Accidents and Malfunctions	TERA

7.1.1 Socio-economic Elements

The potential socio-economic elements interacting with the Project have been identified through: consultation and engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public; experience gained during previous pipeline projects with similar conditions/potential issues (*e.g.,* TMX Anchor Loop Project, Trans Mountain Pump Station Expansion Project, Blue River Pump Station Project); available research literature; and the professional judgment of the assessment team. Issues noted during consultation/engagement with Aboriginal communities, landowners, federal, provincial and municipal regulatory authorities, stakeholders and the general public were essential in the determination of element interactions with the Project (Section 3.0).

Socio-economic elements potentially interacting with the Project include heritage resources, traditional land and resource use (TLRU), traditional marine resource use (TMRU), social and cultural well-being,

human occupancy and resource use (HORU) (including visual aesthetics), infrastructure and services, navigation and navigation safety, employment and economy, community health and HHRA.

Effects arising from potential accidents and malfunctions are also considered. The assessment of onshore facility hypothetical spill scenarios, including a spill at the Westridge Marine Terminal, on the socio-economic environment is provided in Volume 7.

Those socio-economic elements which are not considered to interact with the Project are identified and discussed in Sections 7.2 to 7.7. In accordance with Guide A.2.6 of the NEB *Filing Manual*, no further analysis is necessary for those elements where interactions between the Project component and a socio-economic element are not predicted.

Some socio-economic elements (*i.e.*, social and cultural well-being, HORU, infrastructure and services, employment and economy and community health) have been assessed in an integrated manner for the Project as a whole in Section 7.2, rather than by Project component. Many potential socio-economic effects cannot be disaggregated, and it is key to demonstrate the impacts to the human environment in an integrated manner as they have the potential to be experienced by the communities within the study boundaries. Certain unique land use or infrastructure impacts associated with facilities are discussed in the respective sections, where they are anticipated.

7.1.2 Assessment Indicators and Measurement Endpoints

Beanlands and Duinker (1983) suggest that it is impossible for an impact assessment to address all potential environmental effects of a project. Therefore, it is necessary that the environmental attributes considered to be important in project decisions be identified. Environmental impact assessments should be required to identify at the beginning of the assessment an initial set of indicators (sometimes called Valued Ecosystem Components [VECs] or Valued Social Components [VSCs]) to provide a focus for subsequent study and evaluation (Beanlands and Duinker 1983).

For this assessment, an indicator is defined as a biophysical, social or economic property or variable that society considers to be important and is assessed to predict Project-related changes and focus the impact assessment on key issues. One or more indicators are selected to describe the present and predicted future condition of an element. Societal views are understood by the assessment team through published information such as management plans and engagement with regulators, the public, Aboriginal communities and other interested groups.

The indicators for each element have been identified based on: the NEB *Filing Manual* and other regulatory guidelines; experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public; public issues raised through media; available research literature; and professional judgment of the assessment team.

One or more 'measurement endpoints' (measurable parameters) are identified for each indicator to allow quantitative or qualitative measurement of potential Project effects. The endpoints have been selected based on: the NEB *Filing Manual*, experience gained through during previous projects with similar conditions/potential issues, feedback from regulatory authorities and stakeholders; available research literature; and professional judgment of the assessment team. The degree of change in these measurable parameters is used to characterize and evaluate the magnitude of Project-related effects.

7.1.3 Spatial and Temporal Boundaries

The socio-economic effects assessment considers the potential effects of the Project on the socio-economic environment in the context of defined spatial and temporal boundaries. These boundaries vary with the issues and socio-economic elements or interactions to be considered, and reflect:

- the construction, operations, and decommissioning and abandonment phases of the proposed physical works and physical activities;
- the natural variation of a population or socio-economic indicator;

- the time required for an effect to become evident;
- the time required for a population or socio-economic indicator to recover from an effect and return to a natural condition;
- the area directly affected by proposed physical works and physical activities; and
- the area in which a population or socio-economic indicator functions and within which a Project effect may be experienced.

Temporal Boundaries

The time frames of the assessment of the Project include the planning, construction (including reactivation/modification), operations, and decommissioning and abandonment phases. The planning phase includes all socio-economic studies, engineering surveys and land surveys conducted in support of the Project application and prior to construction. The construction phase for TMEP includes surveying, clearing, soil handling, grading, pipeline trenching and testing, construction at the Westridge Marine Terminal, facility assembly or expansion, additional tankage at Edmonton, Sumas and Burnaby terminals, pipeline reactivation, pump station reactivation and reclamation.

Pending regulatory approval of the Project, construction of the pipeline and facilities is scheduled over an approximately 24 month period to achieve the planned in-service date of late 2017. The installation of automated valves would occur intermittently from Q2 2016 to Q1 2017, while the reactivation of existing pipeline segments would occur from Q3 2016 to Q4 2017. Construction and equipment installation at pump stations and tank terminals is expected to begin in Q1 2016 and take approximately 8 to 10 months for each pump station and between 14 and 23 months at the terminals, depending on, among other variables, scope, land use and construction techniques for each facility. The construction period at Westridge Marine Terminal is expected to commence in Q4 2015 with the first berth expected to be in-service by Q3 2017. The second and third new berths are expected to be in-service by late 2017. Demolition of the existing berth is planned to commence in late 2017 after the new berths are commissioned. The operations phase commences following completion of construction in Q4 2017 and is anticipated to extend for 50 years or more. The decommissioning and abandonment phase would occur at the end of the useful life of the pipeline (50 to 70 years). A detailed construction schedule for the Project is provided in Section 2.0.

Spatial Boundaries

The assessment of the Project was undertaken in the context of one or more of the following spatial boundaries: the Footprint; Local Study Area (LSA); Regional Study Area (RSA); Provincial Area; National Area; and International Area. LSAs and RSAs were developed on an element-specific basis and, therefore, may vary between socio-economic elements. The Footprint of the Project assumes certain quantitative values for the area that will be directly disturbed by Project facilities and activities within the proposed pipeline corridor, including: a 45 m pipeline construction right-of-way (assumed conservative average value including permanent easement and temporary workspace); permanent access road at Black Pines Pump Station (assumed 5 m wide x 25 m long); temporary access roads (assumed to use existing access, where practical); camp and stockpile sites (assumed 7 ha averaging one every 80 km on existing disturbance); valves (assumed to be within the disturbed right-of-way); and power lines (assumed 50 m wide).

The definitions for each spatial boundary are provided in Table 7.1-2. Detailed discussions regarding the element-specific LSAs, RSAs and associated rationale are provided in Sections 7.2 to 7.7.

7.1.4 Potential Socio-economic Effects

The potential socio-economic effects resulting from the Project are identified through consultation and engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public; through experience gained during previous pipeline projects with similar conditions/potential issues; and through available research literature and the professional judgment of the

assessment team. The potential socio-economic effects arising from the construction and operations of the pipeline, temporary facilities, pump stations, tanks and the expansion of the Westridge Marine Terminal, as well as the reactivation of existing pipeline segments and the installation of automated valves, are identified in Sections 7.2 to 7.7. Section 7.8 discusses potential effects of decommissioning and abandonment.

This assessment is based on preliminary engineering and designs. In general, conservative assumptions have been used. In order to confirm the predictions on socio-economic effects, further technical development will be carried out in the engineering and detailed design phase.

TABLE 7.1-2

EVALUATION OF THE SIGNIFICANCE OF RESIDUAL EFFECTS – SOCIO-ECONOMIC ASSESSMENT CRITERIA[1]

Assessment Criteria		Definition
IMPACT BALANCE – of the Residual Effect		
Positive		Residual effect is considered to have a net benefit to the socio-economic indicator.
Neutral		Residual effect is considered to have no net benefit or loss to the socio-economic indicator.
Negative		Residual effect is considered to be a net loss or a detriment to the socio-economic indicator.
SPATIAL BOUNDARY – Location of Residual Effect		
Footprint		The area directly disturbed by surveying, construction and clean-up of the pipeline and associated physical works and activities (including, where appropriate, the permanent right-of-way, pump stations, tanks, Westridge Marine Terminal, temporary construction workspace, temporary stockpile sites, temporary staging sites, construction camps, access roads, power lines).
LSA		The zone of influence (ZOI) or area where the element and associated indicators are most likely to be affected by Project construction and operations. This generally represents a buffer from the centre of the proposed pipeline corridor or edge of a facility site.
RSA		The area extending beyond the LSA boundary where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on the socio-economic indicator. This varies for each element.
Provincial		The area extending beyond regional or administrative boundaries but confined to AB and BC (*e.g.,* provincial permitting boundaries).
National		The area extending beyond Alberta and BC but confined to Canada.
International		The area extending beyond Canada.
TEMPORAL CONTEXT		
Duration – (period of the event causing the effect)	Immediate	Event is limited to less than or equal to two days during either the construction phase or operations phase.
	Short-term	Event occurs during the construction phase or is completed within any 1 year during the operations phase.
	Long-term	Ongoing event that is initiated during the construction phase and extends beyond the first year of the operations phase or is initiated during the operations phase and extends for the life of the Project.
Frequency[2] – (how often would the event that caused the effect occur)	Accidental	Event occurs rarely over assessment period.
	Isolated	Event is confined to a specified phase of the assessment period.
	Occasional	Event occurs intermittently and sporadically over the assessment period.
	Periodic	Event occurs intermittently but repeatedly over the assessment period.
	Continuous	Event occurs continually over the assessment period.
Reversibility – (period of time over which the residual effect extends)	Short-term	Residual effect limited to the construction phase or to less than any 1 year during operations phase.
	Medium-term	Residual effect extends more than 1 year but less than or equal to 10 years into the operations phase.
	Long-term	Residual effect extends beyond the first 10 years of the operations phase.
	Permanent	Residual effects are irreversible.
MAGNITUDE[3] – of the Residual Socio-economic Effect		
Negligible		No detectable change from existing (baseline) conditions.
Low		Change is detectable, but has no effect on the socio-economic environment beyond that of an inconvenience or nuisance value.
Medium		Change is detectable and results in moderate modification in the socio-economic environment.
High		Change is detectable and is large enough to result in a severe modification in the socio-economic environment.
PROBABILITY OF OCCURRENCE – Likelihood of Residual Effect		
High		Likely
Low		Unlikely

TABLE 7.1-2 Cont'd

Assessment Criteria	Definition
LEVEL OF CONFIDENCE[4] – Degree of Certainty Related to Significance Evaluation	
Low	Determination of significance based on incomplete understanding of cause-effect relationships and incomplete data pertinent to the Project area.
Moderate	Determination of significance based on good understanding of cause-effect relationships using data from outside the Project area or incompletely understood cause-effect relationships using data pertinent to the Project area.
High	Determination of significance based on good understanding of cause-effect relationships and data pertinent to the Project area.

Notes: 1 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

2 The assessment period for the effects assessment includes planning, construction, operations, and decommissioning and abandonment phases for the Project while the assessment period for the cumulative effects assessment includes the above interval as well as the development, construction and operations phases of activities or projects that have previously occurred and those that are planned (publicly disclosed).

3 In consideration of magnitude, there is no environmental standard, threshold, guideline or objective for many of the construction/operations issues under evaluation. Therefore, the determination of magnitude of the adverse residual effect often entailed a historical consideration of the assessment of magnitude made by regulators, land authorities, lessees, other stakeholders and the assessment team to adverse effects. The assessment team was also aware of the increasingly stringent societal norms related to socio-economic effects.

4 Level of confidence was affected by availability of data, precedence and degree of scientific uncertainty or other factors beyond the control of the assessment team.

7.1.5 Mitigation and Enhancement Measures

Mitigation measures, as defined under the *CEA Act, 2012*, means measures for the elimination, reduction or control of a project's adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means. This definition also applies to reducing or managing a project's adverse socio-economic effects. For the purposes of this assessment, TERA defines an enhancement measure as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

To ensure that the potential adverse socio-economic effects are reduced and potential positive socio-economic effects are enhanced during Project activities, general and site-specific mitigation and enhancement measures are recommended in this ESA based upon current industry-accepted standards, consultation with regulatory authorities, interested groups and individuals, engagement with Aboriginal communities, and the professional judgment of the assessment team. Mitigation measures suggested by regulatory authorities or other stakeholders have been incorporated into this assessment in Sections 7.2.1 to 7.2.8.

Many of the mitigation measures presented in this ESA have been discussed with Aboriginal communities that have been involved in specific supporting environmental studies. A comprehensive review of all the issues that have been raised by each community and the recommended mitigation measures was conducted with each community during the field surveys and during follow-up results review (Section 3.0).

Mitigation and enhancement measures are outlined in the Project effects assessment, as well as in the Project-specific Environmental Protection Plans (EPPs) (Volumes 6B through 6D). Mitigation and enhancement measures that will be implemented by Trans Mountain to address certain socio-economic issues and opportunities not addressed by the EPPs are summarized in the Socio-economic Management Plan (SEMP) (Volume 6B). Mitigation measures in element-specific technical reports are incorporated into the assessment. In addition, various federal and provincial regulatory authorities, and industry-accepted standards and guidelines are considered in the ESA, and are referenced for each element.

7.1.6 Residual Effects

As defined in the NEB *Filing Manual* (NEB 2013a), residual effects are the socio-economic effects that are present after mitigation and enhancement measures are applied. In many situations, the recommended mitigation measures are predicted to eliminate the potential adverse effects while in other situations, the mitigation measures are predicted to lessen the effects, but do not entirely eliminate them. Elements for which no residual effects are predicted require no further analysis (*i.e.*, significance evaluation).

7.1.7 Significance Evaluation of Potential Residual Effects

The determination of the significance of potential residual effects generally followed the guidelines and principles provided by the NEB, CEA Agency and FEARO documents listed in Section 7.1. The agencies identify several possible methods for determining whether residual socio-economic effects are significant. These include:

- the use of regulatory guidelines or objectives in relation to potential residual effects;
- the use of quantitative risk assessment;
- quantitative assessment of residual effects; and
- qualitative assessment of residual effects.

Where there are no standards, guidelines, objectives or other established and accepted thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method that is based on available research literature is considered to be the appropriate method for determining the significance of the potential residual socio-economic effects. Consequently, the significance is evaluated by developing a set of qualitative criteria based on those identified by Hegmann *et al.* (1999). These criteria are identified below and their definitions are presented in Table 7.1-2.

- Spatial boundary (*i.e.,* the geographic extent in the Footprint, LSA, RSA, Provincial, National, International).
- Temporal context (*i.e.,* duration and frequency of the event causing the residual effect, reversibility of the residual effect). Note that the reversibility criteria have been modified subsequent to the release of the ESA Summary Approach document in March 2013.
- Magnitude (*i.e.,* severity of the residual effect in relation to modification to the socio-economic environment).
- Probability or likelihood of occurrence of the residual effect.
- Level of confidence or uncertainty (*i.e.,* availability of data to substantiate the assessment conclusion, previous success of mitigation measures).

A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent and cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility, within any spatial boundary and cannot be technically or economically mitigated.

The impact balance or direction (*i.e.,* determination as to whether the effect is positive, neutral or negative) was also established for each predicted socio-economic residual effect. A positive impact balance is considered to have a net benefit to the socio-economic indicator. A neutral impact balance is defined as having no net benefit or loss to the socio-economic indicator. A negative balance is considered to be a net loss or detriment to the socio-economic indicator.

All significance assessment criteria (*e.g.,* temporal context, magnitude) are considered by the assessment team for each residual socio-economic effect. Where appropriate, the key or most influential assessment criteria used to determine the significance of each residual effect are noted. It should be noted that the determination of a "not significant residual effect" is based on a pre-defined approach that incorporates magnitude, probability, reversibility and extent but a "not significant residual effect" determination does not mean that the potential residual effect is not important to one or more Aboriginal communities, landowners, regulatory authorities or stakeholders.

For the Project effects assessment, an evaluation of combined residual effects is conducted for those indicators where more than one identified potential adverse or positive residual effect may occur. The evaluation of the combined effects considers only those residual effects that are likely to occur (*i.e.,* of high probability). A discussion of combined effects is included in the significance evaluation in Section 7.10 to clarify the overall effect of the Project on the socio-economic indicator in question and the overall effect of the Project on the element. In addition, the overall effects of the Project on the element are evaluated in consideration of the objectives or goals of applicable land and resource use management plans, municipal development plans (MDPs) and government policies.

The extent to which the professional judgment of the assessment team is used to evaluate the significance of potential socio-economic residual effects is provided within the relevant section of the assessment for each element. For this Project, the assessment team consisted of discipline experts, the TERA Project Manager, experienced assessment practitioners and senior reviewers. For some elements, the evaluation of significance benefited from a review of select publically available post-construction environmental monitoring reports from previous Trans Mountain projects and other projects that encountered socio-economic settings and associated issues similar to those of the Project.

A summary of the significance evaluation for predicted residual socio-economic effects arising from the construction and operations of the proposed pipeline, temporary facilities, pump stations (including reactivation of a station), tanks, the expansion of the Westridge Marine Terminal and reactivation of existing pipeline segments is provided in Sections 7.2 to 7.7. A discussion of decommissioning and abandonment is provided in Section 7.8. A summary of the significance evaluation for residual effects arising from accidents and malfunctions is provided in Section 7.9.

7.2 Effects Assessment - Pipeline Construction and Operations

Using the assessment methodology described in Section 7.1, the potential socio-economic effects associated with the construction and operations of the pipeline component of the Project as well as the proposed mitigation and enhancement measures and resulting residual effects on the socio-economic indicators were evaluated for each element and are described in the following subsections. In addition, the evaluation of significance of potential residual effects using the criteria presented in Table 7.1-2 is also provided.

Socio-economic elements potentially interacting with construction and operations of the proposed pipeline segments are identified in Table 7.2-1.

TABLE 7.2-1

ELEMENT INTERACTION WITH THE PROPOSED PIPELINE COMPONENT

Element	Interaction with Pipeline Component	
	Construction	Operations[1]
Heritage Resources	Yes	No – since surface or buried heritage resources sites, if present, would have been disturbed as a result of construction activities, no interaction is anticipated during operation of the pipeline
Traditional Land and Resource Use	Yes	Yes
Social and Cultural Well-Being	Yes	Yes
Human Occupancy and Resource Use	Yes	Yes
Infrastructure and Services	Yes	Yes
Navigation and Navigation Safety	Yes	Yes
Employment and Economy	Yes	Yes

TABLE 7.2-1 Cont'd

Element	Interaction with Pipeline Component	
	Construction	Operations[1]
Community Health	Yes	Yes
Human Health Risk Assessment	No - emissions from pipeline construction and operations are not expected to affect human health.	

Note: 1 Activities during operations include aerial and ground patrols, vegetation management and integrity digs.

7.2.1 Heritage Resources

This subsection assesses the potential Project effects on heritage resources. The discussion of heritage resources presents potential effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations [including power lines], tanks, temporary facilities, the Westridge Marine Terminal and pipeline reactivation activities).

7.2.1.1 Assessment Indicators and Measurement Endpoints

The selection of indicators for heritage resources included: consideration of the filing requirements in the NEB *Filing Manual*; experience gained during previous projects with similar conditions/potential issues; and the professional judgment of the assessment team. Although archaeological, historic and palaeontological sites have different legislation under Alberta Culture and BC Archaeology Branch, the measurement endpoints and mitigation measures are the same for each of the indicators. Table 7.2.1-1 provides a summary of the indicators and measurement endpoints used in the assessment of potential effects on heritage resources.

TABLE 7.2.1-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR HERITAGE RESOURCES

Heritage Resources Indicators	Measurement Endpoint	Rationale for Indicator Selection
Archaeological sites Historic sites Palaeontological sites	• Qualitative evaluation based on inputs from site-specific assessment and regulatory consultation.	The selection of indicators and the measurement endpoint considered the NEB *Filing Manual* requirements.

7.2.1.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for heritage resources considered one or both of the following areas:

- a Footprint Study Area (as defined in Section 7.1.3 of this ESA); and
- a Heritage Resources RSA.

The ZOI in which heritage resources are most likely to be affected during construction and operations is the Footprint, including any temporary workspace. The potential for impacting archaeological, palaeontological or historical resources is limited to areas of potential clearing or ground disturbance (*i.e.* the Footprint). Consequently, a separate Heritage Resources LSA has not been defined for the Project.

The spatial boundaries of the Heritage Resources RSA (Figure 5.1-1) for the Project comprise an area extending beyond the Footprint and are defined as an area of intersecting Borden Blocks (Borden and Duff 1952). A Borden Block measures 10 minutes of latitude by 10 minutes of longitude which is the accepted standard division of land used by archaeologists across Canada. For the Project, the Borden Blocks intersected by the proposed pipeline corridor measure approximately 12 km east-west by 18 km north-south.

7.2.1.3 Heritage Resources Context

The potential for encountering heritage resources has been reduced by aligning the proposed pipeline corridor to parallel the existing TMPL right-of-way to the extent feasible. Numerous historical and archaeological sites have been identified previously in the vicinity of the proposed pipeline corridor. Field work was conducted by qualified archaeologists with assistance from members of Saddle Lake Cree Nation, Alexander First Nation, Samson Cree Nation, Ermineskin Cree Nation, Montana First Nation, Louis Bull Tribe, Alexis Nakota Sioux First Nation, Paul First Nation, Nakcowinewak Nation of Canada, Sunchild First Nation, Lower Nicola Indian Band, the Nicola Tribal Association and Chawathil First Nation. An Historical Resources Impact Assessment (HRIA) for the Alberta portion of the proposed pipeline corridor commenced in May 2013 under Archaeological Research Permit 13-018. For the HRIA, background data was reviewed and then was complemented with ground reconnaissance which targeted areas for more intensive visual inspection and, where warranted, shovel testing. The ground reconnaissance and shovel testing programs focused on the areas along the proposed pipeline corridor that are of moderate to high potential for archaeological, historic and palaeontological sites. To date, a total of 936 shovel tests have been done under Archaeological Research Permit 13-018. During this assessment, a total of 68 new sites; 54 historic sites and 14 previously unknown archaeological sites were identified within the proposed pipeline corridor.

Qualified archaeologists commenced an Archaeological Impact Assessment (AIA) for the BC portion of the proposed pipeline corridor in July 2013 under Archaeological Research Permit 2013-165. For the AIA, background data was reviewed and then was complemented with ground reconnaissance which targeted areas for more intensive visual inspection and, where warranted, shovel testing. The ground reconnaissance and shovel testing programs focused on the areas along the proposed pipeline corridor that are of moderate to high potential for archaeological, historic and palaeontological sites. To date, a total of 368 shovel tests have been excavated under Archaeological Research Permit 2013-165. During this assessment, 10 previously unknown archaeological sites and 1 historic site were identified within the proposed pipeline corridor.

Trans Mountain will implement recommendations from Alberta Culture and will provide the NEB with a copy of the *Historical Resources Act* clearance letter upon receipt. Trans Mountain will also implement recommendations from BC Archaeology Branch and will provide the NEB with a copy of the *Heritage Conservation Act* acceptance letter upon receipt.

With regards to palaeontological resources, the proposed pipeline corridor crosses 25 quarter-sections in Alberta listed as having HRV values of 5 for palaeontological resources in the current *Listing of Historical Resources* (Alberta Culture 2013). In BC, the proposed pipeline corridor does not encounter any previously designated palaeontological sites and BC does not have an equivalent listing of lands with potential palaeontological resources. There is no provincial legislation providing protection for palaeontological sites in BC.

7.2.1.4 Potential Effects and Mitigation Measures

Identified Potential Effects

Potential effects associated with the construction of the proposed Project on heritage resources are listed in Table 7.2.1-2. These interactions are based on the results of the literature review, desktop analysis, field work, engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public (Section 3.0), and the professional experience of the assessment team. No interaction between the operations of the Project and heritage resources was identified and, consequently, no potential effects for the operations of the Project have been included in Table 7.2.1-2.

Mitigation measures to reduce the severity of potential effects of the proposed pipeline corridor on heritage resources are presented in Table 7.2.1-2 and were developed in accordance with Trans Mountain standards as well as industry and provincial regulatory authority guidelines including Alberta Environment (AENV) (1994a), BC Oil and Gas Commission (OGC) (2010) and Canadian Association of Petroleum Producers (CAPP) (1999, 2001).

TABLE 7.2.1-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PROJECT CONSTRUCTION ON HERITAGE RESOURCES

Potential Effect	Socio-economic Region(s)	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference] [1]	Potential Residual Effect(s)
1. Heritage Resources Indicator – Archaeological Sites				
1.1 Disturbance to previously unidentified archaeological sites during HRIA and AIA	All	Footprint	• Follow any conditions or recommendations identified in the permits for the HRIA for Alberta and AIA for BC. • Suspend work in proximity (*i.e.*, within 30 m) to archaeological, palaeontological or historical sites (*e.g.*, modified bone, pottery fragments, fossils) discovered during construction. No work at that particular location shall continue until permission is granted by the appropriate regulatory authority [Section 7.0]. Follow the contingency measures identified in the Heritage Resources Discovery Contingency Plan [Appendix B]. • Arrange for emergency archaeological excavation of previously unidentified sites endangered by pipeline construction wherever such sites warrant attention and can be excavated without interfering with the construction schedule. When for practical reasons, the sites cannot be investigated, map and suitably flag these sites for later investigation [Section 7.0]. • Refer to environmental resource-specific mitigation tables for archaeological and palaeontological resources [Appendix M]. • Prohibit the collection of any historical, archaeological or palaeontological resources by Project personnel [Section 7.0]. • Avoid, where possible, disturbance of geodetic or legal survey monuments, to the extent feasible. Where a geodetic monument is disturbed during construction of the pipeline and associated facilities, Trans Mountain's Construction Manager will immediately report such disturbance to the appropriate regulatory authority. The contractor will restore or re-establish the monument, where feasible, in accordance with the instructions of the Dominion Geodesist [Section 7.0].	• No residual effect identified.
1.2 Disturbance to known archaeological sites during HRIA and AIA	All	Footprint	• See recommended mitigation measures outlined in potential effect 1.2 of this table.	• No residual effect identified.
1.3 Disturbance of previously unidentified archaeological sites during construction	All	Footprint	• See recommended mitigation measures outlined in potential effect 1.2 of this table.	• No residual effect identified.
2. Heritage Resources Indicator – Historic Sites				
2.1 Disturbance to previously unidentified historic sites during HRIA and AIA	All	Footprint	• See recommended mitigation measures outlined in potential effect 1.2 of this table.	• No residual effect identified.
2.2 Disturbance of previously unidentified historic sites during construction	All	Footprint	• See recommended mitigation measures outlined in potential effect 1.2 of this table.	• No residual effect identified.

TABLE 7.2.1-2 Cont'd

Potential Effect	Socio-economic Region(s)	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference] [1]	Potential Residual Effect(s)
3. Heritage Resources Indicator – Palaeontological Sites				
3.1 Disturbance of previously unidentified palaeontological sites during construction	All	Footprint	• Conduct monitoring during trenching activities at specified watercourse crossings where there is a high potential for palaeontological finds as per Alberta Culture recommendations. • See recommended mitigation measures outlined in potential effect 1.2 of this table.	• No residual effect identified.

Note: 1 Detailed mitigation measures are outlined in the Pipeline EPP (Volume 6B).

7.2.1.5 Potential Residual Effects

Heritage resources provide a window into past human experiences and the geological record, and by their very nature, are non-renewable. Once disturbed, the resource may be altered or even lost. Consequently, the primary mitigation measure in protecting heritage resources is avoidance, and secondarily, site-specific mitigation developed in consultation with appropriate provincial regulatory authorities and approved by these authorities in fulfillment of Permit obligations may also be used. In order to better understand heritage resources and the historical information associated with these resources, disturbing the resource through excavations is an acceptable practice and, in many cases, the only method to collect *in situ* information to add to the archaeological record. Regardless of whether the excavation of the site is for academic or development purposes, the loss of heritage resource sites is generally offset by the recovery of knowledge about the site gained through meticulous identifying, cataloguing and preserving of artifacts and features in compliance with provincial guidelines.

Consequently, the ground work completed during the HRIA and AIA for the Project may mitigate against any potential effects on the heritage resources indicators (*i.e.*, archaeological sites, historic sites and palaeontological sites). Mitigation measures will take place at all previously recorded archaeological sites as well as newly recorded archaeological and historic sites will be mitigated as per the direction of the provincial regulatory authority. In addition, trenching activities at specified watercourses crossings in Alberta will be monitored where there is a high potential for palaeontological finds as per Alberta Culture recommendations. The mitigation measures provided in the HRIA and AIA advances the knowledge and understanding of heritage resources in Alberta and BC and is viewed by the provincial regulatory authority as compensating for the disturbance to the heritage resource. In the unlikely event that an archaeological, historical or palaeontological site is discovered during construction, the Heritage Resources Discovery Contingency Plan will be implemented (*i.e.,* construction at that location is to stop immediately, notify the Environmental Inspector and consult with the Heritage Resource Specialist). Construction activities may resume only with the permission of the provincial regulatory authority upon review and approval of any mitigation to compensate for the disturbance.

Given that disturbances to heritage resources by the Project are effectively offset by knowledge gained through the mitigation approved by the provincial regulatory authorities, no residual effects on heritage resource indicators have been identified and, consequently, no further evaluation of the effects of the Project on heritage resources is warranted.

7.2.2 Traditional Land and Resource Use

This subsection describes the potential Project effects on TLRU and related interests. Traditional land and resource use refers to the current use of lands by potentially affected Aboriginal communities for traditional purposes.

The discussion of TLRU presents anticipated effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, temporary facilities, pump stations, tanks and the Westridge Marine Terminal), since the communities and regions in which the Project occurs will experience Project-related activities in a combined manner. Any unique land or resource use effects associated with a particular Project

component have been highlighted in the appropriate subsection (*e.g.*, pump stations and Westridge Marine Terminal).

The Traditional Land and Resource Use Technical Report of Volume 5D provides further information on existing conditions related to TLRU.

7.2.2.1 Assessment Indicators and Measurement Endpoints

Table 7.2.2-1 summarizes the assessment indicators, measurement endpoints and their rationale for TLRU. The indicators selected represent components of the environment that are of particular value or interest to Aboriginal communities. The indicators have been selected based on feedback from Aboriginal communities and the professional experience of the assessment team, and were refined to reflect the components valued by traditional resource users that are often holistic in nature and span both the biophysical and social disciplines. The potential Project-related effects on TLRU are linked to issues related to biophysical elements (*e.g.,* fish and fish habitat, wetland loss or alteration, vegetation, and wildlife and wildlife habitat) and some socio-economic elements (*e.g.,* employment and economy through the effects of wage employment on traditional lifestyle, social and cultural well-being, navigation and navigation safety and community health).

The measurement endpoints used to assess Project effects on the indicators include qualitative parameters, chosen based on available biophysical and socio-economic information and a review of other assessments of similar projects.

TABLE 7.2.2-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR TRADITIONAL LAND AND RESOURCE USE

Traditional Land and Resource Use Indicators	Measurement Endpoints	Rationale for Indicator Selection
Subsistence activities and sites	• Hunting • Trapping • Fishing • Plant gathering • Trails and travelways • Habitation sites	The selection of indicators and measurement endpoints reflect the NEB *Filing Manual* requirements for the traditional land and resource use element in Table A-3 and considered key issues and interests identified during Aboriginal engagement.
Cultural sites	• Gathering places • Sacred areas	

7.2.2.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for TLRU (Figure 5.2-1) considered one or more of the following areas:

- a Footprint Study Area (as defined in Section 7.1.3);
- a TLRU LSA; and
- a TLRU RSA.

The TLRU LSA encompasses and extends beyond the Footprint to include the zones of influence of water quality and quantity, air emissions, acoustic environment, fish and fish habitat, wetland loss or alteration, vegetation, wildlife and wildlife habitat and heritage resources since TLRU is dependent on these resources (Table 7.2.2-2). The TLRU LSA is the area where there is a reasonable potential for localized Project-related effects to affect existing uses of the land for traditional purposes (*e.g.,* trapping, hunting, fishing and gathering areas). The potential effects of the Project are primarily assessed within the Footprint and the TLRU LSA.

The TLRU RSA is the area where the direct and indirect influences of other land uses and activities could overlap with Project-related effects and cause cumulative effects on the TLRU indicators. The TLRU RSA includes the RSA boundaries of water quality and quantity, air emissions, acoustic environment, fish and fish habitat, wetland loss or alteration, vegetation, wildlife and wildlife habitat and heritage resources (Table 7.2.2-2). Since in some cases, the focus of TLRU may be on lands within a few hundred metres of the Footprint, and in other cases broader territorial uses are identified extending several kilometres from the Footprint, the potential effects of the Project on TLRU are also assessed within the TLRU RSA.

TABLE 7.2.2-2

INPUTS TO TRADITIONAL LAND AND RESOURCE USE STUDY AREA BOUNDARIES

Resource Component	Local Study Area	Regional Study Area	ESA Reference
Water Quality and Quantity	The area generally extending 100 m upstream of the centre of the proposed pipeline corridor to a minimum of 300 m downstream of the centre of the pipeline corridor. For groundwater, the area within 300 m of the proposed pipeline corridor, facility or HDD entrance in potentially vulnerable aquifer areas in hydraulic connection with the Footprint.	Includes all watersheds affected by the Project.	Section 5.3 of Volume 5A
Air Emissions	--	Consists of a 5 km wide band extending from the edges of the proposed pipeline corridor(*i.e.*, 2.5 km on each side of the proposed pipeline corridor) or a 24 km by 24 km area centred on a facility.	Section 5.4 of Volume 5A
Acoustic Environment	Extends 1.5 km from the fenceline or Footprint of the Project. For construction, this includes the pipeline, pump stations and terminals. For operations, this includes the pump stations and terminals only.	Potential effects on human receptors are not anticipated to extend beyond the Acoustic Environment LSA; however, cumulative effects from other energy-related noise sources could occur within a 1.5 km radius of the other developments energy-related noise sources so an RSA of 5.0 km is considered.	Section 5.6 of Volume 5A
Fish and Fish Habitat	Consists of the area extending 100 m upstream of the centre of the proposed pipeline corridor to a minimum of 300 m downstream from the centre of the proposed pipeline corridor.	Includes all watersheds directly affected by the Project.	Section 5.7 of Volume 5A
Wetlands	Consists of a 300 m wide band generally centred on the proposed pipeline corridor (*i.e.,* 150 m on both sides of the proposed pipeline corridor centre) with site-specific tailoring to extend around larger wetland complexes that are encountered by the proposed pipeline corridor.	Includes all watersheds directly affected by the Project.	Section 5.8 of Volume 5A
Vegetation	Consists of a 300 m wide band generally centred on the proposed pipeline corridor (*i.e.*, 150 m on both sides of the proposed pipeline corridor centre).	Consists of a 2 km band generally extending from the centre of the proposed pipeline corridor and facilities (*i.e.*, 1 km on each side of the centre of the proposed corridor).	Section 5.9 of Volume 5A
Wildlife and Wildlife Habitat	Generally consists of a 1 km buffer of the centre of the proposed pipeline corridor and power lines, and within a 1 km buffer around the boundary of the proposed permanent facilities.	Consists of a 15 km buffer of the centre of the proposed pipeline corridor and power lines, and within a 15 km buffer around the boundary of the proposed permanent facilities and species-specific RSAs delineated for caribou (defined by identified range boundaries) and grizzly bear (defined by identified population units).	Section 5.10 of Volume 5A
Heritage Resources	--	Consists of the area extending beyond the Footprint and is defined as an area of intersecting Borden Blocks.	Section 5.1 of this volume

Traditional land and resource use information in this subsection is presented by Aboriginal community from east to west along the proposed pipeline corridor and according to proposed pipeline segment to align with assessment of biophysical elements (Volume 5A). Corresponding Project components (proposed pipeline segments) and socio-economic study regions have been previously described in Section 5.2. The geographic relationship of potentially affected Aboriginal communities to the Project is described in the Traditional Land and Resource Use Technical Report of Volume 5D and detailed

community profile and socio-economic study region information is provided in the Socio-Economic Technical Report of Volume 5D.

7.2.2.3 Traditional Land and Resource Use Context

Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated impacts of the Project on their assertion of Aboriginal rights and title governing traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. Of the 85 Aboriginal communities engaged on the Project with Trans Mountain, the following 62 communities have been identified as having an interest in the Project or having interests potentially affected by the Project:

- Saddle Lake Cree Nation
- Enoch Cree Nation
- Alexander First Nation
- Samson Cree Nation
- Métis Nation of Alberta (Region 4)
- O'Chiese First Nation
- Ermineskin Cree Nation
- Montana First Nation
- Louis Bull Tribe
- Alexis Nakota Sioux Nation
- Foothills Ojibway Society
- Paul First Nation
- Nakcowinewak Nation of Canada
- Sunchild First Nation
- Aseniwuche Winewak Nation
- Lheidli T'enneh
- Simpcw First Nation
- Lhtako Dene Nation
- Canim Lake Band
- Whispering Pines (Clinton Indian Band)
- Métis Nation British Columbia
- Tk'emlúps te Secwépemc
- Skeetchestn Indian Band
- Penticton Indian Band
- Upper Nicola Indian Band
- Lower Similkameen Indian Band
- Upper Similkameen Indian Band
- Lower Nicola Indian Band
- Coldwater Indian Band
- Shackan Indian Band
- Nicomen Indian Band
- Nooaitch Indian Band
- Yale First Nation
- Union Bar First Nation
- Chawathil First Nation
- Shxw'ōwhámel First Nation
- Cheam First Nation
- Sumas First Nation
- Peters Band
- Seabird Island Band
- Popkum First Nation
- Scowlitz First Nation
- Skowkale First Nation
- Yakweakwioose First Nation
- Aitchelitz First Nation
- Skwah First Nation

- Kwaw-kwaw-apilt First Nation
- Soowahlie First Nation
- Shxwha:y Village
- Tzeachten First Nation
- Squiala First Nation
- Leq'á:mel First Nation
- Semiahmoo First Nation
- Matsqui First Nation
- Kwantlen First Nation
- Katzie First Nation
- Kwikwetlem First Nation
- Qayqayt First Nation
- Squamish Nation
- Tsleil-Waututh Nation
- Musqueam Indian Band
- Tsawwassen First Nation

Traditional Land Use (TLU) studies were initiated for the Project in 2012 and are ongoing. Following Project initiation, TERA on behalf of Trans Mountain, facilitated the TLU studies conducted by interested Aboriginal communities for the Project (see Section 5.2). The Project scope, timetable and location were discussed. Project information packages, which included a Project description, facts on the nature, timing, scope and location of the Project and relevant contact information for communication with Trans Mountain and TERA, were sent to each community and meetings were subsequently scheduled. Communities were also provided with copies of the proposed TLU study methods and a draft outline of TERA's TLU study work plan. Participation in the TLU studies, either as TERA-facilitated or community directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies.

Trans Mountain provided funding to assist Aboriginal communities that elected to conduct their own community directed TLU studies. These communities often engaged other consultants to provide technical support and assistance with their TLU studies for the Project (see Section 5.2).

The TERA-facilitated TLU studies were conducted in a phased approach consisting of map reviews/interviews, field reconnaissance and follow-up reporting (see Section 5.2). Interpreters were made available at the request of the community. Each phase of a TERA-facilitated TLU study is described in further detail in the Traditional Land and Resource Use Technical Report of Volume 5D.

A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B and Appendix A of Volume 3B.

To date, the results of TERA-facilitated and community directed TLU studies as well as the preliminary interests summarized as identified by participating Aboriginal communities, revealed TLU sites within the proposed pipeline corridor requiring mitigation, described in Table7.2.2-3.

TABLE 7.2.2-3

TRADITIONAL LAND USE SITES IDENTIFIED WITHIN THE PROPOSED PIPELINE CORRIDOR IDENTIFIED BY PARTICIPATING ABORIGINAL COMMUNITIES

Approximate Distance and Direction from Project	Site Description	Identified By
Hunting Sites		
At RK 135	South of Evansburg – hunting site for moose and rabbit	Alexander First Nation
RK 141.7	Moose hunting area	Samson Cree Nation
RK 175	Elders and community members hunt moose and grouse	Alexander First Nation
24 m north of RK 205.4	Well-used elk trail about 50 m long, 2 m wide as well as habitat (elk antler rub on nearby trees) – elk hunting in general region	Alexander First Nation
10 m north of RK 221.8	Hunting along nearby Wolf Creek	Alexander First Nation
RK 224.1	Game trail from McLeod River to Whitecourt	Alexis Nakota Sioux Nation
From RK 238.4 to 248.8	Hunting site	Paul First Nation
RK 319.7	Hunting south of Hinton (north of Luscar)	Paul First Nation

TABLE 7.2.2-3 Cont'd

Approximate Distance and Direction from Project	Site Description	Identified By
RK 321	Hunting in Hinton area	Aseniwuche Winewak Nation
RK 322.8	Hunting with game trails	Nakcowinewak Nation Of Canada
30 m southeast of RK 325 to RK 416	Hunting region	Samson Cree Nation
12 m southeast of RK 336.4	Game trail	Samson Cree Nation
RK 607.4	Hunting near Blue River	Canim Lake Band
RK 1042	Hunting for bear	Shxw'ōwhámel First Nation
Trapping Sites		
13 m north of RK 135.6	Pembina River - trapping	Alexander First Nation
RK 322.8	Trapper's stand	Nakcowinewak Nation Of Canada
Fishing Sites		
Crossed at RK 33.5	Fishing along North Saskatchewan River	Samson Cree Nation
RK 135.6	Pembina River crossing – locale for net or rod fishing	Alexander First Nation Samson Cree Nation
Crosses at RK 220.3	Fishing on Wolf Creek	Alexis Nakota Sioux Nation
RK 224.3	Fishing along McLeod River	Samson Cree Nation
RK 496.8	Fishing on Fraser River	Aseniwuche Winewak Nation
Crosses at RK 717.3	Fishing on Raft River	Canim Lake Band
10 m north of RK 1061	Fishing on Fraser River	Popkum First Nation
Plant Gathering Sites		
30 m southeast of RK 118.5	Plant gathering site	Samson Cree Nation
RK 118.7	Plant gathering site	Samson Cree Nation
RK 118.8	Plant gathering site	Samson Cree Nation
RK 132.9	Plant gathering site	Samson Cree Nation
Crosses at RK 135.6	Medicinal plant gathering along Pembina River	Samson Cree Nation Paul First Nation Ermineskin Cree Nation
RK 135.9	Plant gathering site	Samson Cree Nation
RK 141.3	Plant gathering site	Samson Cree Nation
RK 141.7	Plant gathering site	Samson Cree Nation
RK 141.9	Plant gathering site	Samson Cree Nation
RK 142.4	Plant gathering site	Samson Cree Nation
RK 160	South of Chip Lake – fungus gathering	Alexander First Nation
20 m north of RK 171	Important medicinal plant harvesting area	Paul First Nation
5 m north of RK 174.1	Plant gathering site	Samson Cree Nation
RK 175.9	Plant gathering site	Samson Cree Nation
RK 176	Plant gathering site	Samson Cree Nation
10 m south of RK 176.1	Plant gathering site	Samson Cree Nation
1 m south of RK 176.2	Plant gathering site	Samson Cree Nation
20 m south of RK 179.1	Plant gathering site	Samson Cree Nation
From RK 196.6 to RK 206.6	Medicinal plant harvesting site near Peers south of McLeod Valley	Paul First Nation
10 m south of RK 205.8	Blue diamond willow	Alexander First Nation
RK 220.4	Plant gathering site	Samson Cree Nation
47 m north of RK 223.6	Berry picking site	Alexander First Nation
8 m south of RK 223.7	Blue diamond willow tree	Alexander First Nation
Crosses at RK 224.3	Wood and mint gathering near McLeod River	Alexis Nakota Sioux Nation
RK 243. 8	Plant gathering site	Samson Cree Nation
RK 244	Plant gathering site	Samson Cree Nation
RK 244.2	Plant gathering site	Samson Cree Nation
RK 271	Berry picking site at Medicine Lodge	Enoch Cree Nation
RK 286.2	Medicinal plant gathering Obed Lake	Aseniwuche Winewak Nation
At KP 305	Medicinal plant gathering	Nakcowinewak Nation Of Canada
RK 307	Plant species of importance identified	O'Chiese First Nation

TABLE 7.2.2-3 Cont'd

Approximate Distance and Direction from Project	Site Description	Identified By
RK 320	Two plant species of importance identified	O'Chiese First Nation Nakcowinewak Nation Of Canada
RK 321	Medicinal and plant gathering near Hinton	Aseniwuche Winewak Nation
RK 326	Medicinal plant gathering near Hinton	Aseniwuche Winewak Nation
RK 332	Medicinal plant gathering	Aseniwuche Winewak Nation
Crosses at RK 333.5	Plant gathering North Saskatchewan River	Samson Cree Nation
RK 339	Both sides of Highway 16 used to gather medicinal plants	Nakcowinewak Nation Of Canada
RK 494.5	Plant gathering near the Hargreaves Trap Site	Aseniwuche Winewak Nation
RK 499	Medicinal plant gathering near the Rearguard Station	Aseniwuche Winewak Nation
RK 500	Plant gathering near the Rearguard Station	Aseniwuche Winewak Nation
RK 505.7	Plant gathering near the Rearguard Station	Aseniwuche Winewak Nation
RK 820	Berry picking site	Whispering Pines First Nation (Clinton Indian Band)
RK 1042	Gathering blueberries	Shxw'ōwhámel First Nation
Trails and travelways		
RK 22.8	Trail near Highway 2	Ermineskin Cree Nation
RK 27.9	Trail from Rocky Mountain House to Edmonton	O'Chiese First Nation
RK 33.5	Travelway on North Saskatchewan River	Ermineskin Cree Nation
From RK 76.8 to RK 86.8	Wagon trail from Hobbema to Lac Ste. Anne	Samson Cree Nation
RK 100.8	Quad trail	Samson Cree Nation
RK 120.2	Trail from Rimbey to Whitecourt	O'Chiese First Nation
RK 135.6	Travelway on Pembina River	Alexander First Nation Samson Cree Nation Ermineskin Cree Nation
RK 172	Trail from O'Chiese IR 203 to Nojack to Mayerthorpe	O'Chiese First Nation
RK 173	Trail from O'Chiese IR 203 to Whitecourt	O'Chiese First Nation
RK 173.5	Range Road 114 was once a wagon trail	Nakcowinewak Nation Of Canada
RK 223.8	Quad trail	Alexander First Nation
RK 224	Trails near McLeod River	Alexis Nakota Sioux Nation
RK 322.6	Trail from O'Chiese IR 203 to Hinton	O'Chiese First Nation
RK 332.4	Willmore trail from Jasper to Grand Cache	Samson Cree Nation
RK 333.4	Horse riding trail and quad trails	Alexis Nakota Sioux Nation
RK 334	Horse riding trail	Samson Cree Nation
RK 339	Old trading trail that is now Highway 16	Samson Cree Nation
RK 339	Highway 16 was once a wagon trail	Nakcowinewak Nation Of Canada
RK 748.8	Trail from the Canim Lake IR 1 to Boulder on the North Thompson River	Canim Lake Band
Habitation Sites		
70 m south of RK 178.6	Foundation of log cabin	Alexander First Nation
RK 322.6	Campsite and cabin near Hinton	O'Chiese First Nation
RK 339	Camping on both sides of Highway 16	Nakcowinewak Nation Of Canada
RK 1058	Pithouses	Shxw'ōwhámel First Nation
10 m north of RK 1060	Pithouses	Popkum First Nation
Gathering Places		
65 m south of RK 118.8	Campsite and potential sweat lodge	Alexis Nakota Sioux Nation
50 m north of RK 129.2	Sweat lodge and ceremonial site	Alexander First Nation
RK 135	Youth gatherings at Pembina River	Enoch Cree Nation
RK 154.7	Camp site	Samson Cree Nation
RK 339	Ceremonial site where moose hides were prepared and on both sides of Highway 16	Nakcowinewak Nation Of Canada
Sacred Areas		
RK 91	Enoch Cree Nation Gravesite 1	Enoch Cree Nation
22 m south of RK 118.8	Sacred tree ribbon site	Samson Cree Nation
40 m south of RK 133.6	Sacred site	Enoch Cree Nation Samson Cree Nation

TABLE 7.2.2-3 Cont'd

Approximate Distance and Direction from Project	Site Description	Identified By
2 m south of RK 141.7	Potential burial site	Samson Cree Nation
RK 151.4	Ceremonial sundance site	Samson Cree Nation
50 m south of RK 151.5	Sacred site with birch tress	Samson Cree Nation
RK 174.2	Sacred King tree	Samson Cree Nation
RK 257.5	Grave site	Nakcowinewak Nation Of Canada
20 m north of RK 287.7	Sacred spring	Paul First Nation
42 m southeast of RK 320.6	Prayer tree with coloured fabric tied to it	Alexander First Nation Samson Cree Nation Nakcowinewak Nation Of Canada
RK 332.4	Gravesites/fasting/vision quests on Willmore trail	Samson Cree Nation
RK 334	Ceremonial site, prayer flags tied to poplar trees bordering existing right-of-way	Alexis Nakota Sioux Nation Nakcowinewak Nation Of Canada
13 m northwest of RK 338.8	Possible grave site	Samson Cree Nation
From RK 1054.1 to RK 1059	Sacred site	Shxw'ōwhámel First Nation

Detailed TLU site information is provided in Section 5.2. In addition, results of the literature/desktop review (Section 5.2) indicate that Aboriginal communities continue to use Crown lands throughout the TLRU RSA for a variety of purposes including hunting, trapping, fishing and plant gathering, spiritual/cultural pursuits as well as through the use of trails and travelways on the landscape to access subsistence resources and neighbouring communities.

The Traditional Land and Resource Use Technical Report of Volume 5D prepared by TERA incorporates the results of TLU studies and preliminary interests identified by participating Aboriginal communities as received by Trans Mountain to date (Section 3.0).

7.2.2.4 Potential Effects and Mitigation Measures

The potential effects of the Project on TLRU were identified based on the results of the literature review, desktop analysis, TLU studies and through ongoing engagement with participating Aboriginal communities (see Section 3.0).

The construction of the Project has the potential to directly and indirectly disrupt subsistence hunting, trapping, fishing and plant gathering through changes to harvesting locales, as well as the broader ecological system, through the temporary physical disturbance of land or resources. Subsistence activities may also be affected by Project activities resulting from limited access and/or increased public access to traditional harvesting areas and increased pressure on environmental resources.

Project construction activities have the potential to result in a direct loss of trails, travelways and habitation sites through clearing. Right-of-way clearing may also alter connectivity to trails and travelways and encroach on lands used for cultural activities. Project construction activities may cause a disruption of access to trails, travelways and habitation sites, and increased public access as a result of development that may lead to increased pressure on resource-rich areas and potential or existing habitation sites.

Project construction activities also have the potential to result in a loss of or disturbance to cultural sites and activities. Sacred areas and gathering places are typically protected from public access, use, and vandalism and, in some cases, may only be accessible with spiritual leaders. Increased access to undisturbed areas has led to greater exposure of sacred areas, areas that range from geologic formations to entire landscapes. Noise and activity as a result of construction and operations may also influence the focus and intent of ceremonial activities.

The operations phase of the Project will affect TLRU primarily through temporary disturbances related to site-specific maintenance. Some ongoing disturbances may also occur in areas where new land is required for the proposed Black Pines Pump Station or for the expansion of select existing pump stations.

There may also be longer-term changes in use patterns where the proposed pipeline corridor deviates from the existing TMPL right-of-way. These new routing areas are discussed in Section 4.0.

Traditional marine resource use is pertinent only to the proposed expansion of the Westridge Marine Terminal and, therefore, is discussed in Section 7.6.2.

Potential Project-related effects on social and cultural well-being, employment and economy, and community health are considered in Sections 7.2.3, 7.2.7 and 7.2.8, respectively.

The potential occurrence and associated effects of disruption of watercourse users on navigable watercourses and safety of watercourse users on navigable watercourses are discussed in Section 7.2.6.

The potential effects associated with accidents and malfunctions on socio-economic elements are provided in Section 7.9.

The potential effects associated with accidents and malfunctions on biophysical elements are provided in Volume 5A. The potential effects associated with accidents and malfunctions during marine transportation are provided in Volume 8A. The potential direct and indirect effects of an operational pipeline or marine spill are evaluated in Volumes 7 and 8A, respectively, including the risk of a spill, the anticipated spill response and the potential effects for various spill scenarios. The potential effects associated with a small spill during loading as well as a large spill scenario at Westridge Marine Terminal are provided in Volume 7.

Identified Potential Effects

Potential effects associated with the construction and operations of the Project on TLRU indicators are listed in Table 7.2.2-4. These interactions are based on the results of the literature review, desktop analysis, TLU studies, Aboriginal participation during biophysical field work, engagement with Aboriginal communities (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.2.2-4 was principally developed in accordance with Trans Mountain standards as well as industry best practices and procedures and provincial regulatory authority guidelines related to specific elements such as fish and fish habitat, vegetation, wetland loss or alteration, wildlife and wildlife habitat, and heritage resources, and are recommended based on engagement with Aboriginal communities, experience gained from other pipeline projects with similar conditions and the professional experience of the assessment team.

TABLE 7.2.2-4

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PIPELINE CONSTRUCTION AND OPERATIONS ON TRADITIONAL LAND AND RESOURCE USE

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1. Traditional Land and Resource Use Indicator – Subsistence Activities and Sites				
1.1 Disruption of use of trails and travelways	New pipeline segments Temporary facilities Black Pines Pump Station and power line Kingsvale Pump Station and power line At locations identified in Table 7.2.2-3	Footprint	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.6 Navigation and Navigation Safety for measures regarding navigable watercourses. • Upon Footprint finalization, applicable mitigation options listed below for previously identified trails and travelways within the proposed pipeline corridor (Table 7.2.2-3) will be confirmed based on the following criteria: the location of the site with respect to the proposed area of development, the relative importance of the site to the community, and the potential for an alternative mitigation strategy to reduce or avoid sensory disturbance. • Should additional trails and travelways be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - detailed recording and mapping to within 100 m on both sides of the pipeline right-of-way; in partnership with community representatives, a decision is then made about the relative importance of the trail and, if warranted, how best to maintain and control access; - signage or scheduling construction during periods of least impact; and/or - alternative site-specific mitigation strategies recommended by participating Aboriginal communities. • Implement appropriate measures identified in the Heritage Resources Discovery Contingency Plan [Appendix B]. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Disturbance of trails and travelways during construction and site-specific maintenance.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1.1 Disruption of use of trails and travelways (cont'd)	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.6 Navigation and Navigation Safety for measures regarding navigable watercourses. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance activities (refer to Section 7.2.4 HORU). • Change in land use patterns during construction and site-specific maintenance (refer to Section 7.2.4 HORU). • Change in land use patterns during operations (refer to Section 7.2.4 HORU).
1.2 Loss of habitation sites or reduced use of habitation sites	New pipeline segments Temporary facilities Black Pines Pump Station and power line Kingsvale Pump Station and power line At locations identified in Table 7.2.2-3	Footprint	• Upon Footprint finalization, applicable mitigation options listed below for previously identified habitation sites within the proposed pipeline corridor (Table 7.2.2-3) will be confirmed based on the following criteria: the location of the site with respect to the proposed area of development, the relative importance of the site to the community, and the potential for an alternative mitigation strategy to reduce or avoid sensory disturbance. • Avoid disturbance of built features during final route refinement, to the extent practical [SEMP Section 4.6] . • Reduce the amount of land disturbed by using previously disturbed areas for stockpiles, staging areas and camps where possible [SEMP Section 4.6]. • Narrow the construction right-of-way at key locations to avoid valued built or natural features, to the extent practical [SEMP Section 4.6]. • Should additional habitation sites be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - detailed mapping, photographic recording and avoidance of the location by the development; - should avoidance of a site not be feasible, mitigation measures consisting of detailed recording and controlled excavations may be implemented; and/or - alternative site-specific mitigation strategies recommended by participating Aboriginal communities. • See Section 7.2.6 Acoustic Environment of Volume 5A for additional mitigation measures. • Implement appropriate measures identified in the Heritage Resources Discovery Contingency Plan [Appendix B]. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Disturbance of habitation sites during construction and site-specific maintenance.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1.2 Loss of habitation sites or reduced use of habitation sites (cont'd)	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.6 Acoustic Environment of Volume 5A for additional mitigation measures. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance activities (refer to Section 7.2.4 HORU). • Change in land use patterns during construction and site-specific maintenance (refer to Section 7.2.4 HORU). • Change in land use patterns during operations (refer to Section 7.2.4 HORU).
1.3 Alteration of plant harvesting sites	All components At locations identified in Table 7.2.2-3	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Ensure equipment arrives at all construction sites clean and free of soil or vegetative debris. Inspect and identify equipment deemed to be acceptable with a suitable marker, such as a sticker. Do not allow any equipment arriving in a dirty condition onsite until it has been cleaned [Section 7.0]. • Should additional plant harvesting sites be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - limiting the use of chemical applications; - replacement of plant species during reclamation; - avoidance of the site; and/or - alternative site-specific mitigation strategies recommended by participating Aboriginal communities. • See Section 7.2.9 Vegetation of Volume 5A for additional mitigation measures. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Alteration of subsistence resources.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1.3 Alteration of plant harvesting sites (cont'd)	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Ensure equipment arrives at all construction sites clean and free of soil or vegetative debris. Inspect and identify equipment deemed to be acceptable with a suitable marker, such as a sticker. Do not allow any equipment arriving in a dirty condition onsite until it has been cleaned [Section 7.0]. • See Section 7.2.9 Vegetation of Volume 5A for additional mitigation measures. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Disruption of subsistence activities during construction and site-specific maintenance.
1.4 Disruption of subsistence hunting activities	All components At locations identified in Table 7.2.2-3	LSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.10 Wildlife and Wildlife Habitat of Volume 5A for mitigation relevant to sensory disturbance, loss or alteration of wildlife habitat, injury and mortality. • Should additional hunting sites be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - adhering to species-specific timing constraints to the extent feasible; - leaving breaks in the pipeline trench to allow animals to cross; - limiting the use of chemical applications; and/or - alternative site-specific mitigation strategies recommended by participating Aboriginal communities. • See Section 7.2.6 Acoustic Environment of Volume 5A for additional mitigation measures. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Alteration of subsistence resources.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1.4 Disruption of subsistence hunting activities (cont'd)	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.10 Wildlife and Wildlife Habitat of Volume 5A for mitigation relevant to sensory disturbance, loss or alteration of wildlife habitat, injury and mortality. • See Section 7.2.6 Acoustic Environment of Volume 5A for additional mitigation measures. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Disruption of subsistence activities during construction and site-specific maintenance.
1.5 Disruption of subsistence fishing activities	All components At locations identified in Table 7.2.2-3	LSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Prohibit recreational fishing by Project personnel on or in the vicinity of the construction right of way. The use of the construction right of way to access fishing sites is prohibited [Section 7.0]. • Should additional fishing sites be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - recording and mapping of fishing locales; - strict adherence to the legislation, standards and guidelines set by provincial and federal regulatory authorities for watercourse crossings; and/or - alternative site-specific mitigation strategies recommended by participating Aboriginal communities. • See Section 7.2.3 Water Quality and Quantity of Volume 5A for mitigation measures relevant to potential effects on water quality and quantity. • See Section 7.2.7 Fish and Fish Habitat of Volume 5A for mitigation measures relevant to potential effects on fish and fish habitat. • See Section 7.6.9 Marine Fish and Fish Habitat for mitigation measures relevant to potential effects on marine habitat, injury and mortality. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Alteration of subsistence resources.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1.5 Disruption of subsistence fishing activities (cont'd)	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Prohibit recreational fishing by Project personnel on or in the vicinity of the construction right of way. The use of the construction right of way to access fishing sites is prohibited [Section 7.0]. • See Section 7.2.3 Water Quality and Quantity of Volume 5A for mitigation measures relevant to potential effects on water quality and quantity. • See Section 7.2.7 Fish and Fish Habitat of Volume 5A for mitigation measures relevant to potential effects on fish and fish habitat. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Disruption of subsistence activities during construction and site-specific maintenance.
1.6 Disruption of subsistence trapping activities	All components At locations identified in Table 7.2.2-3	LSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Prohibit the vandalism or theft on trapper equipment or trapped animals if they are observed on the construction right of way or the construction site prior to clearing [Section 7.0]. • See Section 7.2.4 HORU for measures regarding trapping activities. • Should additional trapping sites or trap line equipment be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - maintaining access to the trap line; - moving of trap line equipment by the trapper prior to construction; and/or - alternative site-specific mitigation strategies recommended by participating Aboriginal communities. • See Section 7.2.6 Acoustic Environment of Volume 5A for additional mitigation measures. • See Section 7.2.10 Wildlife and Wildlife Habitat of Volume 5A for mitigation relevant to sensory disturbance, loss or alteration of wildlife habitat, and wildlife mortality. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Alteration of subsistence resources.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
1.6 Disruption of subsistence trapping activities (cont'd)	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Prohibit the vandalism or theft on trapper equipment or trapped animals if they are observed on the construction right of way or the construction site prior to clearing [Section 7.0]. • See Section 7.2.4 HORU for measures regarding trapping activities. • See Section 7.2.6 Acoustic Environment of Volume 5A for additional mitigation measures. • See Section 7.2.10 Wildlife and Wildlife Habitat of Volume 5A for mitigation relevant to sensory disturbance, loss or alteration of wildlife habitat, and wildlife mortality. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Disruption of subsistence activities during construction and site-specific maintenance.
2. Traditional Land and Resource Use Indicator – Cultural Sites				
2.1 Disturbance of gathering places	New pipeline segments Temporary facilities Black Pines Pump Station and power line Kingsvale Pump Station and power line At locations identified in Table 7.2.2-3	Footprint	• Upon Footprint finalization, applicable mitigation options listed below for previously identified gathering places within the proposed pipeline corridor (Table 7.2.2-3) will be confirmed based on the following criteria: the location of the site with respect to the proposed area of development, the relative importance of the site to the community, and the potential for an alternative mitigation strategy to reduce or avoid sensory disturbance. • Avoid disturbance of known gathering places during right-of-way finalization, to the greatest extent practical. • Narrow construction right-of-way at key locations to avoid known gathering places. • Reduce the amount of land disturbed by using previously disturbed areas for stockpiles, staging areas and camps where possible. • Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0].	• Disturbance of gathering places during construction and site-specific maintenance.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
2.1 Disturbance of gathering places (cont'd)	See above	See above	• Should additional gathering places be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - detailed recording, mapping and avoidance; - assess visual impact; and/or - additional mitigation measures will be refined and optimised through community discussions. • See Section 7.2.4 Air Emissions, Section 7.2.5 GHG Emissions and Section 7.2.6 Acoustic Environment of Volume 5A for measures pertaining to nuisance air and noise emissions, respectively. • Implement appropriate measures identified in the Heritage Resources Discovery Contingency Plan [Appendix B]. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• See above
	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.4 Air Emissions, Section 7.2.5 GHG Emissions and Section 7.2.6 Acoustic Environment of Volume 5A for measures pertaining to nuisance air and noise emissions, respectively. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance activities (refer to Section 7.2.4 HORU). • Change in land use patterns during construction and site-specific maintenance (refer to Section 7.2.4 HORU). • Change in land use patterns during operations (refer to Section 7.2.4 HORU).
2.2 Disturbance of sacred sites	New pipeline segments Temporary facilities Black Pines Pump Station and power line Kingsvale Pump Station and power line At locations identified in Table 7.2.2-3	Footprint	• Upon Footprint finalization, applicable mitigation options listed below for previously identified sacred sites within the proposed pipeline corridor (Table 7.2.2-3) will be confirmed based on the following criteria: the location of the site with respect to the proposed area of development, the relative importance of the site to the community, and the potential for an alternative mitigation strategy to reduce or avoid sensory disturbance. • Avoid disturbance of known sacred areas during right-of-way finalization, to the greatest extent practical. • Narrow construction right-of-way at key locations to avoid known sacred areas. • Reduce the amount of land disturbed by using previously disturbed areas for stockpiles, staging areas and camps where possible. • Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0].	• Disturbance of sacred areas during construction and site-specific maintenance.

TABLE 7.2.2-4 Cont'd

Potential Effect	Project Component(s)	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [EPP Reference][2]	Potential Residual Effect(s)
2.2 Disturbance of sacred sites (cont'd)	See above	See above	• Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Should additional sacred areas be identified during ongoing engagement with Aboriginal communities, implement the TLU Sites Discovery Contingency Plan [Appendix B]. Mitigation may include one or more of the following measures: - detailed recording, mapping and avoidance; - assess visual impact; and/or - additional mitigation measures will be refined and optimised through community discussions. • See Section 7.2.4 Air Emissions, Section 7.2.5 GHG Emissions and Section 7.2.6 Acoustic Environment of Volume 5A for measures pertaining to nuisance air and noise emissions, respectively. • Implement appropriate measures identified in the TLU Sites Discovery Contingency Plan in the event of discovery of sacred areas during construction activities [Appendix B]. • Implement appropriate measures identified in the Heritage Resources Discovery Contingency Plan [Appendix B]. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• See above
	All components	RSA	• Provide Aboriginal communities with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities [Section 4.0]. • Install signage notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • See Section 7.2.4 Air Emissions, Section 7.2.5 GHG Emissions and Section 7.2.6 Acoustic Environment of Volume 5A for measures pertaining to nuisance air and noise emissions, respectively. • Implement applicable mitigation measures listed above during maintenance activities (*e.g.,* integrity digs).	• Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance activities (refer to Section 7.2.4 HORU). • Change in land use patterns during construction and site-specific maintenance (refer to Section 7.2.4 HORU). • Change in land use patterns during operations (refer to Section 7.2.4 HORU).

Notes: 1 LSA = TLRU LSA; RSA = TLRU RSA.

2 Detailed mitigation measures are outlined in the Pipeline EPP (Volume 6B).

7.2.2.5 Potential Residual Effects

The potential residual socio-economic effects on TLRU indicators associated with the construction and operations of the Project (Table 7.2.2-4) are:

- disturbance of trails and travelways during construction and site-specific maintenance;
- disturbance of habitation sites during construction and site-specific maintenance;

- alteration of subsistence resources;
- disruption of subsistence activities during construction and site-specific maintenance;
- disturbance of gathering places during construction and site-specific maintenance;
- disturbance of sacred areas during construction and site-specific maintenance;
- sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site specific maintenance activities;
- change in land use patterns during construction and site-specific maintenance; and
- change in land use patterns during operations.

As noted by the cross-references appearing in Table 7.2.2-4, all components of the biophysical environment are understood to support the land base and habitat conditions essential to the practice of traditional activities. As such, many potential residual effects discussed below, though presented with respect to TLRU, are assessed in consideration of all pertinent biophysical resources known or assumed to be of importance to Aboriginal communities for traditional use.

7.2.2.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method is considered to be the appropriate method for determining the significance of the anticipated residual socio-economic. Consequently, a qualitative assessment of TLRU was determined to be the most appropriate approach with the evaluation of significance of each of the potential residual effects relying on the professional judgment of the assessment team.

Table 7.2.2-5 provides a summary of the significance evaluation of the potential residual socio-economic effects of the construction and operations of the Project on TLRU indicators. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below.

TABLE 7.2.2-5

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PIPELINE CONSTRUCTION AND OPERATIONS ON TRADITIONAL LAND AND RESOURCE USE

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Traditional Land and Resource Use Indicator – Subsistence Activities and Sites									
1(a) Disturbance of trails and travelways during construction and site-specific maintenance.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
1(b) Disturbance of habitation sites during construction and site-specific maintenance.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
1(c) Alteration of subsistence resources.	Negative	RSA	Short-term	Periodic	Long-term	Medium	High	High	Not significant
1(d) Disruption of subsistence activities during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Long-term	Medium	High	High	Not significant
1(e) Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site specific maintenance activities.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
1(f) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant

TABLE 7.2.2-5 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1(g) Change in land use patterns during operations.	Negative to positive	RSA	Short-term	Isolated	Long-term	Medium	High	High	Not significant
1(h) Combined effects on subsistence activities and sites indicator (1[a] to 1[g]).	Negative	RSA	Short-term	Periodic	Long-term	Medium	High	High	Not significant
2. Traditional Land and Resource Use Indicator – Cultural Sites									
2(a) Disturbance of gathering places during construction and site-specific maintenance.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
2(b) Disturbance of sacred areas during construction and site-specific maintenance.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
2(c) Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site specific maintenance activities.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
2(d) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
2(e) Change in land use patterns during operations.	Negative to positive	RSA	Short-term	Isolated	Long-term	Medium	High	High	Not significant
2(f) Combined effects on cultural sites indicator (2[a] to 2[e]).	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant

Notes: 1 LSA = TLRU LSA; RSA = TLRU RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

TLRU Indicator – Subsistence Activities and Sites

The following discusses the significance rationale for the potential residual effects identified related to the subsistence activities and sites indicator.

Disturbance of Trails and Travelways During Construction and Site-Specific Maintenance

The disturbance of trails and travelways during construction and site-specific maintenance is assessed individually in Table 7.2.2-5 (point 1[a]); however, since the use of habitation sites relies on the use of trails and travelways, the potential residual effects on the disturbance of habitation sites and of trail and travelway use are discussed in an integrated manner below.

Disturbance of Habitation Sites during Construction and Site-Specific Maintenance

Disturbances of trails, travelways and habitation sites during construction is anticipated to result from short-term physical disturbance of land and access limitations that may affect the practice of traditional activities by Aboriginal communities. Similar effects of reduced access may occur during periods of site-specific maintenance.

Several trails, travelways and habitations sites were identified within the proposed pipeline corridor during the TLU studies for the Project (Table 7.2.2-3). Upon Footprint finalization, applicable mitigation options listed in Table 7.2.2-4 and in the Traditional Land Use Sites Discovery Contingency Plan (Appendix B of the Pipeline EPP of Volume 6B) will be confirmed based on the following criteria: the location of the site with respect to the proposed area of development; the relative importance of the site to the community; and the potential for an alternative mitigation strategy to reduce or avoid Project-related effects. The

proposed measures described in Table 7.2.2-4 will be implemented to mitigate the potential adverse effects of the Project on these site types and will be dependent upon the type of site identified.

Additional measures to reduce the disruption trails, travelways and habitation sites use include notification regarding construction schedules and pipeline route maps, installing signage notifying of construction activities in the area and working with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members.

Despite the implementation of the proposed mitigation measures, traditional land and resource users may still be unable to use, or be deterred from using, certain areas at times during construction and periods of site-specific maintenance (Table 7.2.2-5, point 1[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – trails, travelways and habitation sites may be physically disturbed if occurring within the construction right-of-way and temporary workspace.
- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.
- Reversibility: short-term – effects will be focused on the construction phase or site-specific maintenance that would occur within any 1 year period during operations.
- Magnitude: medium – it is expected that Project-related disturbances would be temporary through the implementation of the proposed mitigation measures during construction and operations to reduce, but not eliminate, potential effects on disturbance of trails, travelways and habitation sites. Mitigation strategies are also in place in the event any unidentified subsistence sites are discovered.
- Probability: high – trails, travelways and habitation sites occur within the proposed pipeline corridor.
- Confidence: high – based on Project information and the professional experience of the assessment team.

Alteration of Subsistence Resources

Alteration of subsistence resources may be disturbed or altered during construction and operations of the Project. The alteration of subsistence activities could manifest itself through changes to local harvesting locales, behavioural alteration or sensory disturbance of environmental resources or increased public access to traditional harvesting areas and increased pressure on environmental resources. The operation of the proposed Project will affect subsistence resources primarily due to temporary disturbances related to maintenance activities.

Several plant gathering, hunting, fishing and trapping sites were identified within the proposed pipeline corridor during the TLU studies for the Project (Table 7.2.2-3). The proposed measures described in Table 7.2.2-4 will be implemented to mitigate the potential adverse effects of the Project on these site types and include measures outlined under the assessment of relevant environmental resources (*e.g.*, air emissions, acoustic environment, fish and fish habitat, wildlife and wildlife habitat, vegetation, wetlands).

Despite the implementation of the proposed mitigation measures, traditional land and resource users may still be unable to use, or be deterred from using, certain areas at times during construction and periods of site-specific maintenance (Table 7.2.2-5, point 1[c]). Changes to the distribution and abundance of resources could in turn result in loss or alteration of harvesting areas, which could result in indirect effects such as harvesters having to spend more time and money to travel further for subsistence activities. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: TLRU RSA – potential effects may extend beyond the Footprint into the ZOI of target environmental resources.

- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.

- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.

- Reversibility: long-term – the effects of disturbance to traditionally harvested resources will be dependent on each target species' sensitivities and could extend greater than 10 years following decommissioning and abandonment, once native vegetation regenerates over the Project Footprint.

- Magnitude: medium – the effects assessment results for fish and fish habitat, wildlife and wildlife habitat, vegetation, wetlands indicates that effects to traditionally harvested resources may be detectable and is dependent on each target species' sensitivities.

- Probability: high – subsistence resources have been identified within the proposed pipeline corridor.

- Confidence: high – based on Project information and the professional experience of the assessment team.

Disruption of Subsistence Activities During Construction and Site-Specific Maintenance

The disruption of subsistence hunting, fishing, trapping and plant gathering activities is a potential residual effect of interactions between traditional resource users and construction and operations activities of the Project. In the event that subsistence activities are disrupted by the construction or operations of the Project, the interruption could mean that the traditional resource user misses the harvest opportunity or that their participation is curtailed. The disruption of subsistence activities also refers to the possibility that traditional resource users could be prevented from accessing key harvesting areas resulting from limited access or increased public access to traditional harvesting areas. The operations of the proposed Project will affect subsistence activities primarily due to temporary disturbances related to site-specific maintenance.

This assessment considers that, based on the results of TLU studies and engagement for the Project as well as the desktop analysis, subsistence activities including fishing, hunting, trapping and plant gathering are potentially practiced throughout the Project Footprint, the TLRU LSA and the TLRU RSA (Table 7.2.2-5, point 1[d]).

Aboriginal communities will be provided with the anticipated construction schedule and pipeline route maps, a minimum of two weeks prior to the start of construction in the vicinity of their respective communities. Signage will be installed, notifying of construction activities in the area. Trans Mountain will work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: TLRU RSA – the proposed Project may affect subsistence activities beyond the construction footprint and may also indirectly affect the distribution of traditional resource users in other areas of the TLRU RSA.

- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.

- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.

- Reversibility: long-term – the disruption of subsistence hunting, trapping, fishing and plant gathering activities during construction is limited to the construction phase of the Project; however, changes to preferred harvesting locales could result in indirect effects such as harvesters having to spend more time and money to travel further for subsistence activities, and could extend greater than 10 years following decommissioning and abandonment, once native vegetation regenerates over the Project Footprint.

- Magnitude: medium – mitigation measures are in place in the event any unidentified subsistence activities and land users are discovered and given that the effects assessment results for fish and fish habitat, vegetation, wetlands, and wildlife and wildlife habitat demonstrate that equivalent land use capability will be maintained by the application of the mitigation strategies described in this ESA and in the EPPs for the Project. It is expected that Project-related disruptions would be temporary through the implementation of the proposed mitigation measures during the construction and operations phases to reduce, but not eliminate, the potential effects on subsistence activities.

- Probability: high – subsistence activities and land users have been identified within the TLRU RSA.

- Confidence: high – based on Project information and the professional experience of the assessment team.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (from Nuisance Air Emissions and Noise)

The construction and site-specific maintenance of the Project may result in the sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (Table 7.2.2-5, point 1[e]). This potential residual effect is assessed under the aesthetic attributes indicator in Section 7.2.4 HORU. The significance evaluation of this residual effect is provided in Table 7.2.4-3, point 2[d]. A discussion of this residual effect in Section 7.2.4.6, which includes all land and resource users, provides an explanation of the rationale of the significance criteria.

Change in Land Use Patterns

The construction and site-specific maintenance during operations, as well as any new right-of-way areas deviating from the existing TMPL right-of-way may result in changes to access and use patterns for traditional land and resource users (Table 7.2.2-5, points 1[f] and 1[g]). These potential residual effects are assessed under the parks and protected areas indicator in Section 7.2.4 HORU. The significance evaluation of these residual effects is provided in Table 7.2.4-3, points 2[b] and 2[c]. A discussion of these residual effects in Section 7.2.4.6, which includes all land and resource users, provides an explanation of the rationale of the significance criteria.

Combined Effects on Subsistence Activities and Sites

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur for the subsistence activities and sites indicator, likely residual socio-economic effects include disturbance of trails and travelways, disturbance of habitation sites, alteration of subsistence resources, disruption of subsistence activities, sensory disturbance from nuisance air emissions and noise, and change in land use patterns (Table 7.2.2-5, points 1[a] to 1[g]).

The combined effect on the subsistence activities and sites indicator is considered to have a negative net impact balance. The spatial boundary is the TLRU RSA. Although the spatial boundary of the interaction is likely to occur within the Project Footprint or TLRU LSA, indirect effects may be felt throughout the TLRU RSA. The duration of the event is short-term, over the life of the Project, and the frequency is periodic. Interactions of Project construction and operations activities with traditional resource users are considered to be likely. The magnitude of any interactions is considered to be medium. While the proposed pipeline corridor is located adjacent to existing disturbances for 89% of the length, Aboriginal communities continue to practice traditional activities within and adjacent to the proposed pipeline corridor and on Crown lands along the existing TMPL and throughout the RSA (Table 7.2.2-5, point 1[h]). The effects to traditionally harvested resources may be detectable and are dependent on each target species' sensitivities. A summary of the rationale for all of the significance criteria for combined effects on subsistence activities and sites is provided below.

- Spatial Boundary: TLRU RSA – the combined socio-economic effects on subsistence activities and sites could occur at any point in the TLRU RSA.

- Duration: short-term - events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.

- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.

- Reversibility: long-term – overall, the reversibility is long-term since the combined effects may occur for the duration of the operations phase and could extend greater than 10 years when the Project is no longer in operation.

- Magnitude: medium - the combined effects will be detectable by traditional resource users since the effects on traditionally harvested esources range from negligible to detectable and are dependent on each target species' sensitivities and given that equivalent land use capability will be maintained by the application of the mitigation strategies described in this ESA and in the EPPs for the Project.

- Probability: high – given the location of the Project in relation to Indian Reserves (IRs) and asserted traditional territories.

- Confidence: high – based on Project information and the professional experience of the assessment team.

TLRU Indicator - Cultural Sites

The following discusses the significance rationale for the potential residual effects identified related to the cultural sites indicator.

Disturbance of Gathering Places During Construction and Site-Specific Maintenance

The rationale used to characterize the disturbance of gathering places (Table 7.2.2-5, point 2[a]) is presented below in an integrated manner with the disturbance to sacred areas (Table 7.2.2-5, point 2[b]) since the potential residual adverse effects on both gathering places and sacred areas as well as the characterization of these potential residual effects indicate inherent similarities in assessment factors.

Disturbance of Sacred Areas During Construction and Site-Specific Maintenance

The disturbance of gathering places and sacred areas is a potential residual effect of interactions between traditional resource users, and the short-term physical disturbance of land and access limitations that may affect the practice of traditional activities by Aboriginal communities.

Several gathering places and sacred areas were identified within the proposed pipeline corridor during the TLU studies for the Project (Table 7.2.2-3). Upon Footprint finalization, applicable mitigation options listed in Table 7.2.2-4 and in the TLU Sites Discovery Contingency Plan (Appendix B of the EPP) will be confirmed based on the following criteria: the location of the site with respect to the proposed area of development; the relative importance of the site to the community; and the potential for an alternative mitigation strategy to reduce or avoid sensory disturbance. The finalization of the Footprint will avoid disturbance of known sacred areas, to the greatest extent practical; the construction right-of-way will be narrowed at key locations to avoid known sacred areas; and the amount of land disturbed will be reduced by using previously disturbed areas for stockpiles, staging areas and camps where possible. The proposed measures described in Table 7.2.2-4 will be implemented to mitigate the potential adverse effects of the Project on these site types and will be dependent upon the type of site identified.

Additional measures to reduce the disturbance of gathering places and sacred areas include notification regarding construction schedules and pipeline route maps, installing signage notifying of construction activities in the area and working with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members.

Despite the implementation of the proposed mitigation measures, traditional land and resource users may still be unable to use, or be deterred from using, certain areas at times during construction and periods of site-specific maintenance (Table 7.2.2-5, point 2[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – gathering places and sacred areas may be physically disturbed if occurring within the construction right-of-way and temporary workspace.

- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.

- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.

- Reversibility: short-term – effects will be focused on the construction phase or site-specific maintenance that would occur within any 1 year period during operations.

- Magnitude: medium – it is expected that Project-related disturbances would be temporary through the implementation of the proposed mitigation measures during construction and operations to reduce, but not eliminate, potential effects on disturbance of gathering places and sacred areas. Mitigation strategies are also in place in the event any unidentified cultural sites are discovered.

- Probability: high – gathering places and sacred areas occur within the proposed pipeline corridor.

- Confidence: high – based on Project information and the professional experience of the assessment team.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (from Nuisance Air Emissions and Noise)

The construction and site-specific maintenance of the Project may result in the sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (Table 7.2.2-5, point 2[c]). This potential residual effect is assessed under the aesthetic attributes indicator in Section 7.2.4 HORU. The significance evaluation of this residual effect is provided in Table 7.2.4-3, point 2[d]. A discussion of this residual effect in Section 7.2.4.6, which includes all land and resource users, provides an explanation of the rationale of the significance criteria.

Change in Land Use Patterns

The construction and site-specific maintenance during operations, as well as any new right-of-way areas deviating from the existing TMPL right-of-way may result in changes to access and use patterns for traditional land and resource users (Table 7.2.2-5, points 2[d] and 2[e]). These potential residual effects are assessed under the parks and protected areas indicator in Section 7.2.4 HORU. The significance evaluation of these residual effects is provided in Table 7.2.4-3, points 2[b] and 2[c]. A discussion of these residual effects in Section 7.2.4.6, which includes all land and resource users, provides an explanation of the rationale of the significance criteria.

Combined Effects on Cultural Sites

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. For the cultural sites indicator, likely residual socio-economic effects include disturbance of gathering places, disturbance of sacred areas, sensory disturbance from nuisance air emissions and noise, and change in land use patterns (Table 7.2.2-5, points 2[a] to 2[e]).

The combined effect on the cultural sites indicator is considered to have a negative net impact balance. The spatial boundary is the TLRU RSA. Although the spatial boundary of the interaction is likely to occur within the Project Footprint, indirect effects may be felt throughout the TLRU RSA. The duration of the event is short-term, limited to the construction phase or site-specific maintenance that would occur within any 1 year period during operations, and the frequency is periodic. Interactions of Project construction and operations activities with traditional resource users are considered to be likely. The magnitude of any interactions is considered to be medium. While the proposed pipeline corridor is located adjacent to existing disturbances for 89% of the length, Aboriginal communities continue to practice traditional activities within and adjacent to the proposed pipeline corridor and on Crown lands along the existing

TMPL and throughout the RSA (Table 7.2.2-5, point 2[f]). A summary of the rationale for all of the significance criteria for combined effects on subsistence activities and sites is provided below.

- Spatial Boundary: TLRU RSA – the combined socio-economic effects on subsistence activities and sites could occur at any point in the TLRU RSA.
- Duration: short-term - events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.
- Reversibility: short-term – effects will be focused on the construction phase or site-specific maintenance that would occur within any 1 year period during operations.
- Magnitude: medium - it is expected that Project-related disruptions would be temporary through the implementation of the proposed mitigation measures during construction and operations to reduce, but not eliminate, potential residual effects on gathering places and sacred areas.
- Probability: high – given the location of the Project in relation to IRs and asserted traditional territories.
- Confidence: high – based on Project information and the professional experience of the assessment team.

7.2.2.7 Summary

As identified in Table 7.2.2-5, there are no situations for TLRU indicators that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of Project construction and operations on TLRU indicators will be not significant.

7.2.3 Social and Cultural Well-Being

This subsection assesses the potential Project effects on social and cultural well-being. The sense of social and cultural well-being of a community or region is dynamic and influenced by multiple factors and may be experienced differently by different people.

Generally, the results of consultation and engagement indicate that many people believed that Project construction and operations will benefit their community in terms of economic opportunities related to jobs, income, contracting, and spin-offs for local services and businesses. However, issues were identified by certain stakeholders about effects related to increased traffic and traffic safety, the presence of temporary workers in smaller communities (including indirect social effects, and pressures on certain infrastructure and services), as well as the potential disruption to specific community assets and events. In Aboriginal communities, issues were raised about potential effects on traditional Aboriginal culture, including disturbance of harvesting resources and cultural practices, but also the positive opportunities that may come from Project-related employment and TLU studies. The discussion of combined effects on social and cultural well-being considers a range of factors that may influence community perspectives of well-being in relation to the Project.

Many issues related to other biophysical and socio-economic elements (*e.g.*, human health risk, air emissions, acoustic environment, water quality and quantity, employment and economy, infrastructure and services) potentially affect the general sense of well-being at a community level. This subsection, however, focuses on other social and cultural issues not captured elsewhere, such as changes in population due to temporary workers, effects on community assets and values, changes in income patterns, and potential for community/worker interactions and Aboriginal culture. Community health and well-being is discussed in further detail in Section 7.2.8.

The Socio-Economic Technical Report of Volume 5D discusses existing conditions related to social and cultural well-being, including demographic data, income data, information on key cultural assets and

events, crime rates, and key Project-related issues and interests identified by Socio-economic RSA community.

The discussion of social and cultural well-being presents potential effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities, and the Westridge Marine Terminal), since the communities and regions in which the Project occurs will experience Project-related activities in a combined manner. From a community perspective, it is not meaningful to discuss the social and cultural well-being effects of each Project component on a stand-alone basis.

7.2.3.1 Assessment Indicators and Measurement Endpoints

Table 7.2.3-1 summarizes the assessment indicators, measurement endpoints and their rationale for social and cultural well-being. The indicators selected represent components of the socio-economic environment that are of particular importance or interest to regulators, Aboriginal communities, regulatory authorities, local communities, and other interested groups and individuals. The indicators have been selected based on: the NEB *Filing Manual* guidelines; experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, regulatory authorities and stakeholders; feedback from participants in ESA Workshops; public issues raised through media; and the professional judgment of the assessment team. Due to its dynamic, multi-faceted and individual nature, indicators of social and cultural well-being are challenging to pin-point and are often highly qualitative.

The measurement endpoints used to assess Project effects on the indicators include a combination of qualitative and quantitative parameters. These parameters have been chosen based on available socio-economic information and previous experience in assessing the effects of similar projects.

TABLE 7.2.3-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR SOCIAL AND CULTURAL WELL-BEING

Social and Cultural Well-being Indicators	Measurement Endpoints	Rationale for Indicator Selection
Population and demographics	• Project–related workforce • Worker in-migration	The selection of indicators and measurement endpoints considered NEB *Filing Manual* requirements for the social and cultural well-being element in Table A-3 and key issues and interests identified during stakeholder engagement. They also considered feedback from participants in the ESA Workshops, Aboriginal communities and key government departments and service providers (*i.e.,* municipalities, police, and social service providers).
Income levels and distribution	• Project regional employment and contracting opportunities	
Community way-of-life	• Key community events and assets • Community/worker interactions • Incidence of crime and social issues	
Aboriginal culture	• Aboriginal cultural practices	

7.2.3.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for social and cultural well-being considered one or both of the following areas (Figures 5.0-1 to 5.0-7):

- Footprint Study Area (as defined in Section 7.1.3); and
- Socio-economic RSA.

No LSA is being considered for social and cultural well-being. The relevant study area is defined by communities and regions where people are potentially affected by and are potentially benefitting from the Project, not by a specific land area.

The Socio-economic RSA is the area where the direct and indirect influences of other land uses and activities could overlap with Project-related effects and cause cumulative effects on the social and cultural well-being indicators. The Socio-economic RSA considers communities close enough to the Project to potentially be a: source of labour; source of procured goods or services; location of community

infrastructure/services influenced by the Project; accommodation or camp location for Project workers; or Project construction office location. This area includes the counties and regional districts crossed by the proposed pipeline corridor (or certain regional sub-areas) and communities approximately 50 km from the proposed pipeline corridor that could participate in or be affected by the Project. It also includes Aboriginal communities whose reserves or traditional territory is crossed by the proposed pipeline corridor.

Due to the large scale of the Project and the fact that it passes through distinct and different geographical and administrative/political regions, six study regions have been defined for the assessment of select socio-economic elements, including social and cultural well-being. Throughout the socio-economic assessment, these regions are the sections by which the Project is segmented for the purposes of analysis.

The socio-economic regions are broadly similar to the "pipeline segments" used as analytical boundaries by other disciplines in the biophysical assessment in Volume 5A. However, while the pipeline segments are defined based on construction or other technical parameters, the socio-economic regions or sections are defined by political and administrative boundaries that are relevant to service delivery and governance for the communities and residents who may have direct or indirect interactions with the Project. The use of the socio-economic boundaries/regions will allow more accuracy in the estimates of potential effects since they follow jurisdictional boundaries for service delivery and governance and therefore align with available data. These regions will also enable stakeholders to better understand how the assessment reflects local and regional interests.

The borders of the six Socio-economic Regions are defined as follows.

- **Edmonton Region –** Strathcona County to the western boundary of Parkland County.
- **Rural Alberta Region –** eastern boundary of Yellowhead County to eastern boundary of Jasper National Park.
- **Jasper National Park Region –** eastern and western boundaries of Jasper National Park.
- **Fraser-Fort George/Thompson-Nicola Region –** western boundary of Jasper National Park (Alberta/BC border) to approximately halfway between Merritt and Hope (to the border of the TNRD and the FVRD (note that the regions described for the socio-economic assessment do not always correspond with the boundaries of the regional districts through which they pass).
- **Fraser Valley Region –** halfway between Merritt and Hope to the western boundary of the FVRD.
- **Metro Vancouver Region** – boundaries of Metro Vancouver or the Greater Vancouver Regional District.

A detailed description of which pipeline segments and Project facilities are located in each of the six Socio-economic Regions is provided in Table 3.3-1 of the Socio-Economic Technical Report of Volume 5D. A detailed description of the incorporated communities, regions and Indian Reserves (IRs)/Aboriginal communities located in each socio-economic region of the Socio-economic RSA is provided in Table 3.3-2 of the Socio-Economic Technical Report of Volume 5D.

In BC, some of the regional districts through which the proposed pipeline corridor passes (or is near) are large and not all electoral areas within those regional districts are within a distance whereby effects or opportunities related to the Project are reasonably likely. In such regional districts as the Regional District of Fraser-Fort George (RDFFG), Thompson-Nicola Regional District (TNRD), Fraser Valley Regional District (FVRD) and Okanagan-Similkameen Regional District, only certain electoral areas have been included in the study area. All incorporated communities, regions (or electoral areas within regions), and IRs in the Socio-economic RSA are specified in Table 3.3-2 of the Socio-Economic Technical Report of Volume 5D.

7.2.3.3 Social and Cultural Well-Being Context

The proposed pipeline corridor will cross a portion of west-central Alberta and the entire width of BC. The proposed pipeline corridor crosses 18 incorporated municipalities, 7 rural counties or regional districts (including the Metro Vancouver, or the Greater Vancouver Regional District), and 10 IRs. Further, of the 85 Aboriginal communities engaged on the Project with Trans Mountain, 62 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project.

As of 2011, the Socio-economic RSA has a population of approximately 3.9 million people, of which approximately 31% was in Alberta and 69% was in BC (Statistics Canada 2012).

There is great diversity in the population characteristics of the communities and regions crossed by the Project. On the east and west ends of the Project are two large urban hubs: the Edmonton Metropolitan Area to the east and the Metro Vancouver Metropolitan Area to the west, with less densely populated regions in between.

The Edmonton Metropolitan Area (which includes the City of Spruce Grove, the Town of Stony Plain, Parkland County and other surrounding cities, towns, villages, and IRs) and is within the Edmonton Region, is the sixth largest Metropolitan Area in Canada. In 2011, the total population of the Edmonton Region was approximately 1.2 million, representing an 11.8% increase from 2006. In 2011, the median age of the Edmonton Region was 37, and 5.5% of the population identified as Aboriginal.

The Rural Alberta Region includes the less industrial and more agricultural areas west of Edmonton, as well as the Town of Edson and the Town of Hinton. In 2011, the total population of the Rural Alberta Region was approximately 29,300, a 3.5% increase from 2006. In 2011, the median age was 43.5 and approximately 11.5% of the Rural Alberta Region population identified as Aboriginal.

The Jasper National Park region extends through the national park boundaries and the Municipality of Jasper to the Alberta/BC border. In 2011, the total population of the Jasper National Park Region was approximately 4,085, representing a 4.8% decrease from 2006. In 2011, the median age of the Jasper National Park Region was 35, and 2.2% of the population identified as Aboriginal.

The Fraser-Fort George/Thompson-Nicola Region extends from the Alberta/BC border through Electoral Area H of the RDFFG and south for the entire length of the TNRD. In 2011, the total population of the Fraser-Fort George/Thompson-Nicola Region was approximately 129,000, a 4.6% increase from 2006. Key incorporated population centres in the region include the Village of Valemount, the District of Clearwater, the City of Kamloops, the City of Merritt and the District of Barriere, as well as many small unincorporated communities (*e.g.,* Blue River, Vavenby, Avola and Little Fort). In 2011, the median age of the Fraser-Fort George/Thompson-Nicola Region was 45, and 10.6% of the population identified as Aboriginal. There are numerous IRs and communities in this region, with three reserves being crossed by the proposed pipeline corridor.

The Fraser Valley Region extends from the eastern border of the FVRD (approximately halfway between the City of Merritt and the District of Hope) to its western border at the Metro Vancouver Region. It is a heavily agricultural region, with key incorporated municipalities being the District of Hope, the City of Chilliwack and the City of Abbotsford. In 2011, the total population of the Fraser Valley Region was approximately 274,400, an 8.1% increase from 2006. In 2011, the median age of the region was 42.6, and 6.4% of the population identified as Aboriginal. There are numerous IRs in this region, with 3 IRs being crossed by the proposed pipeline corridor.

Metro Vancouver is the third largest Metropolitan Area in Canada. It consists of numerous municipalities and one rural electoral area. The largest city within the Region is the City of Vancouver. Municipalities crossed by the Project in the Metro Vancouver Region include the Township of Langley, the City of Surrey, the City of Coquitlam and the City of Burnaby. In 2011, the total population of the Metro Vancouver Region was approximately 2.3 million, representing a 9.3% increase from 2006. In 2011, the median age of the Metro Vancouver Region was 41, and 2.4% of the population identified as Aboriginal.

In 2011, the median income on a regional basis varied from a low of approximately $23,400 in the Fraser Valley Region to a high of approximately $39,800 in the Edmonton Region.

Aboriginal people living both on and off reserve represent a unique demographic in the Socio-economic RSA. Key traditional land use practices by Aboriginal communities include hunting, fishing, trapping, gathering for food and medicinal plants and also for plants used for traditional crafts, and the ceremonial use or maintenance of spiritual sites. These traditional practices are carried out today in many areas for both cultural and subsistence purposes. A focal point of traditional culture has been survival by living off the land and harvesting the resources the land provides. Participation in these activities is a key element in Aboriginal communities sustaining their culture and in some areas continues to play a role in the provision of foods, medicines and supplies. Such practices involve a sense of harmony with the land and animals, and a sense of independence and dignity to the harvester. Harvesting, and the wild food it produces, has a very high cultural value. Aboriginal people in many communities also contribute to local industry, working as contractors and business owners in oil and gas, forestry, contracting/development, and other industries. Many Aboriginal people participate in the traditional and wage economies concurrently. Given the level of urban develop in the region, there is some level of social and economic integration between many Aboriginal communities in the Socio-economic RSA and the municipalities in or near which they are located. The relatively low levels of the use of Aboriginal language by those of Aboriginal identity reflect this integration. Use and knowledge of Aboriginal languages tends to be higher on-reserve.

The social and cultural effects of the Project will be influenced by the size of the Project-related workforce in relation to the population and labour force of the various host communities that serve as construction hubs. Employment and labour-force related effects are discussed in Section 7.2.7 Employment and Economy.

7.2.3.4 Potential Effects and Mitigation and Enhancement Measures

Identified Potential Effects

Potential effects associated with the construction and operations of the Project on social and cultural well-being indicators are listed in Table 7.2.3-2. These interactions are based on the results of the literature review, desktop analysis, field surveys, interviews and TEK, engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders, the general public (Section 3.0) and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.2.3-2 was principally developed in accordance with Trans Mountain standards and industry best practices.

TABLE 7.2.3-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON SOCIAL AND CULTURAL WELL-BEING

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
1. Social and Cultural Well-Being Indicator – Population and Demographics				
1.1 Change in population and demographics during construction	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Measures to maximize regional employment and procurement will limit the effects of the Project in terms of the need for in-migrating workers and change population and demographics. These measures include: • Develop and implement a program to enhance awareness of pipeline and facilities construction and operations jobs and career opportunities in cooperation with business, industry, community and education and training organizations [Section 8.4.2]. • Create an online employment communications tool where potential workers who are interested in employment can register to receive regular updates [Section 8.4.2].	• Change in population and demographics.

TABLE 7.2.3-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
1.1 Change in population and demographics during construction (cont'd)	See above	See above	• Continue to communicate with Aboriginal communities to discuss issues and interests related to employment opportunities [Section 8.4.2]. • Include regional employment clauses in all Project contracts [Section 8.4.2]. • Give first consideration for employment opportunities to qualified regional and Aboriginal residents with appropriate skills and qualifications, where possible [Section 8.4.2]. • Develop and provide typical job descriptions, including skills and qualifications required to support employment opportunities[Section 8.4.2]. • Ensure contractors communicate upcoming employment opportunities directly to Project area employment offices, women's organizations and Aboriginal communities and organizations [Section 8.4.2]. • Require that General Contractors report to Trans Mountain their steps taken to attempt to hire within the Project area and nationally and report the number of hires from Project area Aboriginal residents and other regional residents [Section 8.4.2]. • Develop a mentorship program for Aboriginal workers to encourage work site integration and retention [Section 8.4.2]. • Initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project [Section 8.4.2]. • Provide information about procurement opportunities to potential Aboriginal, regional, provincial and Canadian suppliers using various communication means [Section 8.4.1]. • Maintain an online procurement registry where interested parties can register their capabilities and express interest in providing goods or services to the Project [Section 8.4.1]. • Develop and implement a process to share information at the regional level in a timely manner about general Project procurement needs and required qualifications, so businesses can prepare [Section 8.4.1]. • Work with contractors to give first consideration to qualified regional suppliers of goods and services, where practical and in conformance with procurement policies [Section 8.4.1].	• See above

TABLE 7.2.3-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
1.2 Change in population during operations	All regions, except Jasper National Park Region / New pipeline segments Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Develop and implement a program to enhance awareness of pipeline and facilities construction and operations jobs and career opportunities in cooperation with business, industry, community and education and training organizations [Section 8.4.2]. • Continue to communicate with Aboriginal communities to discuss issues and interests related to employment opportunities [Section 8.4.2]. • Include regional employment clauses in all Project contracts [Section 8.4.2]. • Give first consideration for employment opportunities to qualified regional and Aboriginal residents with appropriate skills and qualifications, where possible [Section 8.4.2]. • Provide information about procurement opportunities to potential Aboriginal, regional, provincial and Canadian suppliers using various communication means [Section 8.4.1]. • Work with contractors to give first consideration to qualified regional suppliers of goods and services, where practical and in conformance with procurement policies [Section 8.4.1]. • Establish and implement a process for the use of qualified regional Aboriginal contractors for operations phase maintenance contracts [Section 8.4.2].	• See above
2. Social and Cultural Well-Being Indicator – Income Levels and Distribution				
2.1 Changes in income patterns	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• See measures in sections 1.1 and 1.2 of this table. • The Worker Accommodation Strategy [Section 8.4.4] will consider the use of construction camps in certain locations to off-set pressure on housing markets; the use of construction camps would reduce any contribution to housing price inflation that could have implications for community residents with lower or fixed incomes. • Trans Mountain will support existing initiatives aimed at increasing female participation in the construction workforce, driven by government, labour organizations and education institutions. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [Section 8.4.11]. • Continue communication and engagement with stakeholders as the Project progresses [Section 8.4.11].	• Income opportunities associated with Project-related employment (refer to Section 7.2.7 Employment and Economy). • Changes in income patterns. • Business disturbance and disruption to resource-based livelihoods (refer to Section 7.2.7 Employment and Economy). • Reduced availability of labour for other industries due to workers taking Project-related opportunities during construction (refer to Section 7.2.7 Employment and Economy).

TABLE 7.2.3-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
3. Social and Cultural Well-Being Indicator – Community Way-of-Life				
3.1 Change to community life due presence of construction activity and temporary workers	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Develop a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions [Section 8.4.11]. • Establish a process by which community members can raise complaints or concerns related to Project activities or workers [Section 8.4.11]. • Adhere to a policy of no tolerance of use or being under the influence of illicit drugs or alcohol during work hours [Section 8.4.11]. • The Worker Accommodation Strategy will consider the use of construction camps in certain locations. Camps will include recreational amenities for workers (*e.g.,* leisure/fitness areas) [Section 8.4.4]. • Endeavour to align construction schedules around statutory holidays and key community events, to the extent practical [Section 8.4.11]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [Section 8.4.6]. • Ensure any changes in planned timing or location of construction activities are communicated [Section 8.4.6]. • Continue communication and engagement with stakeholders as the Project progresses [Section 8.4.11]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [Section 8.4.11].	• Increased demand of temporary population on various regional infrastructure, services and amenities (refer to Section 7.2.5 Infrastructure and Services). • Effects on community way-of-life.
3.2 Physical disturbance to community assets (*e.g.,* schools, public facilities, parks)	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	• Minimize disturbance of valued natural and built features during final route refinement to the extent practical [Section 8.4.6]. • Narrow the construction right-of-way at key locations to avoid valued built or natural features, to the extent practical [Section 8.4.6]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [Section 8.4.6]. • Ensure any changes in planned timing or location of construction activities are communicated [Section 8.4.6]. • Install signs in parks and protected areas and known recreational use areas in the vicinity notifying users of construction activities and timing [Section 8.4.6]. • Maintain access to established recreation features, through the clearing, construction and reclamation period, where practical [Section 8.4.6].	• Physical disturbance to community use areas during construction (refer to Section 7.2.4 HORU). • Effects on community way-of-life (refer to potential effect 3.1 of this table).
4. Social and Cultural Well-Being Indicator – Aboriginal Culture				
4.1 Effects on Aboriginal harvesting practices and cultural sites	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• Coordinate pipeline construction activity to ensure access to traditional subsistence hunting and fishing areas [Section 8.4.6]. • See recommended mitigation measures in Table 7.2.2-4 Traditional Land and Resource Use.	• Potential effects on subsistence activities and sites, and cultural sites, are discussed in Section 7.2.2. • Effects on Aboriginal culture.

TABLE 7.2.3-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
4.2 Effects on Aboriginal culture due to employment opportunities and other Project activites	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Maximize the hiring of on-reserve and off-reserve Aboriginal community members [Section 8.4.2]. • Continue to communicate with Aboriginal communities to discuss issues and interests related to employment opportunities [Section 8.4.2]. • Provide Aboriginal/Community Liaison workers to liaise with appropriate resources and with contractors [Section 8.4.2]. • Initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project [Section 8.4.2]. • Develop a mentorship program for Aboriginal workers to encourage work site integration and retention Section 8.4.2]. • Evaluate contractors' recruitment and selection processes to ensure opportunities will be available to Aboriginal workers [Section 8.4.2]. • Ensure contractors communicate upcoming employment opportunities directly to Project area employment offices, women's organizations and Aboriginal communities and organizations [Section 8.4.2]. • See recommended mitigation measures outlined in potential effect 1.1 of this table. • Ongoing TLU studies supported by the Project may also contribute to and support broader Aboriginal community cultural objectives. • Any mutial benefit agreements established between Trans Mountain and Aboriginal communities may also contribute to and support broader Aboriginal community cultural objectives.	• See above

Notes: 1 RSA = Socio-economic RSA.
2 Detailed mitigation measures are outlined in the SEMP (Volume 6B).

7.2.3.5 Potential Residual Effects

The potential residual socio-economic effects on social and cultural well-being indicators associated with the construction and operations of the Project (Table 7.2.3-2) are:

- change in population and demographics ;
- changes in income patterns;
- effects on community way-of-life; and
- effects on Aboriginal culture.

7.2.3.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method is considered to be the appropriate method for determining the significance of the anticipated residual socio-economic effects. Consequently, a qualitative assessment of social and cultural well-being was determined to be the most appropriate. The evaluation of significance of each of the potential residual effects relies on the professional judgment of the assessment team.

Table 7.2.3-3 provides a summary of the significance evaluation of the potential residual socio-economic effects of the construction and operations of the proposed pipeline on social and cultural well-being indicators. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below. An evaluation of significance is not required where no residual effect is identified (*i.e.,* change in population during operations).

TABLE 7.2.3-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON SOCIAL AND CULTURAL WELL-BEING

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Social and Cultural Well-Being Indicator – Population and Demographics									
1(a) Change in population and demographics.	Neutral to positive	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
2. Social and Cultural Well-Being Indicator – Income Levels and Distribution									
2(a) Income opportunities associated with Project -related employment.	Refer to Section 7.2.7 Employment and Economy, Table 7.2.7-3 points 2(a) and 2(c) (opportunities for regional Project-related employment during construction and operations, and associated increases in labour income)								
2(b) Changes in income patterns.	Neutral	RSA	Short-term	Isolated	Short-term	Medium	Low or high	Moderate	Not significant
2(c) Combined effects on the income levels and distribution indicator (2[a] and 2[b]).	Positive	RSA	Long-term	Continuous	Long-term	Medium	High	High	Not significant
3. Social and Cultural Well-Being Indicator – Community Way-of-Life									
3(a) Effects on community way-of-life.	Negative to positive	RSA	Short-term	Isolated	Short-term	Medium	Low or high	Moderate	Not significant
4. Social and Cultural Well-Being Indicator – Aboriginal Culture									
4(a) Effects on Aboriginal Culture	Neutral	RSA	Short-term	Isolated to periodic	Short to long-term	Low to medium	High	Moderate	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Social and Cultural Well-Being Indicator- Population and Demographics

The following provides an evaluation of significance of the potential residual effects on the population and demographics indicator.

Change in Population and Demographics

In any project context, temporary or permanent population growth may occur when the existing regional labour force cannot fully meet a project's needs. Population growth may be in response to direct labour needs of a project and also by indirect or induced employment.

Population growth is generally desirable for many communities in the context of economic growth, assuming it can be managed and the service needs of a growing community can be anticipated and planned for. Temporary population influx related to major projects, however, can result in a number of issues for host communities, due to community-worker interactions and increased pressure on services and infrastructure. These issues may be exacerbated when there are multiple projects occurring at the same time in regions with a relatively small population base or an overstretched labour force. For these

reasons, understanding labour force constraints and resulting population implications is key to understanding a range of socio-economic issues addressed in this ESA.

Project workforce demands are discussed in detail in Section 7.2.7 Employment and Economy. Trans Mountain anticipates that the direct construction workforce will result in approximately 1,324,035 worker days over the 2016-2017 construction period, approximately or 60,183 full-time equivalent worker months. At peak (July 2017), the Project will require about approximately 4,475 workers across Alberta and BC combined, related to construction of the pipeline, pump stations, tanks, Westridge Marine Terminal (see Figure 5.0-1).

Direct worker numbers will vary by region and community within the Socio-economic RSA. Based on early construction planning, Trans Mountain has estimated the number of direct workers that may be required in certain communities or "construction hubs" along the proposed pipeline corridor and the number of direct workers that will be based in these areas during the construction period (see Table 7.2.7-7). The estimated average number of direct workers required monthly during construction varies from a low of about 120 in the Community of Blue River to a high of about 655 in Metro Vancouver. The peak number of anticipated monthly direct workers varies from a low of approximately 202 in the City of Chilliwack to a high of approximately 1,200 in Metro Vancouver.

As discussed in Section 7.2.7, the regional labour force is anticipated to be constrained in terms of labour supply and unable to fully meet the Project's demands. Other factors affecting this include the specialized suite of skills and contracts required in pipeline and facilities construction, and that the pipeline and facilities crews will be arranged by General Contractors with established business relationships and practices. Another key factor is the numerous other capital projects anticipated in some areas of the Socio-economic RSA during the construction period which will be competing for labour.

As of 2011, average unemployment rates for the socio-economic regions ranged from a low of 1.9% in Jasper National Park to 5.6% and 5.9% in the Edmonton Region and the Rural Alberta Region, respectively. Unemployment rates are higher in BC, ranging from 7.2% in the Metro Vancouver Region to 9.3% in the Fraser-Fort George/Thompson-Nicola Region. While more recent data specific to Socio-economic RSA communities is not available, recent labour force information for the provincial Economic and Development regions in which the socio-economic regions are located indicate further employment growth and tightening of the labour market since 2011. In June 2013, the unemployment rates in relevant Alberta Economic regions was between 4.0% and 4.6%; unemployment rates in the relevant BC Economic regions were between 5.0% and 6.6% (Section 7.2.7, Table 7.2.7-10). The Alberta government indicates that a balanced labour market typically has a 5% unemployment rate, and higher rates of unemployment suggest a surplus labour market. Labour shortages are assumed to occur when the unemployment rate drops to 3% or less. This supports the understanding that some local labour will be available to participate in the Project, although there may not be an extensive regional supply of available labour in certain areas. Additional labour can be induced into the market through training and other initiatives, which may allow for additional labour to be available.

Within the available regional labour pool, one of the challenges will be to find workers with training and skills relevant to construction. In 2011, about 9.3% of the workforce in Alberta as a whole and 7.7% of the workforce in BC as a whole was employed in the construction industry (Statistics Canada 2013a). However, there are regional differences within Socio-economic RSA (see Table 7.2.7-8). The percentage of the labour force employed in the construction industry ranges from 4.6% in the Jasper National Park Region, to 8.5% in the Rural Alberta Region and 7.7% in the Fraser-Fort George/Thompson-Nicola Region, to 11.4% in the Fraser Valley Region (see Table 7.2.7-8).

Based on a labour supply-demand analysis, Trans Mountain estimates that 5-30% of direct construction workers (depending on the socio-economic region) will be regional residents, with the remainder of the construction workforce being filled by in-coming temporary workers (Section 7.2.7, Table 7.2.7-8). These are preliminary and conservative estimates only; Project policies will promote maximizing local labour content from construction hubs and levels of local participation will be influenced by other labour demands in the socio-economic regions at the time of construction.

As such, an influx of temporary workers throughout the Socio-economic RSA is anticipated during the construction period, though at different times in different communities and regions. The need for people to come from outside the region to meet the Project's direct and indirect labour demand is a function of:

- the large labour demand of the Project;
- the small labour force in certain parts of the Socio-economic RSA;
- declining unemployment rates in both Alberta and BC; and
- projections for strong continued economic growth and employment in both Alberta and BC.

Based on the capacity of the regional labour force (Section 7.2.7, Table 7.2.7-8) and on on *average* construction workforce requirements over the 2016-2017 construction period, it is anticipated that the influx of temporary workers will range from a low of approximately 265 construction workers in the Edmonton Region to a high of approximately 1,220 construction workers in the Fraser-Fort George/Thompson-Nicola Region. Based on *peak* construction workforce requirements, it is anticipated that the influx of temporary workers could range from a low of approximately 515 workers in the Edmonton Region to a high of approximately 2,900 workers in the Fraser-Fort George/Thompson-Nicola Region.

Table 7.2.3-4 provides a summary table of anticipated non-regional construction workforce by socio-economic region.

The Worker Expenditures Along the Pipeline Corridor Technical Report of Volume 5D provides further detail on anticipated regional versus non-regional workers by construction hub.

TABLE 7.2.3-4

SOCIO-ECONOMIC RSA ESTIMATED REGIONAL AND NON-REGIONAL CONSTRUCTION WORKFORCE

Socio-economic Region	Anticipated Construction Hubs	Regional Population and Labour Force (2011)		Estimated Project Construction Workforce			Estimated Regional Construction Workforce (Current Residents)			Estimated Non-Regional Construction Workforce (In-Migrating Temporary Workers)		
		Population (No.)[1]	Size of Labour Force[1]	Low	Peak	Average	Regional Workers (%)	Regional Workers – Peak (No.)	Regional Workers – Avg. (No.)	Non-Regional Workers (%)	Non-Regional Workers – Peak (No.)	Non-Regional Workers – Avg. (No.)
Edmonton Region	Edmonton (including Stony Plain)	1,188,968	696,610	136	734	377	30%	220	113	70%	514	264
Rural Alberta Region	Hinton, Edson	29,335	16,985	57	1,232	484	10%	123	48	90%	1,109	436
Jasper National Park Region[2]	Hinton	4,085	2,490	--	--	--	--	--	--	--	--	--
Fraser-Fort George/Thompson-Nicola Region	Valemount, Blue River, Vavenby/ Clearwater, Kamloops, Merritt	128,978	63,175	82	3,195	1,357	10%[3]	320	136	90%*	2,876	1,221
Fraser Valley Region	Hope, Chilliwack, Abbotsford	274,404	138,485	163	863	549	10%	86	55	90%	777	494
Metro Vancouver Region	Metro Vancouver	2,313,328	1,271,430	14	1,204	655	30%	361	197	70%	843	459

Sources: KMC 2013a, Statistics Canada 2012, 2013a

Notes: 1 Population data are from the 2011 Census of Canada. Labour force data are from the 2011 NHS. Underlying population counts in the NHS may differ from those provided by the Census of Canada due to differing survey methods; however, labour force metrics based on the NHS are the best available at the community/municipality level.

2 Labour for work in areas within Jasper National Park Region (*i.e.*, Jasper Pump Station and Hinton to Hargreaves reactivation segment) are anticipated to be based in Hinton construction hub, due to small size of Jasper National Park Region labour force. Available labour from Jasper National Park Region is considered in Rural Alberta Region estimates.

3 10% regional workers is the approximate estimate for Fraser-Fort George/Thompson-Nicola Region. There is variation anticipated between hub communities, upon which regional calculations are based. In the Village of Valemount, the regional estimate is 5%, in the community of Blue River the regional estimate is 10% to a maximum of 5 workers, in the community of Vavenby and the District of Clearwater the regional estimate is 10% to a maximum of 50 workers, in the Cities of Kamloops and Merritt, the regional estimate is 10%. See Worker Expenditures Along the Pipeline Corridor Technical Report of Volume 5D. See also Table 7.2.7-8 in Employment and Economy.

The contractors and companies that supply goods and services needed for Project construction will also have employment needs that could drive further in-migration of population. However, there is no direct method for assessing the current capability of regional businesses to provide the goods and services required directly for Project construction or to supply Trans Mountain or its contractors with goods and services. Although Trans Mountain and all associated contractors and companies will use local businesses where feasible, the extent to which goods and services will be bought from local businesses ultimately depends on the qualifications of each business and the ability of each business to provide the required goods and services in the specified time frame, at prices competitive with businesses outside the region and according to industry requirements. While further employment and, consequently, in-migration is anticipated as an indirect response to Project demand, it would be considered in the context of cumulative demand of all other projects anticipated in the Socio-economic RSA during the construction time frame. In-migration will be more closely associated with the Project where few other major projects are anticipated and the Project-related workforce is substantial (*e.g.,* Valemount, Blue River, Vavenby).

The population influx that is the focus of the assessment is anticipated to be driven only by temporary workers during the construction phase. As certain direct industries will service the needs of general growth in the region, there is some possibility that workers associated with indirect and induced employment needs could relocate to the region with their families, thereby further contributing to population increases. Given the relatively short period of construction, it is not anticipated that any incoming workers directly related to the Project would choose to relocate to the region with their families.

The influx of direct Project-related workers will likely be focused in communities identified as construction hubs. However, workers could also choose to reside elsewhere in the Socio-economic RSA and commute to construction hub communities. This situation may be more prevalent for indirect and induced workers who are not directly related to Project activities but are rather supplying inputs and services to contractors directly involved in the Project. Larger population bases such as the City of Edmonton and Metro Vancouver will likely experience a smaller population influx, because of their larger labour pools and higher anticipated proportion of local workers. Less densely populated areas in the Socio-economic RSA that are construction hubs are anticipated to experience larger relative population influxes. In some communities, the benefits of the worker influx may be local residents currently working in other areas who choose to return to their home community to participate in Project-related opportunities. This may be more pertinent in BC portions of the Project, as BC as whole is experiencing net interprovincial out-migration of people, many of which are going to Alberta. Recent reports on interprovincial migration indicate that in 2012 BC had a net out-migration of over 8,600 people, of which 56% went to Alberta (Alberta had a total interprovincial in-migration in 2012 of approximately 46,000 people) (TD Economics 2013). This trend is reflective of the relative strength of Alberta's labour market compared to BC, as well as higher incomes in Alberta compared to BC (TD Economics 2013). For example, during consultation in the City of Kamloops it was noted that many male residents work in Alberta (Kwiatkowski pers. comm.). Similar comments were heard in several Project-related open houses. The Project may contribute to opportunities that allow such workers to return home.

Increases in construction-phase workers in smaller construction hubs (*e.g.*, the Town of Edson, the Village of Valemount, the District of Clearwater and the Community of Blue River) would notably increase the population of the communities and could shift the demographic configuration of the community during the small window of the construction period. The demography of construction workforces tends to be predominantly young/middle-aged and male. Women tend to be under-represented in the construction industry. For example, women make up only 14.2% of those employed in the Alberta construction sector (Alberta Enterprise and Advanced Education 2013a). In BC in 2011, 12.1% of those employed in the construction industry were female (Statistics Canada 2013a). The Construction Sector Council (CSC) reports that despite successful initiatives to increase the numbers of women in the construction industry, the rate of female participation, particularly in the trades and onsite construction management, has not grown substantially over time (Canadian Construction Council 2010).

Although it is not yet known if temporary foreign workers will be required for the Project, temporary foreign workers may be used if they are required to meet direct, indirect or induced labour needs during the construction period. If temporary foreign workers are used for the Project, demographics may be further affected. It should be noted that the number of temporary foreign workers has increased in certain parts of the Socio-economic RSA in recent years. For example, in the Town of Edson, an accelerated influx of temporary foreign workers has resulted in accommodation crowding issues (Lemieux, pers. comm.).

Shifts in community demography are, however, influenced by many factors beyond the Project, including general economic trends and the workforce needs of other industries. However, given the relatively short time frame of Project construction (approximately 2 years) and its large workforce requirements, changes to regional demography are anticipated to occur at a greater rate than if the Project were not to occur. This accelerated and short-term change, specifically in smaller communities, might not allow for natural adaption and integration of workers into the community. As a result, a number of indirect issues could arise as a result of likely young/middle-aged male demographic of the temporary construction workforce. These issues are discussed further below (see residual effect related to change in community way-of-life and related discussion in Section 7.2.8 Community Health). Given the dynamic nature of community demographics, some of the direct and indirect issues that may arise due to short-term changes in community demography during construction will be uncertain and not directly manageable solely by the Project. Such issues can be identified and monitored through ongoing issues tracking, consultation, and adaptive management as required through the construction phase. Overall, the temporary increases in population, as well as isolated demographic shifts in smaller communities, are anticipated to be short-term, occurring only during the construction phase of the Project.

The additional operations workforce required for the Project is anticipated to be approximately 90 full-time personnel across the Socio-economic RSA, of which 40 are anticipated to be in Alberta and 50 in BC. Some of these permanent operating positions are likely to be filled by current regional residents, which will have no effect on the population. However, the operations labour requirements are generally small such that any in-coming workers to meet this need would be imperceptible in the context of the Socio-economic RSA population.

Depending on the community experiencing the influx of workers during construction, the potential population effect could be negative, neutral or positive. In communities with larger populations such as the City of Edmonton and municipalities of Metro Vancouver, the potential residual effect would be neutral. It is unlikely that a temporary increase in regional population of on average approximately 265 workers in the Edmonton Region and approximately 460 workers in the Metro Vancouver Region during construction would be perceptible in these areas. Consultation with the City of Burnaby, the City of Surrey, the City of Kamloops and Strathcona County all indicated that a temporary workforce of up to several hundred would be imperceptibly absorbed into the urban population given the diverse range of industrial and commercial activity and the diverse demographics in such centres (Baron, Fretz, Mills, Te pers. comm.). In communities with smaller populations such as the Town of Hinton, the Town of Edson, the Village of Valemount, the Community of Vavenby, the District of Clearwater and the Community of Blue River, the potential residual effect could be negative or positive. Municipal governments typically support economic development leading to population growth that is consistent with long-term plans and existing infrastructure. However, large short-term or unexpected population increases can place demands on community infrastructure and services and can be disruptive to local residents, particularly where the number of workers is large relative to the population of host or nearby communities. Population increase in itself was not identified as a concern during consultation, but concerns were raised about the certain effects associated with temporary population growth due to construction phase workers (*e.g.*, housing capacity, social disruption, increases in certain crimes).

Measures to enhance regional employment, as well as the development of a Worker Accommodation Strategy that considers the desires and capacities of potential hub communities to accommodate workers (including camps anticipated in the Edson, Blue River and the Clearwater/Vavenby area) are expected to mitigate against immediate negative residual effects of population growth due to temporary workers on overall community capacity. Some smaller communities have goals and plans to increase their populations, whereby the potential residual effect would be positive. For example, the Village of Valemount has noted an interest in increasing the population of the village, particularly to increase the population in its schools. Overall, population growth is considered to have a neutral to positive effect on communities, in the context of supporting economic opportunities and community development objectives (Table 7.2.3-3, point 1[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – temporary population increases may occur across the Socio-economic RSA and likely to be focused in communities identified as construction hubs.

- Duration: short-term – the event causing a potential change in population and demographics is construction activity.

- Frequency: isolated – the construction activities leading to worker influx would occur during specified months in given communities/areas during the overall construction phase.

- Reversibility: short-term – the change in population would be limited to the construction phase.

- Magnitude: medium – in smaller communities a change in population would be notable and could require a local government management response in terms of demands on services and amenities, resulting in a moderate modification in the socio-economic environment.

- Probability: high – given the limited labour availability in the Socio-economic RSA and the strong anticipated growth that will continue to increase labour demands, it is likely that temporary workers will be brought into the region.

- Confidence: high – based on labour force information, economic trends, feedback from stakeholders and the professional experience of the assessment team.

Social and Cultural Well-Being Indicator - Income Levels and Distribution

The following provides an evaluation of significance of the potential residual effects on the income levels and distribution indicator. Income opportunities associated with Project-related employment is are assessed in Section 7.2.7 Employment and Economy.

Changes in Income Patterns

Economic opportunities related to the Project in terms of employment and income may be experienced differently by different cohorts of the regional population (*e.g.,* based on age, gender and cultural background).

As discussed in Section 7.2.7, a wide range of employment opportunities are anticipated in relation to the Project, particularly during construction. There may, however, be challenges associated with certain Socio-economic RSA residents accessing them. For example, certain Aboriginal communities may face constraints related to seasonal harvesting commitments, levels of education or lack of services that support someone accepting a job away from his/her family and community (*e.g.,* transportation, day care, counselling). Women may also face challenges in accessing employment opportunities. This is discussed further in Section 7.2.7 Employment and Economy.

Trans Mountain is committed to and has made efforts to enhance regional participation through its regional procurement enhancement measures and Aboriginal training measures (see Section 7.2.7); however, there are limitations to the regional population experiencing direct Project related income because of employment constraints. As discussed in Section 7.2.7, the proportion of the direct workforce that is anticipated to be current regional residents ranges from 5-30%, depending on the location and size of the construction hub. The larger cohort of income beneficiaries is anticipated to be the temporary workforce who, as discussed previously, may be primarily young/middle-aged and male. Another concern is that current residents that are not directly involved in Project opportunities may have lower incomes than the temporary workforce, while at the same time may be facing short-term inflationary pressures on certain goods and services (*e.g.*, rental housing). The City of Kamloops raised a concern about temporary workers using rental housing in the context of low vacancy in rental units. If low income housing is taken up by temporary workers it may effectively push local residents out and may encourage development of illegal suites (Fretz pers. comm.).

There is evidence to suggest that the levels of income experienced by those involved in direct Project-related employment during construction may be notably higher than existing average incomes in the Socio-economic RSA. The median income of the various socio-economic regions varies between a low of approximately $23,400 in the Fraser Valley Region to a high of approximately $39,800 in the Edmonton Region In comparison, the wages paid related to construction positions tend to be higher. In Alberta in 2011, the average hourly wage in the construction industry was $30/hour, higher than the all-industry average of $25/hour. Construction industry wages were notably higher than average wages in the agricultural industry ($17/hour), the retail trade industry ($17/hour), the accommodation and food services industry ($12/hour), and the information, culture and recreation industry ($18/hour) (Alberta

Enterprise and Advanced Education 2013b). Typical wages for key pipeline positions (based on available information from collective agreements provided by Trans Mountain) may range from about $28 per hour (about $57,000 per year) for a welders helper or skilled labourer to approximately $47 per hour (or about $94,000 per year) for a construction foreman. These wage rates are not reflective of overtime rates, which would be higher thus increasing Project-related income at times.

Trans Mountain is committed to carrying out enhancement measures that will maximize the levels of local participation in Project opportunities through procurement strategies, an on-line jobs registry, and support for Aboriginal training. Trans Mountain will also support existing initiatives aimed at increasing female participation in the construction workforce, driven by government, labour organizations and education institutions. However, it is possible that in certain construction hubs some change in community income patterns could emerge during the construction phase, particularly based on age and gender. This residual effect could occur in any populated area within the Socio-economic RSA, though it is likely to be more perceptible in construction hubs with smaller populations (*e.g.,* the Town of Hinton, the Town of Edson, the Village of Valemount, the Community of Blue River, the Community of Vavenby/the District of Clearwater). Trans Mountain is considering the use of construction camps in certain location to off-set pressure on housing markets; the use of construction camps would reduce any contribution to housing price inflation that could have implications for community residents with lower or fixed incomes or those not participating in the Project.

The residual effect of changes in community income patterns that could occur as a result of the temporary workforce could be considered both positive and negative. Improved income levels at a community level will likely be perceived positively by those who are directly employed by the Project and local business owners and operators benefitting from the spending of local workers. Higher incomes are generally associated with improved well-being. Income differentials may be perceived negatively by residents of smaller communities who are not involved in the Project, and it may contribute to community issues requiring a local government response (*e.g.,* if rental housing prices escalate which may affect those on fixed incomes). A change in income patterns, however, is not anticipated to be perceptible in larger urban centres such as those in the Edmonton Region, Metro Vancouver Region, the City of Kamloops and the City of Abbotsford.

Overall, the residual effect of changing income patterns, and any emerging income differentials, is anticipated to be neutral. Employment income will continue through operations, but the number of incremental permanent positions are relatively small, meaning that any associated income differential would likely be seen as part of the normal variability within the community. The effect is considered to be of medium magnitude, because any resulting income differentials could be highly detectable in smaller communities but imperceptible in larger communities. The likelihood of this residual effect could be low or high, depending on the size of particular Socio-economic RSA communities. In smaller communities, where the temporary workforce will be relatively large in comparison to the existing population, any income differentials will be more noticeable and, therefore, likely. In larger communities, the likelihood of perceptible income differentials will be low. It is generally expected that the Project workforce will be made up predominately of young/middle-aged men, however, the precise demographics of the temporary workers and any incoming indirect/induced workers will depend on labour force circumstances at the time of construction. Therefore, the level of confidence is moderate (Table 7.2.3-3, point 2[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the potential residual effect will be felt in construction hub communities or other regional communities where workers choose to reside.

- Duration: short-term – the event causing a potential change in income patterns is construction activity and related employment.

- Frequency: isolated – the construction activities leading to improved income levels and the potential for income differential would occur during specified months in given communities/areas during the construction phase.

- Reversibility: short-term – the residual effect will be limited to the construction phase.

- Magnitude: medium – any changes in income patterns may be highly detectable in smaller communities, but would be considered negligible in larger communities.

- Probability: low or high – perceptible changes in income patterns are likely in smaller communities, but unlikely in larger communities.

- Confidence: moderate – based on labour force information, income data, and the professional experience of the assessment team; but understanding that the precise demographics of the temporary workforce and the uptake on regional economic opportunities related to the Project cannot be accurately predicted.

Combined Effects on Income Levels and Distribution

The combined effects on income levels and distribution consider income opportunities associated with Project-related employment (discussed in Section 7.2.7 Employment and Economy) as well as the potential for changes in income patterns in certain communities discussed above.

Income effects are tied to the workforce demands and employment estimates of the Project. During the construction phase, increased income opportunities associated with direct Project-related construction employment will be substantial due to the large construction workforce required. The anticipated higher-than-average disposable income of temporary construction workers residing in construction hubs, compared to documented median incomes, may result in changes in income patterns and distribution in some communities during the construction phase. Inflationary pressures on wages and some goods and services (*i.e.,* rental housing) in smaller hub communities may occur during construction, which could have negative implications for those on fixed or with lower incomes. However, personal differentials in income are typically considered in the normal range of variability, and income differentials will likely be imperceptible in larger centres such as the City of Edmonton, Metro Vancouver, the City of Kamloops and the City of Abbotsford. In order to address the potential for income disparity in smaller communities, mitigation measures, including establishing construction camps, will reduce upward pressure on housing and other services that could affect people on lower or fixed incomes. Issues associated with Project-associated income disparity are not anticipated in the operations phase, because the size of the additional direct operations workforce is relatively small.

The overall Project effect on income levels and distribution is anticipated to be positive, as increased income opportunities are generally considered desirable from a community and individual well-being perspective. The overall spatial boundary of income effects will be the Socio-economic RSA, since employment/contracting opportunities will extend regionally. Although it is acknowledged that income effects related to capital expenditures will extend throughout Alberta, BC and nationally, for the purposes of assessment the focus is on regional effects. The overall duration of income effects is long-term, since employment/contracting opportunities will extend throughout operations. The frequency will be continuous, since Project-related income will be generated for the duration of Project operations, and as such, the effect would be reversible in the long-term. The magnitude of the overall effect is considered medium; income opportunities and their effects could be highly detectable in smaller communities (even during the operations phase) and represent a substantial change in the socio-economic environment, but they are anticipated to be imperceptible in large urban centres. The probability of overall increases in income related to the Project is high, given workforce estimates, information about construction wages and regional incomes and the outcomes of economic modelling (Table 7.2.3-2 point 2[c]). A summary of the rationale for all of the significance criteria of combined effects on income levels and distribution is provided below.

- Spatial Boundary: Socio-economic RSA – employment/contracting opportunities will extend regionally.

- Duration: long-term – employment/contracting opportunities will extend throughout operations.

- Frequency: continuous – Project-related income will be generated from operations activities throughout the assessment period.

- Reversibility: long-term – income opportunities will extend throughout operations.

- Magnitude: medium – income opportunities and their effects may be highly detectable in smaller communities, but are anticipated to be imperceptible in large communities.

- Probability: high – income opportunities are likely, based on the workforce needs of the Project.

- Confidence: high – based on Project information, income and construction sector wage information, and the professional experience of the assessment team.

Social and Cultural Well-Being Indicator - Community Way-of-Life

The following provides the evaluation of significance of potential residual effects on the community way-of-life indicator.

Effects on Community Way-of-Life

The opportunities for Project-related income are anticipated to have positive effects for communities, as are the local economic benefits for businesses and notable increases in municipal taxes that will result from the Project (which are discussed related to the municipal economies indicator in Section 7.2.7 Employment and Economy). While these factors will affect well-being in a positive manner, effects on community way-of-life could occur during the construction phase related to both the influx of temporary workers or direct Project interactions with key community events or assets.

Community assets refer to areas utilized by individuals within the community for personal, social, formal or informal gatherings. These areas include schools, playgrounds, outdoor recreation sites and other public facilities or use areas. A physical disturbance to these assets will result in community members being unable to use them for specific periods of time which could disrupt community life to some degree. Physical disturbance to community use areas is assessed in Section 7.2.4 HORU. For example, in the Community of Little Fort, BC the proposed pipeline corridor crosses the Little Fort Cemetery (approximately RK 756.5) and in the City of Chilliwack, the proposed pipeline corridor crosses the property of the Watson Elementary School (approximately RK 1098.2). Known school properties crossed by or in proximity to the proposed pipeline corridor are listed in Section 5.5.5.

Construction of the Project could also have implications for certain key community events that coincide with construction. It was noted during consultation that the Edson Kin Slo-Pitch Tournament in the Town of Edson occurs in August and could be disrupted by an influx of workers during construction (Lemieux pers. comm.). However, the construction activities that will be based out of the Town of Edson are anticipated to be outside of the summer season thus avoiding disruption to this community event. Similarly, the City of Abbotsford hosts the Abbotsford Airshow annually on the August long weekend. The annual event attracts large crowds; during this time, many hotels in Abbotsford, Chilliwack, Langley and Surrey are fully booked (Teichroeb pers. comm.). The Project will endeavour work its construction schedule around such community events to the greatest extent possible. In the situation of the Abbotsford Airshow, it is anticipated that a construction shut-down will be planned to coincide with the timing of the event.

Trans Mountain will be implementing a range of measures to reduce disturbance to community assets and events. Key mitigation measures include: avoiding important community features and assets during right-of-way finalization; narrowing the right-of-way in select areas; scheduling construction to avoid important community events where possible; communication of construction schedules and plans with community officials; and other ongoing consultation and engagement with local and Aboriginal governments. Even with mitigation measures, there are likely still to be some residual effects in terms of disruption to community use areas, even as it relates to the general presence of construction activities, vehicles and sensory disturbance. Potential effects on transportation infrastructure are assessed in Section 7.2.5 Infrastructure and Services. Potential effects on aesthetic attributes and residential land use are assessed in Section 7.2.3 HORU.

An influx of temporary workers during construction can also have direct and indirect effects on community way-of-life. While the presence of temporary workers most notably can result in substantial economic benefits for communities due to spending of income, some undesirable social outcomes may also occur. Project-related income can be spent in ways that are beneficial and can lead to improved lifestyles or

increased opportunities for individuals and their families. Income that is spent on drugs, alcohol or gambling, however, could be considered detrimental, as it could contribute to social problems in communities or more increased traffic violations/accidents. Further, temporary workers will not have family or their regular community supports in place during their period on construction crews, and as previously discussed, tend to be young/middle-aged and male with higher than average disposable incomes. These factors can result in temporary workers being more readily drawn into socially-disruptive behaviours. See Section 7.2.8 Community Health for further discussion of these potential community well-being effects. Negative worker/community interactions are not always the case and outcomes will depend heavily on individual choices. For example, during the construction of the TMX Anchor Loop Project there was anecdotal feedback about workers integrating in a positive manger with community events and activities (*e.g.*, sports leagues). Further, crime rate data from the Municipality of Jasper and the Village of Valemount, communities that hosted construction crews during the construction of the TMX Anchor Loop Project in 2007/2008, do not indicate a notable or persistent increase in drug-related crime during this period. For example, in the Municipality of Jasper, the rate of drug violations generally declined during the 2007 to 2009 period; a decline of approximately 34% occurred between 2007 and 2008, and a decline of approximately 40% occurred between 2008 and 2009 (Statistics Canada 2013b). In the Village of Valemount, the rate of drug violations declined by approximately 63% between 2007 and 2008, and then rose marginally (approximately 1%) between 2008 and 2009 (Statistics Canada 2013c).

Trans Mountain will implement a range of measures to reduce the potential for negative Project/community interactions. Key mitigation measures include: implementing a Code of Conduct for workers, including community awareness training in worker orientation sessions; establishing a mechanism for communities to register construction-related complaints; developing a detailed Worker Accommodation Strategy that will consider camps in locations where local communities will not have adequate housing capacity; and providing recreational and leisure facilities for workers within any camps. However, even with mitigation measures in place to encourage acceptable worker behaviour it is impossible and undesirable to control all aspects of workers during their off-time spent in communities during the construction phase.

The impact on community way-of-life associated with the Project could be positive, neutral or negative. It will depend on the size of the construction hub community in relation to the size of the temporary workforce, housing strategies within each region, and individual choices of workers. Effects are anticipated to be neutral in larger urban centres (*e.g.,* Edmonton, Metro Vancouver communities) as temporary workers are likely to be easily absorbed. Effects will be positive, neutral or negative in other locations depending on community and individual perspectives. In construction hubs where construction camps are anticipated (*i.e.*, Edson, Blue River and Clearwater/Vavenby), the benefit of increased incomes for regional residents and increased municipal tax increases that can support broader community development objectives will generally outweigh any adverse effects related to community/interactions. Effects may ultimately be more perceptible in moderately sized communities without construction camps, such as the Town of Hinton, the Village of Valemount, the City of Merritt, and the District of Hope. The spatial boundary for the effect is regional, as it could occur throughout communities in the Socio-economic RSA that serve as construction hubs for the Project or where workers may choose to spend time when off-shift. The reversibility of the effect is short-term, since change in community way-of-life related to disturbance or temporary workers would only occur during the construction phase. The probability of the effect is considered to be low or high, depending on the particular community within the Socio-economic RSA. Some communities will not have events or assets disturbed by the Project and, therefore, will not be affected in this regard. (Table 7.2.3-3, point 3[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – change to community way-of-life could occur throughout communities in the RSA that serve as construction hubs for the Project.

- Duration: short-term **–** related primarily to the presence of the temporary workforce and construction activities during the construction phase.

- Frequency: isolated **–** the presence of temporary workers and construction activities which could affect community way-of-life would be limited to the construction phase only.

- Reversibility: short-term – effects on community way-of-life would only occur during the construction phase.

- Magnitude: medium – community use areas may be physically disturbed; presence of temporary workers will be highly detectable in smaller communities, but imperceptible in larger communities.

- Probability: low or high – depends on the size of construction hub communities in relation to the temporary workforce.

- Confidence: moderate – given the labour demands of the Project, the estimates of non-regional workers, feedback from stakeholders, the professional experience of the assessment team, but considering the inherent uncertainty around individual behaviour.

Social and Cultural Well-Being Indicator - Aboriginal Culture

The following provides the evaluation of significance of potential residual effects on the Aboriginal culture indicator.

Effects on Aboriginal Culture

The Project has the potential to affect Aboriginal culture through several pathways: the effects on traditional harvesting practices or cultural sites; cultural effects of Project-related employment and income; and Project studies and other activities that could support broader cultural objectives.

The Project may have potential adverse effects on opportunities to participate in traditional harvesting associated with direct Project effects on the land and wild food supplies (*i.e.,* wildlife, fish, and plants). Traditional harvesting activities conducted by Aboriginal communities in the Socio-economic RSA include hunting and trapping game for food and fur, fishing and gathering vegetation for food, medicines and supplies. Participation in these activities helps Aboriginal communities sustain their culture and provides foods, medicines and supplies. These activities involve a sense of being in harmony with the land and the animal, and a sense of independence and dignity to the harvester. While there is some level of social and economic integration between many Aboriginal communities and the municipal areas where (or near where) they reside, traditional harvesting activities are still valued by many communities. Some Aboriginal communities have a higher dependency on traditional harvesting than others. The Project could also affect Aboriginal culture through the disruption of identified cultural sites.

The results of TLU studies for the Project, described in Section 7.2.2 and discussed in detail in the Traditional Land and Resource Use Technical Report of Volume 5D, substantiate the importance of traditional harvesting activities to Aboriginal communities. As noted in Section 7.2.2, subsistence activities may be disrupted by the construction or operations of the Project and the interruption could mean that the traditional resource user misses the harvest opportunity or that their participation is curtailed. The disruption of subsistence activities also refers to the possibility that traditional resource users could be prevented from accessing key harvesting areas resulting from limited access or increased public access to traditional harvesting areas. While construction activities could disrupt harvesting and cultural activities and sites, the magnitude of the physical disturbance residual effects is considered to be medium since mitigation measures are in place in the event any unidentified subsistence activities and land uses are discovered. This also considers that the effects assessment results for water quality and quantity, fish and fish habitat, vegetation, wetlands, and wildlife and wildlife habitat indicate that equivalent land and resource use capability will be maintained by the application of the mitigation measures described in Volume 5A and in the Pipeline and Facilities EPPs (Volumes 6B and 6C).

Despite the application of mitigation measures, it is likely that some localized harvesting practices may be disrupted due to construction activity in certain areas. For example, cultural harvesting practices may be disrupted where construction occurs during the fall hunting seasons or during the berry picking season in select areas. There may also be sensory disturbances experienced by traditional land users from construction related equipment and traffic. Project-related traffic in certain areas may contribute to short-term access constraints to certain areas used for traditional cultural pursuits. For example, communities in the Fraser Valley region rely on Highway 1 to get to certain areas for cultural pursuits, and further traffic increases on this major highway may contribute to decline in participation in certain events during specific

construction windows. Any disruption to harvesting activities due to effects of disturbance to traditionally harvested resources will be dependent on each target species' sensitivities and could extend beyond the first 10 years operations related to the time required for native vegetation to regenerate over the Project Footprint. Distruption to cultural sites, or sensory or traffic related disturbances, would be reversible in the short-term.

Another factor that could affect Aboriginal culture is the influence of Project-related employment and employment income. Project-related employment may influence the amount of time that traditional land users dedicate to the pursuit of traditional activities, their motivation to do so, and the resources available to support these activities. Traditional harvesting and wage employment can be regarded as competing activities, because the more time devoted to one, the less time there is available for the other. However, many Aboriginal people residing in communities along the proposed pipeline corridor participate in the wage economy and have expressed interest in participating in Project-related employment and business opportunities. It was also noted during engagement activities that gear required for hunting in particular is expensive (*e.g.,* quads, snowmobiles, trucks, guns, ammunition) and hunting may be positively affected by an increase in Project-related wage employment opportunities for Aboriginal communities.

Project-related employment could also increase harvesting motivation amongst hunters, trappers and fishers. Those who spend some of their earnings on harvesting equipment will likely be eager to use their equipment. However, direct employment in Project-related jobs may also have the secondary effect of limiting the time availability to participate in the hunting, trapping and fishing activities. It is challenging to fully evaluate how these competing influences and motivations will play out for Aboriginal communities, as outcomes are based on individual choices and other economic influences. Overall, the effects on traditional cultural harvesting practices due to changes in time and resource availability resulting from Project-related employment are anticipated to be negligible. During Project-related discussions, participants in some communities noted that there are relatively few residents who currently hunt, gather, or trap (fishing is a more common practice, especially in the interior of BC). As such, the commitment to traditional harvesting will likely not be notably diminished by concurrent opportunities for wage employment with the Project in particular. Even if traditional land users pursue Project-related employment and decide to forego harvesting while employed, they would miss only a few harvesting seasons given the short duration of construction. It is more likely that any traditional land users would continue to harvest even if they are employed (*i.e.,* during off hours or when off-rotation), as harvesting is a source of enjoyment and cultural sustenance for those who practice it. The probability of any detectable Project effects on culture, positive or negative, at a community level is low, particularly given the existing levels of social and economic integration between Aboriginal and non-Aboriginal communities along the proposed pipeline corridor and the broader context of other regional urban and industrial development in the vicinity of the Project in many areas.

Another factor that may affect Aboriginal culture is the potential for the Project to support the generation of cultural information and provide resources that can indirectly support Aboriginal cultural objectives. During engagement activities, many Aboriginal communities noted they have, or wish to develop, programs that facilitate educating youth about cultural practices and traditional languages. TLU studies completed for or supported by the Project may support the documentation of traditional cultural information that can facilitate cultural transmission to future generations. It was noted during biophysical field study participation and through the collection of TEK for the Project that these activities themselves provided Aboriginal communities the opportunity to come together to contribute their TEK to the biophysical and heritage resources studies. The studies also provided the opportunity for community members to learn from one another and from field scientists about the ecosystems that exist on their reserves and within their traditional territories. Generally, participation in biophysical field studies and conducting the TLU studies supported by the Project may facilitate the generation of culturally important information that can be used for broader community purposes. In addition, to the extent that mutual benefit agreements are established between the Project and potentially affected Aboriginal communities, such agreements may further support broader cultural objectives of participating Aboriginal communities.

Overall, the effects of the Project on Aboriginal culture are anticipated to be neutral, resulting in no net benefit or loss at a community level. While there are likely to be adverse effects on harvesting activities and sites, at select locations, disturbance will be localized and reduced with the effective implementation of mitigation measures to minimize construction disruption to resources that are the focus of traditional harvesting (*e.g.,* wildlife, vegetation, fish, water sources), as well as by working with Aboriginal

communities to develop strategies to most effectively communicate the construction schedule and work areas to its members. Measures to minimize sensory disturbance and manage traffic in traditional use areas during construction and site-specific maintenance will also reduce effects on traditional resource users and cultural pursuits. Training, employment and procurement opportunities that will be available to Aboriginal communities may result in income that can be used to support the purchase of equipment used in cultural pursuits; but given the urban and industrialized context of much of the study area, opportunities for wage employment associated with the Project are not unique and Project-specific employment/income opportunities are not anticipated to notably contribute to cultural change at a community level. The spatial boundary of the potential residual effect on Aboriginal culture is the Socio-economic RSA, extending to all Aboriginal communities with IRs or traditional use interests affected by the Project. The reversibility of the potential effects on Aboriginal culture is short to long-term, as it is related to construction, or site-specific maintenance that would occur within any 1 year during operations; however, effects to traditionally harvested resources will be dependent on each target species' sensitivities and could extend beyond the first 10 years operations reltaed to the time required for native vegetation to revegetate (Table 7.2.3-3 point 4[a]). A summary of the rationale for all of the significance criteria of effects on Aboriginal culture is provided below.

- Spatial Boundary: Socio-economic RSA **–** Project-related disturbance, employment opportunities and cultural knowledge in TLU studies could be experienced by Aboriginal community members across the Socio-economic RSA.

- Duration: short-term **–** the events potentially causing effects on Aboriginal culture are in some instances related to construction and site-specific maintenance (*e.g.,* related to land disturbance, sensory disturbance, income opportunities); cultural opportunities could also be supported by TLU studies conducted during the pre-construction and construction phases.

- Frequency: isolated to periodic – the events contributing to the effect will occur primarily during or related to construction of the Project (isolated); however, site-specific maintenance which occurs intermittently but repeatedly during the Project may also contribute to Aboriginal cultural effects related to harvesting and cultural sites (periodic).

- Reversibility: short to long-term – the potential residual effect is primarily related to construction, or site-specific maintenance that would occur within any 1 year during operations; however, effects of disturbance to traditionally harvested resources will be dependent on each target species' sensitivities and could extend beyond the first 10 years operations related to the time required for native vegetation to regenerate over the Project Footprint.

- Magnitude: low to medium **–** disruption harvesting and cultural activities and sites could occur during specific times, which may be of medium magnitude where there are effects on traditional livelihoods (*i.e.,* more than a nuisance or inconvenience); generally effects on cultural practices of some community members may be detectable, but any Project-related influence on culture would be in the normal range of variability at the community level (low magnitude).

- Probability: high **–** the residual effect is characterized as likely given the location of the Project in relation to IRs and traditional use areas.

- Confidence: moderate – engagement and TLU studies with and by Aboriginal communities are ongoing, and cultural change is affected by numerous factors; however, engagement and studies completed to-date and the professional experience of the assessment team suggest that the conclusions drawn are appropriate.

7.2.3.7 Summary

As identified in Table 7.2.3-3, there are no situations for social and cultural well-being indicators that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of Project construction and operations on social and cultural well-being indicators will be not significant.

7.2.4 Human Occupancy and Resource Use

This subsection describes the potential Project effects on HORU. This refers to the use of the land and resources by people, in both a consumptive and non-consumptive manner. Given the length of the proposed pipeline corridor and the range of geographies and terrain it covers, a wide range of human uses are examined and considered, including: parks and protected areas; Indian Reserves, Métis Settlements and asserted traditional territories; outdoor recreation; agriculture; residential; non-traditional hunting, trapping and fishing; managed forest areas; minerals, aggregates and oil and gas resources; industrial and commercial; and water supply and use. Aesthetic attributes of human use areas are also considered in this discussion (*e.g.*, sensory disturbance, changes in viewshed). This subsection also discusses the consistency between the Project and any relevant local and regional land use plans.

The discussion of HORU presents anticipated effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, temporary facilities, pump stations, tanks and the Westridge Marine Terminal), since the communities and regions in which the Project occurs will experience Project-related activities in a combined manner. It is not meaningful from a community perspective to discuss the HORU effects of each Project component on a stand-alone basis. Any unique land or resource use effect associated with a particular Project component has been highlighted in the appropriate section (*e.g.*, pump stations and Westridge Marine Terminal).

While this subsection includes Indian Reserves, Métis Settlements and asserted traditional territories as a general category of human land use, traditional land and resource use effects are discussed in a comprehensive manner in Section 7.2.2 Traditional Land and Resource Use.

The Socio-Economic Technical Report (Volume 5D) provides further information pertaining to existing conditions, as well as issues and concerns identified by stakeholders related to HORU.

7.2.4.1 Assessment Indicators and Measurement Endpoints

Table 7.2.4-1 summarizes the assessment indicators, measurement endpoints and their rationale for HORU. The indicators selected represent components of the socio-economic environment that are of particular value or interest to Aboriginal communities, regulatory authorities, local communities, and other interested groups and individuals. The indicators have been selected based on: the NEB *Filing Manual* guidelines; experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, regulatory authorities and stakeholders; feedback from participants in ESA workshops; public issues raised through the media; and the professional experience of the assessment team.

The measurement endpoints used to assess Project effects on the indicators include a combination of qualitative and quantitative parameters. These parameters have been chosen based on available socio-economic information and previous experience in assessing the effects of similar projects.

TABLE 7.2.4-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR HUMAN OCCUPANCY AND RESOURCE USE

Human Occupancy and Resource Use Indicators	Measurement Endpoints	Rationale for Indicator Selection
Parks and protected areas	• Parks • Other protected areas	The selection of indicators and measurement endpoints considered NEB *Filing Manual* requirements for the HORU element in Table A-3 and key issues and interests identified during stakeholder engagement. They also considered feedback from participants in the ESA Workshops and from key regulatory authorities.
Indian Reserves, Métis Settlements and asserted traditional territories	• Indian Reserves, Métis Settlements and other Aboriginal communities • Asserted Aboriginal traditional territories	
Residential use	• Residential areas • Community use areas (*e.g.*, schools, playgrounds, public facilities)	

TABLE 7.2.4-1 Cont'd

Human Occupancy and Resource Use Indicators	Measurement Endpoints	Rationale for Indicator Selection
Agricultural use	• Natural pasture and grazing areas • Field crop areas • Organic and specialty crop areas • Livestock and crop facilities	• See above
Outdoor recreation use	• Outdoor recreation trails and use areas • Commercial recreation tenures	
Other land and resource use	• Non-traditional hunting, trapping, and fishing areas • Managed forest areas (including old growth management areas) • Merchantable timber • Forest health • Mineral, aggregate, and oil and gas resources • Industrial and commercial use areas	
Water supply and use	• Surface water supply and use areas • Groundwater supply and use areas	
Aesthetic attributes	• Sensory disturbance • Viewshed alteration	

Marine commercial, recreational and tourism use is pertinent only to proposed expansion of the Westridge Marine Terminal and, therefore, is discussed in Section 7.6.4.

7.2.4.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for HORU (Figure 5.4-1) considered one or more of the following areas:

- a Footprint Study Area (as defined in Section 7.1.3);
- a HORU LSA; and
- a HORU RSA.

For the proposed pipeline and facilities, the spatial boundary of the HORU LSA is defined by a 2 km wide band extending from the proposed Footprint (*i.e.*, the Footprint plus 1 km on each side) and is based on the area that could be directly affected by localized, Project-specific effects. The HORU LSA was established to provide adequate consideration to existing land and resource uses (*e.g.,* farming, livestock grazing, hunting, fishing, protected areas) in the Project area which may experience direct effects associated with the Project beyond the Footprint.

The spatial boundary for the HORU RSA consists of the area extending beyond the HORU LSA boundary and is defined as the area where the direct and indirect influence of other land uses and activities could overlap with Project-specific effects and cause cumulative effects on the HORU indicators. This includes the RSA boundaries of fish and fish habitat, wetlands, vegetation and wildlife (Volume 5A). The HORU RSA was selected to reflect the general Project setting and to describe resource use related elements that could be indirectly affected by the Project (*e.g.*, consumptive and non-consumptive recreation, hunting, trapping and fishing).

Due to the large scale of the Project and the fact that it passes through distinct and different geographical and administrative/political regions, six study regions have been defined for the assessment of socio-economic elements, including HORU. Throughout the socio-economic assessment, these regions are the sections by which the Project is segmented for the purposes of analysis. The socio-economic regions have been previously described in Section 7.2.3.

Maps of the HORU LSA and HORU RSA are found in Figures 5.4-1 to 5.4-7.

7.2.4.3 Land and Resource Use Context

The proposed pipeline corridor will cross a portion of west-central Alberta and the entire width of BC. The Alberta portion of the proposed pipeline corridor crosses various areas of land use including agricultural, commercial, industrial, oil and gas, recreational, rural and urban residential and trapping areas. The BC portion of the proposed pipeline corridor also crosses various areas of land use including agricultural, commercial, forestry, industrial, guide-outfitting, mining, recreational, rural and urban residential, trapping areas, protected areas and tourism.

Current and future land use in the vicinity of the proposed pipeline corridor is governed by a wide range of land use and development plans. Land use plan boundaries crossed by the proposed pipeline corridor in Alberta are primarily Municipal Development Plans (MDPs). In BC, the Project is located in the boundaries of Land and Resource Use Management Plans (LRMPs), which are the result of collaborative planning processes with stakeholders and First Nations. They provide strategic management planning for resources on Crown land. The proposed pipeline corridor also crosses Sustainable Resource Management Plans (SRMPs), Official Community Plans (OCPs) and Regional Growth Strategies (RGSs), as well as plans which provide direction for specific topics such as agriculture, transportation, parks and water management.

The proposed pipeline corridor crosses 10 IRs. Of the 85 Aboriginal communities engaged on the Project with Trans Mountain, 62 Aboriginal communities have been identified as having an interest in the Project or having interests potentially affected by the Project.

Edmonton Region

The Footprint and HORU LSA of the Edmonton Region are located in the boundaries of the Upper Athabasca Land Use Framework Planning Region and the North Saskatchewan Land Use Framework Planning Region. Regional Plans for the Upper Athabasca and North Saskatchewan regions have not yet been developed (Government of Alberta 2012). The Project in the Edmonton Region is located on land under the jurisdiction of numerous land use plans including: the City of Edmonton MDP, the City of Spruce Grove MDP, the Town of Stony Plain MDP, the Strathcona County MDP and the Parkland County MDP.

The Project crosses industrial, utility corridors, oil and gas activities, agriculture and forestry land use areas in the Edmonton Region. No known parks or protected areas are directly crossed by the proposed pipeline corridor in the Edmonton Region. However, three municipal parks within the City of Edmonton are crossed by the proposed pipeline corridor. There are 2 provincial parks, 15 municipal parks, 1 nature reserve, 2 municipal sports parks, 1 municipal ball park and 1 municipal off-leash dog park located in the HORU LSA in this region, as described in Table 5.4.1-1. The Project predominantly crosses urban and residential centres such as Strathcona County, City of Edmonton, City of Spruce Grove and the Town of Stony Plain. There are no trapping tenures or guide-outfitting tenures crossed by the proposed pipeline corridor in the Edmonton Region.

Rural Alberta Region

The Footprint and HORU LSA of the Rural Alberta Region are located within the boundaries of the North Saskatchewan Land Use Framework Planning Region. It is also is located on land under the jurisdiction of the Town of Edson MDP, the Town of Hinton MDP, the Hinton Community Sustainability Plan and the Yellowhead County MDP.

The Project crosses in residential, recreational, industrial, oil and gas activities, agriculture and forestry land use areas in the Rural Alberta Region. There are no known provincial or municipal parks or protected areas crossed by the proposed pipeline corridor in the Rural Alberta Region. There is one provincial park (Obed Lake Provincial Park), one natural area, two provincial recreation areas and five municipal parks located in the HORU LSA in this regionas described in Table 5.4.1-1. The Project crosses residential land use areas in the Town of Stony Plain and the Town of Edson, as well as several hamlet

growth areas (*e.g.*, Niton, Wildwood, and Evansburg). There are 18 registered trapping tenures and no guide-outfitters operating along the proposed pipeline corridor in the Rural Alberta Region.

Jasper National Park Region

Project-related activities in the Jasper National Park Region are limited to work at the Jasper Pump Station, automation of valves and some reactivation activities along the Hinton to Hargreaves Segment of the pipeline. The Footprint and HORU LSA of the Jasper National Park Region are located within the boundaries of the Municipality of Jasper and the Jasper National Park. The Jasper Pump Station is located on land under the jurisdiction of the Jasper Community Sustainability Plan. Key land uses within Jasper National Park consist of recreational activities including camping, hiking, wildlife viewing and skiing.

Fraser-Fort George/Thompson-Nicola Region

The Project in the Fraser-Fort George/Thompson-Nicola Region is located within the boundaries of the Robson Valley LRMP (BC MFLNRO 1999) and the Kamloops LRMP (City of Kamloops 1995). The Project is also located on land under the jurisdiction of the RDFGG's Robson Valley-Canoe Upstream OCP, the Blue River OCP, KAMPLAN the City of Kamloops OCP, the City of Kamloops Airport Land Use Plan and the City of Merritt OCP.

The land and resource uses in the HORU LSA and HORU RSA for the Project in the Fraser-Fort George/Thompson-Nicola Region include residential, industrial, agricultural use and forestry. The proposed pipeline corridor crosses three provincial parks or protected areas and two municipal parks in this region. There are 12 Class A provincial parks, 1 ecological reserve, 2 regional parks and 1 municipal park located in the HORU LSA in this region, as described in Table 5.4.1-2. The proposed pipeline corridor crosses various types of residential land use, from rural parcels to residences in small communities (*e.g.*, Blue River, Avola, and Clearwater) and larger urban centres (*e.g.* Kamloops). There are 30 registered trapping tenures crossed by the proposed pipeline corridor a total of 50 times in the Fraser-Fort George/Thompson-Nicola Region. There is one guide outfitter operating along the proposed pipeline corridor in the region, whose outfitting area is crossed twice by the Project.

Fraser Valley Region

The Project in the Fraser Valley Region is located on land under the jurisdictions of the District of Hope OCP, the City of Chilliwack OCP and the City of Abbotsford OCP. The Fraser Valley Region is also in the area of the Fraser Valley RGS and Chilliwack Forest District SRMP.

The land and resource uses in the HORU LSA and HORU RSA for the Project in the Fraser Valley Region include forested land, urban development and a high level of agricultural use. The proposed pipeline corridor crosses two provincial parks or protected areas, one regional park and one municipal park in this region. There are 3 provincial parks, 1 regional park, 1 municipal nature reserve and 12 municipal parks located in the HORU LSA in this region, described in Table 5.4.1-2. The proposed pipeline corridor crosses residential use areas in the District of Hope, the City of Chilliwack and the City of Abbotsford. There are five registered trapping tenures crossed by the proposed pipeline corridor and one guide outfitter operating along the proposed pipeline corridor in the Fraser Valley Region.

Metro Vancouver Region

The Project in the Metro Vancouver Region is located on land under the jurisdictions of the Township of Langley OCP, the City of Surrey OCP, the City of Coquitlam Citywide OCP and the City of Burnaby OCP. The land and resource use in the HORU LSA and HORU RSA for the Project in the Metro Vancouver Region is predominantly urban development. The proposed pipeline corridor crosses one regional park, two municipal conservation area, one municipal neighbourhood park, several other municipal parks and a Canadian Heritage River (Fraser River) in this region. There is 1 municipal conservation area, 7 municipal natural areas, 30 municipal/municipal neighbourhood parks and 1 regional nature park located in the HORU LSA in this region, as described in Table 5.4.1-2. The proposed pipeline corridor crosses residential use areas in the Township of Langley, City of Coquitlam, and the City of Surrey. There is some agricultural use areas crossed by the proposed pipeline corridor mainly located in the Salmon River valley

near Fort Langley BC. There are no registered trapping tenures or registered guide outfitters located along the proposed pipeline corridor in the Metro Vancouver Region. The Westridge Marine Terminal is located on the marine waters of the Burrard Inlet. The marine resource use context of the Westridge Marine Terminal is described in Section 7.6.1.3.

7.2.4.4 Potential Effects and Mitigation Measures

The construction of the Project will affect HORU through the temporary physical disturbance of land or resources that have a human use. Construction along the proposed pipeline corridor could cause disturbances to land used for parks and protected areas, IRs or traditional use, agriculture and livestock use, outdoor recreational use, non-traditional hunting, trapping and fishing, as well as managed forest areas. There may be physical disturbances to residential areas or industrial/commercial areas. There may also be temporary disturbances to water resources that have a human use (*e.g.*, waterways used for recreational, agricultural water supply purposes). The construction of the Project may also have implications for access to certain use areas due the presence of construction traffic and construction activities along roadways. The construction of the Project may also have sensory effects for recreational, residential, or commercial users in proximity due to nuisance noise and air emissions. For the purposes of the air and noise assessments, an effect considered to be of nuisance value is considered to be one that is perceptible and may result in annoyance (*e.g.*, nuisance air emissions may include dust during construction, while nuisance noise emission may include noise from construction equipment.). There could be visual effects related to the presence of construction activities, including worksite lighting. The presence of any new or expanded above ground facilities could also change viewsheds.

The operations of the Project will affect HORU primarily through temporary disturbances related to site-specific maintenance. There may be some operations phase effects related to agricultural use, where certain crops require time beyond the standard surface reclamation period to re-establish their productivity. Some ongoing disturbances may also occur in areas where new land is required for the proposed Black Pines Pump Station or for the expansion of select existing pump stations. There may also be longer-term changes in use patterns where the proposed pipeline corridor has been re-routed away from the existing TMPL right-of-way. These new routing areas are discussed in Section 4.0.

Identified Potential Effects

Potential effects associated with the construction and operations of the Project on HORU indicators are listed in Table 7.2.4-2. These interactions are based on the results of the literature review, desktop analysis, engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.2.4-2 was principally developed in accordance with Trans Mountain standards and industry best practices. A full list of socio-economic mitigation measures is found in the SEMP of Volume 6B, as well as in the Pipeline EPP and Facilities EPP of Volumes 6B and 6C.

TABLE 7.2.4-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON HORU

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
1. HORU Indicator – Parks and Protected Areas				
1.1 Physical disturbance to protected areas	Jasper National Park Region Fraser-Fort George/ Thompson-Nicola Region Fraser Valley Region Metro Vancouver Region / New pipeline segments Temporary facilities Reactivated pipeline segment (Hinton to Hargreaves)	Footprint	• Minimize disturbance of valued natural features with a non-traditional human use (*e.g.*, recreational trails, recreational use areas, key use areas within parks and protected areas) during final route refinement to the extent practical [SEMP Section 8.4.6]. • Reduce the amount of land disturbed by using previously disturbed areas for stockpiles, staging areas and camps where possible [SEMP Section 8.4.6]. • Provide provincial and federal regulatory authorities, municipal / regional governments; Aboriginal communities; affected landowners, occupants and Crown tenure holders and recreational organizations with final routing information, including maps, as well as construction schedule information [SEMP Section 8.4.6]. • Install signs in parks and protected areas and known recreational use areas in the vicinity notifying users of construction activities and timing [SEMP Section 8.4.6]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [SEMP Section 8.4.6]. • Ensure any changes in planned timing or location of construction activities is communicated to the public, relevant municipal and regional governments, Aboriginal communities, landowners, occupants, Crown tenure holders and formal recreation organizations in affected areas [SEMP Section 8.4.6]. • Apply all measures pertaining to HORU in the SEMP and all measures pertaining to notification and vegetation in the EPPs.	• Physical disturbance to natural and built features in protected areas during construction and site-specific maintenance.
1.2 Physical disturbance to facilities, including trails and trailheads, within protected areas	Fraser-Fort George/ Thompson-Nicola Region Fraser Valley Region Metro Vancouver Region / New pipeline segments Temporary facilities	Footprint	• Avoid disturbance of built features during final route refinement, to the extent practical [SEMP Section 8.4.6] . • Narrow the construction right-of-way at key locations to avoid valued built or natural features, to the extent practical [SEMP Section 8.4.6]. • Ensure closure signage is placed on the affected established trails or trailheads [SEMP Section 8.4.6]. • Contact appropriate regulatory authorities (*e.g.*, Alberta Environment and Sustainable Resource Development, BC Ministry of Forests, Lands and Natural Resource Operations, Alberta Tourism, Parks, and Recreation, BC Parks, Parks Canada) and municipal tourism offices prior to construction activities and provide maps and schedules of the proposed construction activities to enable them relay information about possible trail and recreational use area closures [SEMP Section 8.4.6]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [SEMP Section 8.4.6]. • Apply all measures pertaining to HORU in the SEMP and all measures pertaining to notification and vegetation in the EPPs.	• Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users (refer to potential effects 5.1 and 5.2 of this table).

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
1.3 Change to access of protected areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	RSA	• Maintain access to established recreation features, through the clearing, construction and reclamation period, where practical [SEMP Section 8.4.6]. • Deactivate and reclaim temporary access routes and sites required to construct the Project once Project construction is complete [SEMP Section 8.4.6]. • Place signage on access roads in the vicinity of the construction activities to ensure users are aware that construction activities are taking place [SEMP Section 8.4.6]. • Bore under paved and high use roads where practical [SEMP Section 8.4.6]. • Where minor roads are crossed that may affect established community use/access routes, complete open cut crossing within one day, to the extent practical [SEMP Section 8.4.6]. • Provide provincial and federal regulatory authorities, municipal / regional governments; Aboriginal communities; affected landowners, occupants and Crown tenure holders; and recreational organizations with final routing information, including maps, as well as construction schedule information [SEMP Section 8.4.6]. • Develop Traffic Control Plans for site-specific sections of roads affected by the Project [SEMP Section 8.4.3]. • Develop a communication plan for activities that impact normal traffic flow, such as road closures, detours [SEMP Section 8.4.3]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [SEMP Section 8.4.6]. • Ensure any changes in planned timing or location of construction activities is communicated to the public, relevant municipal and regional governments, Aboriginal communities, landowners, occupants, Crown tenure holders and formal recreation organizations in affected areas [SEMP Section 8.4.6]. • Apply all other measures pertaining to notification and access in the SEMP and EPPs.	• Change in land use patterns during construction and site-specific maintenance. • Change in land use patterns during operations.
1.4 Sensory disturbance of land and resource users	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• See recommended mitigation measures in for potential effect 8.1 of this table.	• Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance activities (refer to potential effect 8.1 of this table).
2. HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories				
2.1 Physical disturbance to IRs and Aboriginal communities	Fraser-Fort George/Thompson-Nicola Region Fraser Valley Region / New pipeline segments Temporary facilities	Footprint	• Minimize disturbance of valued natural features with a non-traditional human use (*e.g.*, recreational trails, recreational use areas, key use areas within parks and protected areas) during final route refinement to the extent practical [SEMP Section 8.4.6]. • Avoid disturbance of built features during final route refinement, to the extent practical [SEMP Section 8.4.6].	• Physical disturbance to IRs and asserted traditional territories.

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
2.1 Physical disturbance to IRs and Aboriginal communities (cont'd)	See above	See above	• Reduce the amount of land disturbed by using previously disturbed areas for stockpiles, staging areas and camps where possible [SEMP Section 8.4.6]. • Avoid disturbance to ornamental trees, windbreaks and shelterbelts on landowner property, to the extent practical [SEMP Section 8.4.6]. • Narrow the construction right-of-way at key locations to avoid valued built or natural features, to the extent practical [SEMP Section 8.4.6]. • Provide provincial and federal regulatory authorities, municipal / regional governments; Aboriginal communities; affected landowners, occupants and Crown tenure holders; and recreational organizations with final routing information, including maps, as well as construction schedule information [SEMP Section 8.4.6]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [SEMP Section 8.4.6]. • Ensure any changes in planned timing or location of construction activities is communicated to the public, relevant municipal and regional governments, Aboriginal communities, landowners, occupants, Crown tenure holders and formal recreation organizations in affected areas [SEMP Section 8.4.6]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11]. • Continue communication and engagement with stakeholders as the Project progresses [SEMP Section 8.4.11].	• See above
2.2 Physical disturbance to asserted traditional territories	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	Footprint	• Reduce the amount of land disturbed by using previously disturbed areas for stockpiles, staging areas and camps where possible [SEMP Section 8.4.6]. • Narrow the construction right-of-way at key locations to avoid valued built or natural features, to the extent practical [SEMP Section 8.4.6]. • Provide provincial and federal regulatory authorities, municipal / regional governments; Aboriginal communities; affected landowners, occupants and Crown tenure holders; and recreational organizations with final routing information, including maps, as well as construction schedule information [SEMP Section 8.4.6]. • Ensure closure signage is placed on the affected established trails or trailheads [SEMP Section 8.4.6]. • Ensure any changes in planned timing or location of construction activities is communicated to the public, relevant municipal and regional governments, Aboriginal communities, landowners, occupants, Crown tenure holders and formal recreation organizations in affected areas [SEMP Section 8.4.6]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11]. • Continue communication and engagement with stakeholders as the Project progresses [SEMP Section 8.4.11]. • See recommended mitigation measures in Table 7.2.2-4 Traditional Land and Resource.	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
2.3 Disruption of traditional land and resource use activities	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	LSA	• See recommended mitigation measures in Table 7.2.2-4 Traditional Land and Resource Use.	• Disruption of subsistence activities (refer to Section 7.2.2 Traditional Land and Resource Use).
2.4 Change to access of IRs and asserted traditional territories	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• See recommended mitigation measures for potential effect 1.3 of this table.	• Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table).
2.5 Sensory disturbance of land and resource users	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• See recommended mitigation measures for potential effect 8.1 of this table.	• Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance (refer to potential effects 8.1 of this table).
3. HORU Indicator – Residential Use				
3.1 Physical disturbance to residential areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	• See recommended mitigation measures for potential effect 2.1 of this table.	• Physical disturbance to residential areas. • Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table).
3.2 Disturbance to community use areas (schools, playgrounds, public facilities)	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	• See recommended mitigation measures for potential effect 2.1 of this table.	• Physical disturbance to community use areas.
3.3 Sensory disturbance of land and resource users	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• See recommended mitigation measures for potential effect 8.1 of this table.	• Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance (refer to potential effect 8.1 of this table).

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4. HORU Indicator – Agricultural Use				
4.1. Changs to all agricultural land uses	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	<u>Soil Disturbance and Compaction (All Agricultural Land Uses)</u> • Salvage all available topsoil/root zone material using the Environmental Alignment Sheet as a guide [EPP Section 8.0]. • Conduct three lift soils handling at locations identified on the Environmental Alignment Sheets [EPP Section 5.0]. • Ensure that the lower lift of subsoil is backfilled before the upper lift of subsoil where three lift soils handling has been conducted [EPP Section 8.0]. • Conduct full right of way topsoil salvage on agricultural lands that have been identified with a high water table [EPP Section 5.0]. • Prevent working on wet soil, in areas with high water table, or during heavy rain [Appendix C, Section 10.0; EPP Sections 7.0 and 8.0]. • Determine locations where subsoil compaction has occurred by comparing compaction levels on and off the construction right of way. Sites compared will be in close proximity and have similar drainage, soil moisture, aspect and land use, if feasible [EPP Section 8.0]. • Rip compacted subsoils on the construction right of way adjacent to the ditchline and along shoo flies with a multi shank ripper or breaking disc to a depth of 30 cm or the depth of compaction, whichever is deeper. If soils are moist, postpone ripping of subsoils until soils dry to ensure that the soils fracture when ripped [EPP Section 8.0]. • Employ a subsoiler plow (*e.g.,* Paratiller) along segments of the construction right of way adjacent to the ditchline where topsoil salvage did not occur and subsoil compaction is severe. Do not use a subsoiler plow on native grasslands [EPP Section 8.0]. • Disc or chisel plow and harrow ripped subsoils to smooth the surface. Limit discing to that necessary to break up clods in order to prevent further compaction of the subsoils or to increase the potential for soil erosion by wind [EPP Section 8.0]. <u>Cutting of Subsurface Drainage and Irrigation Lines (All Agricultural Land Uses)</u> • Repair any drainage tiles cut during trenching or crushed by heavy equipment. Obtain assistance from a drainage tile expert to ensure that permanent damage to drainage does not result from damage to drainage tiles (see Agricultural Management Plan in Appendix C). Ensure that the backfill is adequately compacted (*i.e.,* in minimum of 2 lifts) on flood irrigated fields. Compact after each lift. Also backfill and compact trench spoil in lifts or install a steel plate at locations where the wheels of pivot irrigation systems cross the backfilled trench line. Inform landowners of the location and depth of burial of any steel plates installed [see Agricultural Management Plan in Appendix C, Section 2.0]. • Repair and compact any irrigation/border dikes disturbed during construction to a standard that matches the adjacent undisturbed dikes [EPP Section 8.0]. • Install pipe at adequate depth to allow for installation of subsurface drains in those regions where the practice is commonly used.	• Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table). • Effects on livestock or agricultural plants due to the introduction of pests and disease.

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4.1. Changs to all agricultural land uses (cont'd)	See above	LSA	<u>Potential Weed Introduction (All Agricultural Land Uses)</u> • Undertake a pre-construction weed survey of agricultural lands along the pipeline route [Section 6.0; Appendix C, EPP Section 2.0]. • Power wash and misting stations will be established, where required, to clean equipment used during clearing and topsoil handling activities (see Appendix F). Basic shovel and sweep cleaning will be conducted on clearing and topsoil handling equipment before moving equipment off of cultivated fields. In addition, shovel and compressed air cleaning stations for topsoil handling equipment will be established at selected locations to prevent the spread of weeds (see Appendix J) [EPP Section 8.0]. • Ensure equipment arrives at all construction sites clean and free of soil or vegetative debris. Inspect and identify equipment deemed to be acceptable with a suitable marker, such as a sticker. Do not allow any equipment arriving in a dirty condition on-site until it has been cleaned [Appendix C, Section 14.0]. • Monitor weed growth on topsoil/root zone material piles during the course of construction and conduct corrective measures (*i.e.,* spraying) if warranted [Appendix C, Section 14.0]. • Consider salvaging topsoil from the full construction right-of-way if localized weed infestations are encountered, as outlined in the Weed and Vegetation Management Plan [Appendix C, Section 14.0]. • Clean equipment (*i.e.,* shovel and sweep, pressurized water or compressed air) involved in topsoil/root zone material handling at weed-infested sites prior to leaving the location unless full right-of-way topsoil/root zone material salvage has been conducted. Clean equipment involved in topsoil handling at weed-infested sites prior to leaving the location [Appendix C, Section 14.0]. • Implement weed management (*i.e.,* using proper application of chemical, mechanical or manual measures, or a combination of all) at locations identified within the pre-construction weed survey to a level that is consistent with weed management observed adjacent to the eventual construction right-of-way to reduce the potential for weed infestations following construction. Refer to the Weed and Vegetation Management Plan [Appendix C, Section 14.0]. • Conduct post-construction environmental monitoring of disturbed areas on agricultural lands as described in Volume 6A. <u>Crop and Productivity Loss (All Agricultural Land Uses)</u> • Compensate proven crop loss.	• See above
4.2 Disturbance of natural pasture and grazing areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations	LSA	<u>Grazing Disturbance</u> • Install temporary fences surrounding the trench where livestock are kept, if requested by the landowner in the Line List, in order to prevent entry onto the construction right-of-way while during construction [Appendix C, Section 2.0; EPP Section 8.0].	
		Footprint	<u>Soil Disturbance and Compaction</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		LSA	<u>Potential Weed Introduction</u> • See recommended mitigation measures for potential effect 4.1 of this table.	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4.2 Disturbance of natural pasture and grazing areas (cont'd)	See above	Footprint	<u>Reclamation Procedures</u> • Seed lands in Alberta with native and non native seed mixes developed for the Project that are based on vegetation field survey data and carry out consultation with landowners/lessees or appropriate regulatory authorities [EPP Section 8.0]. • Revegetation of lands in the Agricultural Land Reserve in BC must be undertaken in accordance with Schedule B, Site Reclamation Requirements in the *Agricultural Land Reserve Act* [EPP Section 8.0]. • Seed lands outside of the Agricultural Land Reserve in BC with native and non native seed mixes developed for the Project that is based on vegetation field survey data and consultation with the landowner and appropriate regulatory authority [EPP Section 8.0]. • Revegetate disturbed areas at the appropriate time of the year [Appendix C, Section 2.0; EPP Section 8.0].	• See above
		LSA	<u>Public Access</u> • Install locked gates at locations noted on the Environmental Alignment Sheets to block unauthorized travel along the construction right of way following clearing. Keep gates locked and assign security personnel, if warranted, to block access [EPP Section 8.0]. • Brace fences before they are cut. Install gates in fences crossed by the construction right of way. Ensure gates are located within the boundaries of the construction right of way, are the same height as the adjacent fence and are adequately sized to allow passage of all construction equipment [EPP Section 8.0]. • Close gates after use [EPP Section 8.0]. • Install temporary fences, if warranted, to restrict grazing and trampling of the seeded construction right-of-way until vegetation becomes established or less palatable [EPP Section 8.0].	
		Footprint	<u>Crop and Productivity Loss</u> • See recommended mitigation measures for potential effect 1 of this table. • See additional measures provided in the Agricultural Management Plan [Appendix C, Section 2.0].	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4.3 Disruption to livestock movement and grazing patterns	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations	LSA	<u>Livestock Management Disruption</u> • If requested by and in consultation with the landowner in the Line List install temporary fences surrounding parts of the trench where livestock are kept, in order to prevent entry onto the construction right-of-way while during construction. Install ditch plugs to help animals cross the trench and leave gaps in topsoil piles, subsoil piles, set-up pipes and welded pipe to allow access to water and alternative grazing lands [EPP Section 8.0]. • Leave gaps in set-up and welded pipe to allow wildlife, farm equipment and livestock to cross the construction right-of-way [EPP Section 8.0]. • Install temporary fences surrounding the trench where livestock are kept, if requested by the landowner, in order to prevent entry onto the construction right-of-way during construction [Section 8.0]. • Maintain all fences and gates and ensure livestock cannot access public roads [Appendix C, Section 2.0]. • Keep watering systems connected during construction or provide an alternative water source to support livestock outside the Footprint [Appendix C, Section 2.0; EPP Section 8.0]. • Enable livestock access to, and use of, improved pasture and hay land areas outside of the Footprint that may be isolated by construction activities.	• See above
4.4 Disturbance of field crop areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	<u>Crop Management Disruptions</u> • Accommodate landowner/Crown land authority topsoil/root zone material salvage requests, if feasible. Record any locations where a landowner/land authority has requested topsoil's handling which differs from the planned method. Attempt to coordinate topsoil salvaging with the farmer to start construction before seeding or after harvest [EPP Section 8.0].	• Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table). • Reduced crop yields due to introduction of weeds. • Reduced crop yields in deep rooting crops due to deep soil compaction. • Reduced crop yields due to deep tillage restriction. • Reduced crop yields due to future subsurface drainage restriction. • Reduced crop yield due to temperature effects of the pipeline in the root zone.
		Footprint	<u>Soil Disturbance and Compaction</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		Footprint	<u>Potential Weed Introduction</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		Footprint	<u>Reclamation Procedures</u> • Re-seed disturbed areas with an approved cover crop and/or grass seed mix and, where warranted, install biodegradable erosion control measures [Appendix C, Section 2.0]. • Re-seed disturbed areas at the appropriate time of the year [Appendix C, Section 2.0].	
		LSA (if adjoining fields are affected)	<u>Cutting of Drainage and Irrigation Lines</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		Footprint	<u>Tillage Restrictions</u> • Install pipe at adequate depth to allow for subsoiling in those regions where the practice is commonly used.	
		Footprint	<u>Crop and Productivity Loss</u> • See recommended mitigation measures for potential effect 4.1 of this table.	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4.5 Disturbance of organic and specialty crop areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	LSA	<u>Crop Management Disruptions</u> • Provide ample notice to farm operator to find an alternative growing location and to separate and remove above ground infrastructure [Appendix C, Section 2.0]. • Accommodate landowners/operator requests for plant salvage and plant relocation protocols on intensive crop production lands such as nurseries, blueberry and sod farms, where feasible (see Appendix C Section 2.0) [EPP Section 8.0]. • Move container nursery production to an alternative location [Appendix C, Section 2.0].	• See above
		Footprint	<u>Soil Disturbance and Compaction</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		LSA	<u>Potential Weed Infestations</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		Footprint	<u>Reclamation</u> • Revegetate disturbed areas with an approved cover crop and/or grass seed mix and, where warranted, install biodegradable erosion control measures [Appendix C, Sections 2.0, 7.0 and 14; EPP Section 8.0]. • Revegetate disturbed areas at the appropriate time of the year [Appendix C, Section 2.0, EPP Section 8.0]. Obtain permission on organic farms from the farm operator and appropriate regulatory aurhorities for all reclamation activities [Appendix C, Section 2.0; EPP Section 8.0].	
		LSA	<u>Cutting of Drainage and Irrigation Lines</u> • See recommended mitigation measures for potential effect 4.1 of this table.	
		LSA	<u>Tillage Restrictions</u> • Install pipe at adequate depth to allow for deep tillage and subsoiling in those regions where deep rooted crops are grown and the practice is commonly used.	
		Footprint	<u>Production of Dust</u> • Consult with and inform landowners with the potential to be affected by dust emissions from construction activities prior to commencement of these activities in proximity to the respective landowners [EPP Section 8.0]. • Water down construction sites and access roads, when warranted, as directed by Trans Mountain, to reduce or avoid the potential for dust emissions. Increase the frequency of watering roads and sites during periods of high risk (*e.g.,* high winds). Additional dust abatement measures (*e.g.,* covering topsoil windrows, installing sediment fences, applying a tackifier) will be implemented, when warranted, during clearing and construction activities [EPP Section 8.0].	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4.5 Disturbance of organic and specialty crop areas (cont'd)	See above	Footprint	Working on Organic Farms • Prohibit refuelling/servicing of equipment/vehicles on organic fields unless otherwise approved by the landowner [EPP Section 8.0]. • Prohibit the installation of waste collection receptacles or portable toilets on organic fields [EPP Section 8.0]. • Ensure a tarp is used when working on organic fields to collect all bevel shavings [EPP Section 8.0]. • Application of fertilizer or pesticide on organic fields will not be permitted unless otherwise requested by the landowner (see Agricultural Management Plan in Appendix C Section 2.0) [EPP Sections 7.0 and 8.0]. • Ensure waste containers accompany each working unit. • Prohibit the disposal of waste in the trench [EPP Section 7.0].	• See above
		Footprint	Crop and Productivity Loss • See recommended mitigation measures for potential effect 4.1 of this table.	
4.6 Disruption of farm facilities	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	LSA	Farm Facility Disruptions • Relocate all paddocks, pens and other containment areas away from the Footprint [Appendix C, Section 2.0]. • Develop a management plan to enable farm facility access to, and use of, farm areas outside of the Footprint that may be isolated by construction [Appendix C, Section 2.0].	• Effects on livestock or agricultural plants (refer to potential effect 4.1 of this table). • Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table).
		LSA	Potential Weed Infestations • See recommended mitigation measures for potential effect 4.1 of this table.	
		LSA	Noise and Vibration Disruption Effects on Livestock • Provide 4 to 6 months' notice to poultry farm operators to allow them to arrange to lease out their quota in case barns are required to be depopulated [Appendix C, Section 2.0].	
		LSA	Interference with Watering Systems for Poultry and Livestock • Keep poultry and livestock watering systems connected during construction [Appendix C, Section 2.0].	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
4.7 Risk to livestock and plant health	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	LSA	<u>Introduction of Pests and Diseases</u> • Power wash and misting stations will be established to clean and disinfect equipment used during construction in areas frequented by livestock or near certain livestock facilities. In addition, the Project Environmental Education Program will outline that personnel arriving from outside Canada will be required to have clothing and footwear disinfected, or have an appropriate period of non-farm visits prior to be allowed on livestock facilities. Equipment directly transported in from Alberta must be cleaned and disinfected prior to use on BC livestock yards (see Agricultural Management Plan in Appendix C) [EPP Section 8.0]. • Avoid importing plants, soil or organic matter onto nursery lands during pipeline construction [Appendix C, Section 2.0; EPP Section 7.0]. • Ensure all construction equipment and vehicles (and personnel footwear) arrive on the construction right-of-way in a clean condition and adhere to the nursery's Biosecurity Management Plan to reduce the risk of introducing or spreading *Phytophthora ramorum* prior to topsoil salvage activities [Appendix C, Section 2.0; EPP Section 7.0]. • Ensure equipment has been thoroughly washed and sterilized if it has been on another nursery [Appendix C, Section 2.0]. • Maintain a detailed record of sanitation activities conducted on the construction right-of-way on nursery lands [Appendix C Section 2.0; EPP Section 7.0]. • Ensure equipment has been washed and sterilized if it has been within the controlled access zone (CAZ) of another poultry farm prior to or after topsoil salvage [Appendix C, Section 2.0]. • Ensure all construction equipment and vehicles (and personnel footwear) arrive on the construction right-of-way in a clean condition and adhere to the facility's Biosecurity Management Plan to reduce the risk of introducing or spreading Avian Flu prior to topsoil salvage activities [Appendix C, Section 2.0; EPP Section 7.0]. • Provide restricted access for vehicles and staff around poultry barns. Setting up parking areas on public roads or along the proposed corridor outside the CAZ will be implemented, where required [Appendix C, Section 2.0]. • Ensure all employees who have recently arrived from outside Canada have all clothes and footwear disinfected. [Appendix C, Section 2.0]. • Maintain a detailed record of sanitation activities conducted on the construction right-of-way on the CAZ [Appendix C, Section 2.0].	• Effects on livestock or agricultural plants (refer to potential effect 4.1 of this table).
		LSA	<u>Crop and Productivity Loss</u> • See recommended mitigation measures for potential effect 4.1 of this table.	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
5. HORU Indicator – Outdoor Recreation Use				
5.1 Physical disturbance of waterways used for recreational activities	All regions, except Jasper National Park Region / New pipeline segments Pump stations (Black Pines Pump Station power line)	RSA	• See recommended mitigation measures pertaining to Navigation and Navigation Safety in Section 7.2.6.	• Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during construction. • Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during site-specific maintenance. • Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table).
5.2 Physical disturbance to outdoor recreation trails and use areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	RSA	• See recommended mitigation measures for potential effect 1.1 and 1.2 of this table. • Prohibit the recreational use of all-terrain vehicles (ATVs) or snowmobiles by construction personnel on the construction right-of-way or at a construction site [EPP Section 7.0].	
5.3 Disruption to commercial recreation tenures	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations (Rearguard Pump Station)	RSA	• See recommended mitigation measures for potential effect 1.1 and 1.2 of this table. • Contact directly affected commercial recreation tenure holders prior to clearing and construction activities, providing maps and schedule information to enable them to select alternate areas for their activities [SEMP Section 8.4.6].	• Change in land use patterns during construction and site-specific maintenance (refer to potential effect 1.3 of this table). • Change to resource-based livelihoods (refer to Section 7.2.6 Employment and Economy).
5.4 Sensory disturbance of land and resource users	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• See recommended mitigation measures in for potential effect 8.1 of this table.	• Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance (refer to potential effect 8.1 of this table).

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
6. HORU Indicator – Other Land and Resource Use				
6.1 Disruption of outfitting, trapping, hunting and fishing activities	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations (Hinton, Rearguard, Darfield, Black Pines, Kingsvale power line)	RSA	• See recommended mitigation measures for potential effect 1.1 of this table. • Contact trappers of affected registered fur management areas and traplines and guide-outfitters in relevant wildlife management units prior to clearing and construction activities, providing maps and schedule information to enable them to select alternate areas for their activities [SEMP Section 8.4.6]. • Provide compensation, considering various forms, to affected trappers according to established industry and provincial protocols if reduced fur harvest and lost revenue is proven [SEMP Section 8.4.6]. • Prohibit the vandalism or theft of trapper equipment or trapped animals if they are observed on the construction right-of-way or the construction site prior to clearing [EPP Section 7.0]. • Prohibit recreational fishing by Project personnel on or in the vicinity of the construction right-of-way. The use of the construction right-of-way to access fishing sites is prohibited [EPP Section 7.0]. • See measures for potential effect 8.1 of this table (sensory disturbance). • Apply all measures in the EPPs regarding fish and fish habitat, wildlife, vegetation, access management, and notification.	• Disruption of outfitting and non-traditional non-recreational trapping, hunting and fishing activities of Aboriginal and non-Aboriginal land users during construction.
6.2 Disturbance to managed forest areas (*e.g.,* FMAs, woodlots)	Rural Alberta Region Fraser-Fort George/Thompson-Nicola Region Fraser Valley Region Metro Vancouver Region / New pipeline segments Temporary facilities	Footprint	• Complete a timber valuation for all private and public lands that may be affected. • Notify and consult with all affected timber tenure licensees or other permit holders prior to construction. This will involve the cooperation of the BC MFLNRO and AESRD. • Apply all mitigation measures pertaining to timber outlined in the Pipeline EPP (see Timber Salvage Management Plan).	• Loss of forestry resources and reduction of land base for timber harvest during construction and operations.
6.3 Disturbance of Old Growth Management Areas	Fraser-Fort George/Thompson-Nicola Region Fraser Valley Region / New pipeline segments Temporary facilities Pump Station (Kingsvale power line)	Footprint	• Following identification of disturbed OGMAs, Trans Mountain must apply for appropriate permits where required (BC MFLNRO and BC MOE). This will include identification of replacement areas as required, prior to construction.	
6.4 Disruption to merchantable timber areas and production	Rural Alberta Region Fraser-Fort George/Thompson-Nicola Region Fraser Valley Region New pipeline segments Temporary facilities	Footprint	• Complete a timber valuation for all private and public lands that may be affected. • Notify and consult with all affected timber tenure licensees or other permit holders prior to construction. This will involve the cooperation of BC MFLNRO. • Obtain cutting permits prior to construction. • Apply all mitigation measures pertaining to timber outlined in the Pipeline EPP (see Timber Salvage Management Plan).	

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
6.5 Decline in forest health during construction	All regions / New pipeline segments Temporary facilities	Footprint	• Implement guidelines for right-of-way construction activities that involve tree removal prior to construction commencement. This would include felling guidelines and coarse woody debris / slash management. • Schedule hauling of timber potentially infected by a forest parasite (*e.g.,* mountain pine beetle) for the period either before or after the beetle flight period, to the extent feasible, unless otherwise approved by provincial forestry authorities [Section 8.0]. • Cut Douglas-fir and spruce stumps below a height of 45 cm [Section 8.0]. • Carefully control the movement of woody debris and follow the relevant guidelines and restrictions of the local Forest Districts for control of mountain pine beetle and other forest pests, as warranted, as outlined in the Timber Salvage Management Plan (see Appendix C) [Section 8.0]. • Use of a variety of techniques such as burning of merchantable timber or removal of all bark from pine logs will be implemented if tree clearing and hauling occurs within the beetle flight period. Where logs are to be transported into Alberta or within BC, all bark from logs will be removed as per procedural guidelines that apply within the relevant Forest District. Check with the local Forest District contact as to the anticipated beetle flight period prior to transporting logs [Section 8.0]. • Dispose of all salvageable timber infested with mountain pine beetle (or other forest parasite) by burning or mulching to eliminate the risk of spread of forest parasites [Section 8.0].	• No residual effect anticipated.
6.6 Disruption of oil and gas activities	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities	LSA	• See recommended mitigation measures for potential effect 1.1 of this table. • Notify all oil and gas tenure/disposition holders before construction to coordinate planned activities and secure agreements, as necessary [SEMP Section 4.6].	• Reduction of land base for subsurface activities during construction and operations.
6.7 Disruption of mineral and aggregate extraction activities	Fraser-Fort George/Thompson-Nicola Region Fraser Valley Region / New pipeline segments Temporary facilities Pump stations (Rearguard, Kingsvale power line)	LSA	• See recommended mitigation measures for potential effect 1.1 of this table. • Notify all affected mineral and aggregate tenure / disposition holders before construction to coordinate planned activities and secure agreements, as necessary [SEMP Section 8.4.6].	• Reduction of land base for subsurface activities during construction and site-specific maintenance.
6.8 Physical disturbance to industrial and commercial use areas	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	• See recommended mitigation measures for potential effect 1.1 of this table.	• Physical disturbance to industrial and commercial use areas during construction.
6.9 Change to access for other land and resource users during construction	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	RSA	• See recommended mitigation measures for potential effect 1.3 of this table. • For construction in urban areas that impacts traffic routes, establish alternate access routes for commercial or residential areas where applicable and practical [SEMP Section 8.4.6].	• Change in land use patterns during construction and site-specific maintenance and operations (refer to potential effect 1.3 of this table).

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
6.10 Sensory disturbance of land and resource users	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• See recommended mitigation measures in for potential effect 8.1 of this table.	• Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance (refer to potential effect 8.1 of this table).
7. HORU Indicator – Water Supply and Use				
7.1 Alteration of surface water supply and quality for downstream water users	All, except Jasper National Park Region / New pipeline segments Temporary facilities	RSA	• See recommended mitigation measures pertaining to Water Quality and Quantity in Section 7.2.3 of Volume 5A.	• Alteration of surface water supply and quality (refer to Section 7.2.3 Water Quality and Quantity of Volume 5A).
7.2 Alteration of well water flow and quality for water users	All, except Jasper National Park Region / New pipeline segments Temporary facilities	Footprint	• See recommended mitigation measures pertaining to Water Quality and Quantity in Section 7.2.3 of Volume 5A.	• Alteration of well water flow and quality (refer to Section 7.2.3 Water Quality and Quantity of Volume 5A).
8. HORU Indicator – Aesthetic Attributes				
8.1 Sensory disturbance	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments	RSA	• Adhere to all federal and provincial guidelines and legislation for noise management [EPP Section 7.0]. • Schedule construction activities to be conducted within 250 m of residences, cabins, campgrounds or parks in accordance with applicable municipal noise bylaws or approval conditions [EPP Section 7.0]. • Noise abatement and construction scheduling will be considered at noise-sensitive locations (*i.e.*, neighboring landowners) and during noise-sensitive periods [EPP Section 7.0]. • Enforce vehicle speed limits and inform contractor truck drivers and equipment operators that engine retarder braking in urban areas is prohibited [EPP Section 7.0]. • Use only the size and power of tools necessary to limit noise from power tool operations. Ensure stationary equipment, such as compressors and generators, will be located away from noise receptors, to the extent feasible [EPP Section 7.0]. • Maintain noise suppression equipment (*e.g.,* silencers) on all construction machinery and vehicles [EPP Section 7.0]. • Implement mitigation measures where night-time activity (*e.g.,* HDD) on the construction right-of-way or facility site is located within 500 m of residences [EPP Section 7.0]; notify potentially affected residents of any major construction activities that will occur at night [SEMP Section 8.4.7].	• Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction. • Sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during site-specific maintenance activities.

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
8.1 Sensory disturbance (cont'd)	See above	See above	• Enclose noisy equipment and use baffles such as material storage and subsoil piles, where and when feasible, to limit the transmission of noise beyond the construction site [EPP Section 7.0]. • Restrict the duration that vehicles and equipment are allowed to sit and idle to less than one hour, unless air temperature is less than 0°C [EPP Section 7.0]. • To reduce noise and air emissions from Project-related vehicles, use multi-passenger vehicles for the transportation of crews to and from the job sites, where feasible [EPP Section 7.0; SEMP Section 8.4.3]. Encourage car-pooling when shuttle bus services are not practical [SEMP Section 8.4.3]. • Install tree/shrub plantings at potential access points and viewsheds to the construction right-of-way to provide a visual screen to the construction right-of-way [EPP Section 8.0]. • Direct lighting for all construction activities downward and, where feasible, positioned to avoid or reduce annoyance of nearby residents [Facilities EPP Section 7.0]. • Post signs stating the applicable speed limits for construction traffic to reduce dust [EPP Section 7.0]. • Trans Mountain will consult with and inform landowners with the potential to be affected by dust emissions from construction activities prior to commencement of these activities in proximity to the respective landowners [EPP Section 8.0]. • Water down construction sites and access roads, when warranted, to reduce or avoid the potential for dust emissions. Increase the frequency of watering roads and sites during periods of high risk (*e.g.*, high winds). Additional dust abatement measures (*e.g.*, covering topsoil windrows, installing sediment fences, applying a tackifier) will be implemented, when warranted, during clearing and construction activities [EPP Section 8.0]. • Implement all other mitigation measures pertaining to noise, air/GHG emissions and dust suppression in the EPPs. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11].	• See above

TABLE 7.2.4-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
8.2 Alteration of viewsheds	All regions / New pipeline segments (where deviating from TMPL right-of-way) Temporary facilities Pump station (Black Pines) Terminal activities	LSA and RSA	• Replace ornamental trees and other vegetation disturbed during construction or site-specific maintenance on residential and commercial properties, as per landowner agreements [SEMP Section 8.4.7]. • To limit the effects of clearing in areas of new pipeline right-of-way, during reclamation use seeds that ensure vegetation regrowth blends with adjacent vegetation [SEMP Section 8.4.7). • Use seedlings and/or larger trees for vegetation screens that have been salvaged from the construction right-of-way or sourced from acceptable donor sites or commercially propagated rooted stock seedlings and container trees grown from a seed sources obtained from the same natural subregion/Biogeoclimatic Zone, as well as the same general latitude and elevation [EPP Section 8.0]. • Maintain an undisturbed vegetation screen between a new borrow site and an adjacent road [EPP Section 11.0]. • Landscape facility sites to limit visual impacts to wildlife and the public (*i.e.,* leave a vegetation buffer between facility sites and public roads) [Facilities EPP Section 7.0]. • Install lighting control systems in the facility site that permit the reduction of the amount of lighting during periods of low activity [Facilities EPP Section 7.0]. • Paint tanks neutral colors so they blend into the surrounding environment [Facilities EPP Section 7.0]. • Install tree and shrub plantings at access points no longer required and at viewscapes to provide a visual screen to the facility site [Facilities EPP Section 8.0; see Drawing Visual Screen – Facility Site in Appendix R of Facilities EPP]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP 8.4.11]. • Continue communication and engagement with stakeholders as the Project progresses [SEMP 8.4.11].	• Alteration of viewsheds.

Notes: 1 LSA = HORU LSA; RSA = HORU RSA.

2 Detailed mitigation measures are outlined in the SEMP (Volume 6B) and the EPPs (Volumes 6B and 6C). EPP referenced is the Pipeline EPP, except where otherwise noted.

7.2.4.5 Potential Residual Effects

The potential residual socio-economic effects on HORU indicators associated with the construction and operations of the Project (Table 7.2.4-2) are:

- physical disturbance to natural and built features in protected areas during construction and site-specific maintenance;
- change in land use patterns during construction and site-specific maintenance, as well as during operations;
- physical disturbance to IRs and asserted traditional territories;
- physical disturbance to residential areas;
- physical disturbance to community use areas;

- decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during construction and site-specific maintenance;
- effects on livestock or agricultural plants due to the introduction of pests and disease;
- reduced crop yields due to introduction of weeds;
- reduced crop yields due in deep rooting crops due to deep soil compaction;
- reduced crop yields due to deep tillage restriction;
- reduced crop yields due to future subsurface drainage restriction;
- reduced crop yield due to temperature effects of the pipeline in the root zone;
- disruption of outfitting and non-traditional non-recreational trapping, hunting and fishing activities of Aboriginal and non-Aboriginal land users during construction;
- loss of forestry resources and reduction of land base for timber harvest during construction and operations;
- reduction of land base for subsurface activities during construction and operations;
- physical disturbance to industrial and commercial use areas during construction and site-specific maintenance;
- sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance; and
- alteration of viewsheds.

Forest health issues associated with the proposed pipeline corridor are unlikely to be exacerbated by clearing and construction activities if standard mitigation measures outlined in Table 7.2.4-2 are employed along the construction right-of-way. Assuming the successful implementation of suggested mitigation measures, no residual effect on forest health is anticipated. See the Managed Forest Areas and Forest Health Technical Report in Volume 5D for further discussion on forest health.

7.2.4.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method is considered to be the appropriate method for determining the significance of the anticipated residual socio-economic effects. Due to a lack of regulatory thresholds, standards or guidelines for HORU indicators, a qualitative assessment of HORU was determined to be the most appropriate. The evaluation of significance of each of the potential residual effects relies on the professional judgment of the assessment team.

Table 7.2.4-3 provides a summary of the significance evaluation of the potential residual effects of the construction and operations of the Project on HORU indicators. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below.

TABLE 7.2.4-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON HORU

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. HORU Indicator – Parks and Protected Areas									
1(a) Physical disturbance to natural and built features in protected areas during construction and site-specific maintenance.	Negative	Footprint	Short-term	Periodic	Short to medium-term	Medium	High	Moderate	Not significant
1(b) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
1(c) Change in land use patterns during operations.	Negative to positive	RSA	Short-term	Isolated	Long-term	Medium	High	High	Not significant
1(d) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
1(e) Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during construction.	Negative	RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
1(f) Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during site-specific maintenance.	Neutral to negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
1(g) Combined effects on the parks and protected areas indicator (1[a] to 1[f]).	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
2. HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories									
2(a) Physical disturbance to IRs and asserted traditional territories.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
2(b) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
2(c) Change in land use patterns during operations.	Negative to positive	RSA	Short-term	Isolated	Long-term	Medium	High	High	Not significant
2(d) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
2(e) Combined effects on the IRs, Métis Settlements and asserted traditional territories indicator (2[a] to 2[d].	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
3. HORU Indicator – Residential Use									
3(a) Physical disturbance to residential areas.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
3(b) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
3(c) Physical disturbance to community use areas.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
3(d) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant

TABLE 7.2.4-3 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
3(e) Combined effects on the residential use indicator (3[a] to 3[d]).	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
4. HORU Indicator – Agricultural Use									
4(a) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
4(b) Loss of livestock or agricultural plants due to the introduction of pests and diseases.	Negative	LSA	Short-term	Accidental	Medium-term	High	Low	High	Not significant
4(c) Reduced crop yields due to introduction of weeds.	Negative	LSA	Short-term	Periodic	Medium-term	Low	Low	High	Not significant
4(d) Reduced crop yields in deep rooting crops due to deep soil compaction.	Negative	Footprint	Short-term	Periodic	Medium to long-term	Low	Low	High	Not significant
4(e) Reduced crop yields due to deep tillage restriction.	Negative	Footprint	Short-term	Isolated	Long-term	Low	Low	High	Not significant
4(f) Reduced crop yields due to future subsurface drainage restriction.	Negative	LSA	Short-term	Isolated	Long-term	Low	Low	High	Not significant
4(g) Change in crop yields due to temperature effects of pipeline in the root zone.	Negative	Footprint	Long-term	Continuous	Long-term	Low	Low	Moderate	Not significant
4(h) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
4(i) Combined effects on the agricultural use indicator (4[a] and 4[h]).	Negative	RSA	Short-term	Periodic	Short-term	Low to medium	High	High	Not significant
5. HORU Indicator – Outdoor Recreation Use									
5(a) Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during construction.	Negative	RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
5(b) Decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during site-specific maintenance.	Neutral to negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
5(c) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
5(d) Change in land use patterns during operations.	Negative to positive	RSA	Short-term	Isolated	Long-term	Medium	High	High	Not significant
5(e) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
5(f) Combined effects on the outdoor recreation use indicator (5[a] to 5[e]).	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
6. HORU Indicator – Other Land and Resource Use									
6(a) Disruption of outfitting and non-traditional non-recreational trapping, hunting and fishing activities of Aboriginal and non-Aboriginal land users during construction.	Negative	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant

TABLE 7.2.4-3 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
6(b) Loss of forestry resources and reduction of land base for timber harvest during construction and operations.	Negative	Footprint	Short-term	Isolated	Long-term	Low	High	High	Not significant
6(c) Reduction of land base for subsurface activities during construction and operations.	Negative	LSA	Long-term	Continuous	Long-term	Medium	High	Moderate	Not significant
6(d) Physical disturbance to industrial and commercial use areas during construction and site-specific maintenance.	Negative	Footprint	Short-term	Periodic	Short-term	Medium	High	High	Not significant
6(e) Change in land use patterns during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
6(f) Change in land use patterns during operations.	Negative or positive	RSA	Short-term	Isolated	Long-term	Medium	High	High	Not significant
6(g) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
6(h) Combined effects on the other land and resource use indicator (6[a] to 6[g]).	Negative	RSA	Short to long-term	Periodic to continuous	Short to long-term	Medium	High	High	Not significant
7. HORU Indicator - Water Supply and Use									
Refer to Section 7.2.3 Water Quality and Quantity of Volume 5A.									
8. HORU Indicator – Aesthetic Attributes									
8(a) Sensory disturbances for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions, noise and visual effects) during construction and site-specific maintenance.	Negative	RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
8(b) Alteration of viewsheds.	Negative	LSA to RSA	Short-term	Isolated	Long-term	Low	High	High	Not significant
8(c) Combined effects on the aesthetic attributes indicator (8[a] and 8[b].	Negative	LSA to RSA	Short-term	Isolated to periodic	Short to long-term	Low	High	High	Not significant

Notes: 1 LSA = HORU LSA; RSA = HORU RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

HORU Indicator - Parks and Protected Areas

The following provides the evaluation of significance of potential residual effects on the parks and protected areas indicator.

Physical Disturbance to Natural and Built Features in Protected Areas During Construction and Site-Specific Maintenance

There are a number of parks and protected areas with known human uses crossed by the proposed pipeline corridor that may be disturbed during construction activities, as well as during periods of site-specific maintenance (*i.e.*, integrity digs). These include:

- Finn Creek Provincial Park (RK 638.4 to RK 639.3);

- North Thompson River Provincial Park (RK 725.4 to RK 727.8);
- Lac du Bois Grasslands Protected Area (RK 828.4 to RK 836.9; RK 842.3 to RK 843.9);
- Fraser Valley Region Coquihalla Summit Recreation Area (RK 992.3 to RK 1005.2);
- Cheam Lake Wetlands Regional Park is crossed by the proposed pipeline corridor (RK 1079.9 to RK 1080.0 and RK 1080.1 to RK 1080.4);
- Surrey Bend Regional Park (approximately RK 1160.6 to RK 1160.6);
- F.H. Barber Provincial Park (RK 1062.6 to RK 1062.9);
- Fraser River (Canadian Heritage River) (approximately RK 499.7 and RK 1168.6); and
- Burnaby Mountain Conservation Area (approximately RK 1180 to RK 1181).

Further details on these parks and protected areas are found in Section 7.1 in the Socio-Economic Technical Report of Volume 5D.

Natural and built features within protected areas - such as interpretive signs, parking lots, picnic areas, trees, rocks, watercourses and trails - may have intrinsic, interpretive and recreational value, which may be disturbed as a result of pipeline construction and site-specific maintenance. For example, the proposed pipeline corridor crosses a paved parking lot in Finn Creek Provincial Park (approximately RK 638.8), a road in North Thompson River Provincial Park (approximately RK 725.5), a large gravel area with a winter working shed (for highways department) in Coquihalla Summit Recreation Area, a park gate with parking area and trails in Douglas Taylor Municipal Park (approximately RK 1130.5), a park gate with parking area and trails in Ponder Municipal Park, and Burnwood Trail in Burnaby Mountain Conservation Area (approximately RK 1180.5).

Trans Mountain has initiated the consultation and investigation process with BC Parks regarding Project activities within BC parks and protected areas, including requests for boundary adjustments required for temporary construction activity in Finn Creek Provincial Park, North Thompson River Provincial Park, and the Lac du Bois Grasslands Protected Area. Investigations have also been initiated regarding the use of temporary workspace adjacent to the existing TMPL right-of-way in Bridal Veil Falls Provincial Park (however, the proposed pipeline corridor subject to this assessment does not cross this park). At the time of writing, Trans Mountain has received direction from the Executive Director, Parks, Planning and Management Branch, BC Parks, that the Minister of Environment determined the proposal for Finn Creek Provincial Park, North Thompson River Provincial Park, Lac du Bois Grasslands Protected Area and Bridal Veil Falls Provincial Park could be further considered as a Stage 2 boundary adjustment. The Minister directed that a boundary adjustment is not required for the pipeline segment through Coquihalla Summit Recreation Area but determined a full impact assessment be completed for the Project in the recreation area. As the Project progresses, Trans Mountain will continue its consultation, and parallel assessment and permitting process, with BC Parks and other regulatory authorities pertaining to proposed works in parks and protected areas.

Mitigation measures related to vegetation, wetlands, wildlife and wildlife habitat and fish and fish habitat have been designed to reduce the amount of land disturbed in any park or protected area. Other key mitigation measures includes avoiding key valued natural or built features during right-of-way finalization, narrowing the right-of-way in certain areas, and restoring any trails or other valued features that may be disturbed. Even with the implementation of mitigation measures to reduce land disturbance, certain natural features with intrinsic value may be disrupted depending on the final right-of-way selection, resulting in a residual adverse effect. Assuming the implementation of all mitigation measures, the residual effect of the Project on natural and built features in protected areas is considered to be reversible in the short to medium-term (*i.e.*, residual effects will primarily occur during construction, but restoration of valued features or areas may extend into the first several years of operations). The magnitude of the effect is considered medium; though the effect may be primarily that of an inconvenience or nuisance, parks and protected areas have an intrinsic value to many users (Table 7.2.4-3, point 1[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – natural and built features within parks and protected areas will be directly affected by construction of the pipeline.

- Duration: short-term – the residual effect will be caused by construction and site-specific maintenance that may occur within any 1 year during operations.

- Frequency: periodic – the disturbance to natural and built features in parks and protected areas will be caused by construction and periods of site-specific maintenance that would occur intermittently but repeatedly during the assessment period.

- Reversibility: short to medium-term – disturbance to natural and built features will be primarily limited to the construction phase and periods of site-specific maintenance; but post-construction restoration of natural areas and features may extend into the first several years of operations.

- Magnitude: medium – given the intrinsic value of parks and protected areas, disruptions are considered a moderate modification in the socio-economic environment.

- Probability: high – construction activities will take place through parks and protected areas; therefore, disturbance of natural features with intrinsic value is likely.

- Confidence: moderate – particular valued built or natural features potentially disturbed will depend on right-of-way finalization.

Change in Land Use Patterns

This discussion pertains to change to access and use patterns for all land and resource users identified in this assessment, as all users may be affected similarly by certain Project-related activity. As such, the below discussion highlights the potential for changes in access and use patterns for multiple HORU indicators in an integrated manner.

Construction and Site-Specific Maintenance

Change in land use patterns in the HORU RSA during construction is anticipated to result from short-term physical disturbance of land, access roads and/or from alteration of traffic patterns, movements and volumes along highways and roads. Traffic movement patterns are assessed in Section 7.2.5 Infrastructure and Services. This residual effect applies to a variety of land use areas, including parks and protected areas, IRs and traditional territories, residential areas, commercial areas, outdoor recreational areas, agricultural use areas, and other land and resource users. A short-term disruption to access and use patterns could affect commercial, residential and recreational (both in and outside of park and protected areas) users who are deterred from visiting a particular location. Commercial activities could be disrupted resulting in a loss of income for local commercial retailers. A disruption of access to IRs and asserted traditional territories could affect the practice of traditional activities by Aboriginal users.

Agricultural land use patterns could be disrupted by restrictions in access to certain parts of properties which may affect cultivation and harvesting. There would also be an inability to use land for crops during specific periods during the construction phase of construction and crops would be lost for specific periods of activity. Access restrictions may also affect livestock on grazing range and in forest used for grazing, and some livestock operations may have paddocks, corrals or other fenced facilities that may be disturbed which would disrupt the facility's operations. Similar effects regarding reduced access to land due to disturbances for all use types would occur during periods of site-specific maintenance (*i.e.,* integrity digs). See the Agricultural Assessment Technical Report in Volume 5D for more details on potential agricultural effects.

Right-of-way finalization to avoid key use areas and access routes to the greatest extent practical will minimize effects. Trans Mountain will employ mitigation measures that will assist in minimizing the above effects. Mitigation measures to reduce Project-related traffic (such as using multi-passenger vehicles and obeying traffic, road-use and safety laws) as well as low-impact road crossing construction methods will be implemented during Project construction activities, and will also minimize access and use disruptions. In agricultural areas, mitigation measures such as enabling livestock to access to pasture areas away

from the Project Footprint, relocating livestock containment areas, and providing adequate notice to poultry farmers to allow them to lease out their quotas will lessen the effects of the Project. However, residual effects are still anticipated, as land disturbance through a range of land use areas and increased traffic on select access routes are unavoidable during specific times of the Project. The impact balance of this residual effect is considered negative, but these residual effects of disruption to access and use patterns of land is considered to be reversible in the short-term (*i.e.,* limited to the construction phase or periods of site-specific maintenance that would occur within any 1 year during operations). Even after the implementation of proposed mitigation measures, users may still be unable to use, or be deterred from using, certain areas at certain times. Recreationalists may alter their use destinations away from areas that interface with Project construction. Disruption of access may result in certain Aboriginal land and resource users being deterred from practicing traditional activities and could affect the livelihoods of certain users. Construction activity could deter people from visiting commercial locations or affect resource based business practices (*e.g.,* agriculture, commercial recreation), which could result in a loss of income for those reliant on natural resources or commercial locations for their livelihood. Agricultural operators will be required to adapt their farming practices during construction or periods of site-specific maintenance occurring on their agricultural land. Given the potential implications for livelihood practices associated with a disruption to access and use patterns of some land use areas, the magnitude of this residual effect is considered to be medium (*i.e.,* more than an inconvenience or nuisance) (Table 7.2.4-3, point 1[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU RSA – access roads to use areas in the HORU RSA may be physically disturbed by construction activity and disrupted by construction-related traffic.

- Duration: short-term – the event causing the disruption to access and use is the construction phase and site-specific maintenance during operations.

- Frequency: periodic – the event causing the disruption to access and use would occur intermittently but repeatedly (*i.e.,* specific months of construction and during site-specific maintenance that would occur during any 1 year of operations).

- Reversibility: short-term – the residual effect is limited to the construction phase or periods of site-specific maintenance occurring within any 1 year during operations.

- Magnitude: medium – the change would be detectable and would extend beyond that of an inconvenience or nuisance where there are implications for livelihood practices.

- Probability: high – Project activities will disturb land use areas and may impede access to specific areas at select times.

- Confidence: high – based on Project information, regional land use and access patterns, and the professional experience of the assessment team.

Operations

Changes to land use patterns in the HORU RSA during operations may result from vegetation management on the pipeline right-of-way in areas where the proposed pipeline corridor deviates from the existing TMPL right-of-way or other linear disturbances. These effects will be limited; however, because the proposed pipeline corridor is on or adjacent to the existing TMPL right-of-way for approximately 73% of its length and follows other linear disturbances (*e.g.,* other rights-of-ways) for approximately 17% of its length; new corridor is proposed for only 10% of the proposed route. Key areas where the proposed pipeline corridor deviates from the existing TMPL right-of-way include: approximately RK 93 to RK 99; RK 311 to RK 327; RK 935.6 to RK 946.6; and RK 980.6 to RK 1018.6. Land use observed in areas of proposed new right-of-way includes summer tourism areas, hiking and mountain biking trails, forested land and a provincially-designated recreation area. Where the proposed pipeline corridor is in a previously disturbed right-of-way or linear disturbance, the operations phase is not anticipated to have any residual effect on land use patterns, as use patterns already consider the disturbed area.

In the areas of new right-of-way, vegetation management during operations will involve the removal of trees or any vegetation that might restrict service and maintenance equipment along the pipeline right-of-

way. As a result, the new pipeline right-of-way will form a linear feature that will remain largely cleared (though some low growth vegetation will be re-established). Areas of new cleared right-of-way could improve access for some users, including outfitters, fishing/trapping/hunting users, recreationalists, and traditional Aboriginal resource users. The use of the right-of-way as a recreational trail route was mentioned as a benefit in many communities during stakeholder consultation.

Any new cleared right-of-way could also contribute to fragmentation of certain land use areas over the longer term, resulting in a disruption to recreational, residential and traditional use activities for both Aboriginal and non-Aboriginal resource users. For example, new right-of-way in areas used for hiking or mountain biking could result in land users not using the area; however, it could also result in improved recreational access. Fragmentation could also result in changes in the behaviour of wildlife, and it is possible that it would have negative effects on hunting activities for both Aboriginal and non-Aboriginal resource users in some areas.

As noted, patterns of use in areas where the proposed pipeline corridor aligns with the existing TMPL right-of-way or other linear disturbances are already established and no incremental fragmentation or change in land use patterns would occur over the long-term. Pre-construction use and access in these areas is anticipated to resume during the operations phase.

A range of mitigation measures will be implemented to manage issues related to any long-term changes in access and land use patterns that emerge based on right-of-way finalization. These mitigation measures include: notifying all affected trappers, guide outfitters, commercial recreation tenure holders before construction so they can choose alternate locations for their activities; provide compensation, considering various forms, to private land and property owners and trappers according to established industry protocols where losses or damages are proven; communications measures with governments, residents and recreational users about site-specific maintenance activities; and measures to ensure minimization of vegetation disturbance and optimize reclamation. The impact balance of this residual effect is considered negative or positive, depending on the user. The reversibility of the effect is considered long-term, since changes to access and use patterns in areas where the proposed pipeline corridor deviates from the existing TMPL right-of-way or other linear disturbances will extend throughout the operations phase. The magnitude of this residual effect is medium. Although the residual effect will be only a nuisance for some land users (*i.e.,* recreationalists), it may have implications (positive or negative) for livelihood practices for others (*i.e.*, trappers, Aboriginal, and commercial outdoor users) (Table 7.2.4-3, point 1[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU RSA – clearing of the new pipeline right-of-way may result in fragmentation of land use areas beyond the Footprint and HORU LSA throughout operations. However, it will occur only in the limited areas where new corridor is required (new corridor is proposed for only 10% of the proposed route).

- Duration: short-term – the event causing the change to land use and access is the construction of the pipeline.

- Frequency: isolated – the event causing the change in land use and access is the construction of the pipeline which is limited to a specific phase of the assessment period.

- Reversibility: long-term – the residual effect extends throughout operations.

- Magnitude: medium – after the implementation of the proposed mitigation measures change would be detectable and could have implications on livelihood practices for some land and resource users.

- Probability: high – new right-of-way will be cleared in select areas.

- Confidence: high – based on Project information, current land uses in the HORU RSA and the professional experience of the assessment team.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

The construction and site-specific maintenance of the Project may result in the sensory disturbance for Aboriginal and non-Aboriginal local residents and land users. The significance evaluation of these residual effects during construction and operations is provided in Table 7.2.4-3 (point 1[d]). A discussion of this residual effect under the aesthetic attributes indicator (point 8[a]), which includes users of parks and protected areas as well as several other user types, provides an explanation of the rationale of the significance criteria.

Decrease in Quality of the Outdoor Recreational Experience of Aboriginal and Non-Aboriginal Resource Users

The construction and site-specific maintenance of the Project may result in the decrease in the quality of the outdoor recreation experience of Aboriginal and non-Aboriginal resource users. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (points 1[e] and 1[f]). A discussion of these residual effects under the outdoor recreation use indicator (points 5[a] and 5[b]), which includes recreational users both inside and outside parks and protected areas, provides an explanation of the rationale of the significance criteria.

Combined Effects on Parks and Protected Areas

An evaluation of the combined effects on parks and protected areas considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for parks and protected areas evaluated in Section 7.2.4.6 (Table 7.2.4-3, points 1[a] to 1[f]) are of high probability and, consequently, were considered in the evaluation of combined effects on the parks and protected areas indicator.

Overall, the Project-related terrestrial effects on parks and protected areas are associated with the potential physical disturbance during construction to natural and built features that may have intrinsic, interpretive and recreational value (*e.g.,* interpretive signs, parking lots, picnic areas, trees, rocks, watercourses and trails). This could also result in a change in access and use patterns to certain recreational areas within parks, as people divert to other areas to avoid construction noise and activity. The effects may also result in an overall decrease in the quality of the outdoor experience of Aboriginal and non-Aboriginal park users during construction and, at times, extending into operations due to site-specific maintenance. Sensory effects on parks and protected area users may also occur during site-specific maintenance.

Mitigation measures are in place to reduce the land disturbance in parks and protected areas, as well as disturbance to valued natural or built features. Measures to reduce Project-related traffic (*e.g.,* providing daily shuttle bus service from designated staging areas to work sites and encouraging carpooling when shuttle bus service is not practical or available; the logistical measure of using rail for major equipment delivery to regional centres will also reduce the time which heavy equipment vehicles on the road) and related to dust control and noise abatement will reduce sensory disturbance. Even with the implementation of mitigation measures to reduce land and sensory disturbance, certain natural features with intrinsic values may be disrupted depending on the final right-of-way selection and residual sensory disturbance will occur. As such, the combined effect on parks and protected areas is considered negative. The spatial boundary of the overall effects is regional, since construction related nuisance noise and air emissions, and access implications, could extend to users in wider areas. The frequency of the overall effect is periodic since it will extend into the operations phase and occur intermittently but repeatedly (*i.e.,* during site-specific maintenance). Though there will be some long-term disturbance associated with new right-of-way in some areas (*e.g.,* Surrey Bend Park, Lac Du Bois Grasslands Protected Area), on balance reversibility is considered short-term, as the effects will be largely associated with the construction phase or site-specific maintenance that would occur within any 1 year period during operations. The magnitude of the overall effect is considered low; change may be detectable, but would not extend beyond that of an inconvenience or nuisance and in many cases the proposed route/existing TMPL right-of-way pre-dates the existence of particular parks. The probability of the overall effect on parks and protected areas is high, given the known location of the proposed pipeline corridor in relation to several parks and protected

areas. Confidence in this evaluation is high, though it is not known which precise features may be disturbed in certain areas. A summary of the rationale for all of the significance criteria of combined effects on parks and protected areas (Table 7.2.4-3, point 1[g]) is provided below.

- Spatial Boundary: HORU RSA – construction related nuisance noise and air emissions, and access implications, could extend to users in wider areas.
- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – construction and site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.
- Reversibility: short-term – effects will be focused on the construction phase or site-specific maintenance that would occur within any 1 year period during operations.
- Magnitude: low – change may be detectable, but would not extend beyond that of an inconvenience or nuisance to users.
- Probability: high – given the location of proposed pipeline corridor in relation to several parks and protected areas.
- Confidence: high – given the location of proposed pipeline corridor and the professional experience of the assessment team.

HORU Indicator - Indian Reserves, Métis Settlements and Asserted Traditional Territories

The following provides the evaluation of significance of potential residual effects on the Indian Reserves, Métis Settlements and asserted traditional territories indicator.

Physical Disturbance to Indian Reserves and Asserted Traditional Territories

The proposed pipeline corridor crosses 10 IRs as described in Section 5.4. In populated reserves crossed by the proposed pipeline corridor, construction may disrupt residents and disturb features such as access roads, yards, or other features utilized by local residents. To address these effects on some of the reserves, mitigation measures such as reroutes have been proposed. For example, the corridor deviates from the existing TMPL right-of-way to skirt around the populated Coldwater No. 1 reserve.

A physical disturbance to IRs will result in a negative effect to the way in which individuals live, specifically in the case of populated reserves crossed by the pipeline corridor in proximity to residential areas (*e.g.,* Tzeachten No. 13). Further disruption may occur related to the presence of construction crews, sensory disturbance from construction equipment and vehicles, and access restrictions. However, opportunities exist for materials and equipment to be stored on some reserves, and some Aboriginal communities have offered to have temporary construction camps constructed on their land, should the opportunity arise.

Sixty-two Aboriginal communities have been identified as potentially affected by the Project in terms of traditional land use areas. Construction could disrupt subsistence and non-subsistence activities such as harvesting, hunting, trapping, fishing, gathering and recreation as well as other sites such as cultural and spiritual sites in these areas depending on time of year. Examples that were noted by Aboriginal participants during Project field studies include: disturbance to Mount Hope Lookout Trail, a recreational trail used by both Aboriginal and non-Aboriginal individuals in Hope, BC; disturbance to salmon habitat/spawning beds in the Fraser River and some tributaries; habitat loss for other species as a result of future right-of-way widening including disturbance to medicinal plants.

A physical disturbance to traditional territories will result in a negative effect to the way in which Aboriginal communities live. The presence of construction crews and equipment in addition to aesthetic disturbances and access restrictions will result from construction activities occurring within Aboriginal

traditional territories. Effects on specific traditional use areas and resources are assessed in Section 7.2.2 Traditional Land and Resource Use.

The impact balance of this residual effect is considered negative, but short-term in duration. The residual effect is considered to be of medium magnitude due to the potential to affect livelihoods and resources that have intrinsic cultural value including certain very specific, but not all, areas within reserves and traditional territories that may be affected. The residual effect is reversible in the short-term (*i.e.,* limited to the construction phase or periods of site-specific maintenance occurring within any 1 year of operations) (Table 7.2.4-3, point 2[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – physical disturbance will be confined to the area directly disturbed by Project construction.
- Duration: short-term – the event causing physical disturbance to IRs and asserted traditional territories is construction or periods of site-specific maintenance occurring within any 1 year of operations.
- Frequency: periodic – the event causing physical disturbance to IRs and asserted traditional territories is construction activity, or site-specific maintenance that would occur intermittently but repeatedly during the assessment period.
- Reversibility: short-term – the physical disturbance to IRs and asserted traditional territories is limited to the construction, or periods of site-specific maintenance that would occur within any 1 year during operations.
- Magnitude: medium – IRs will be disturbed, which may include some residential areas and features, resulting in a substantial impact to select areas; but for a community as a whole the effect is considered moderate as construction will occur only in select areas. Disturbance to asserted traditional territories may affect livelihoods and resources that have intrinsic cultural value and thus would be considered more than a nuisance or inconvenience.
- Probability: high – IRs and asserted traditional territories are crossed by the Project.
- Confidence: high – based on the location of the Project, feedback during engagement with Aboriginal communities, and the professional experience of the assessment team.

Change in Land Use Patterns

The construction and site-specific maintenance during operations, as well as any new right-of-way areas deviating from the existing TMPL may result in changes to access and use patterns within IRs and asserted traditional territories. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (points 2[b] and 2[c]). A discussion of these residual effects under the parks and protected areas indicator (points 1[b] and 1[c]), which includes IRs and asserted traditional territories as well as several other types of land uses, provides an explanation of the rationale of the significance criteria.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

The construction of the Project, and site-specific maintenance during operations, may result in the sensory disturbance for inhabitants of IRs and Aboriginal users of asserted traditional territories. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (point 2[d]). A discussion of this residual effect under the aesthetic attributes indicator (point 8[a]), which includes users of IRs and asserted traditional territories as well as several other user types, provides an explanation of the rationale of the significance criteria.

Combined Effects on Indian Reserves, Métis Settlements and Asserted Traditional Territories

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for IRs and asserted traditional territories evaluated in Section 7.2.4.6 (Table 7.2.4-3, points 2[a] to 2[d]) are of high probability and, consequently, were considered in the evaluation of combined effects on the Indian Reserves, Métis Settlements and asserted traditional territories indicator.

The overall Project-related terrestrial effects on the Indian Reserves, Métis Settlements and asserted traditional territories indicator relate primarily to the areas where physical disturbance and direct Project activities will occur. In populated IRs crossed by the proposed pipeline corridor, construction may disrupt residents and disturb features such as access roads, yards, or other features utilized by local residents. In order to mitigate the effects of the pipeline corridor on some of the reserves, mitigation measures such as reroutes have been proposed. Sixty-two Aboriginal communities have been identified as potentially affected by the Project in terms of traditional use areas. Construction and site-specific maintenance activities could disrupt subsistence and non-subsistence activities such as harvesting, hunting, trapping, fishing and recreation as well as other sites such as cultural and spiritual sites. The combined effects on the disruption of traditional land and resource activities are assessed in Section 7.2.2 Traditional Land and Resource Use.

The combined effect of the Project on IRs and asserted traditional territories is negative (Table 7.2.4-3, point 2[e]). The spatial boundary of the overall effect is the HORU RSA; while physical disturbance is limited to the Footprint, general use by Aboriginal community members may be affected beyond the final Project footprint due to access limitations and sensory disturbance. The overall effect is considered to be reversible in the short-term; effects will be limited to the construction phase or site-specific maintenance that would occur within any 1 year period during operations. The magnitude of the overall effect is medium since it may result in livelihood effects for Aboriginal communities, thus extending beyond that of a nuisance or inconvenience. A summary of the rationale for all of the significance criteria of combined effects on IRs and asserted traditional territories is provided below.

- Spatial Boundary: HORU RSA – nuisance sensory disturbance and access implications could extend beyond Footprint and HORU LSA.
- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – site-specific maintenance activities will occur intermittently but repeatedly throughout the assessment period.
- Reversibility: short-term – effects will be limited to the construction phase or site-specific maintenance that would occur within any 1 year period during operations.
- Magnitude: medium – change will be detectable and may have implications for traditional livelihoods (*i.e.,* more than a nuisance or inconvenience).
- Probability: high – given the location of the Project in relation to IRs and asserted traditional territories.
- Confidence: high – given the location of the Project and the professional experience of the assessment team.

HORU Indicator - Residential Use

The following provides the evaluation of significance of potential residual effects on the residential use indicator.

Physical Disturbance to Residential Areas

A key routing principle for the Project is to avoid residential disturbance to the greatest degree possible. For example, in the City of Kamloops the proposed pipeline corridor deviates from the existing TMPL right-of-way to avoid the residential community of Westsyde. However, urban development over the last

60 years has limited routing options in some locations (*e.g.* Fraser Valley and Metro Vancouver regions). As such, there are a number of residential areas crossed by the proposed pipeline corridor. It should be pointed out that no residential areas will be physical disturbed by construction of Project facilities (*i.e.,* tanks, pump stations). While certain terminals and pump stations are located in municipal/settled areas (*e.g.,* Edmonton Terminal, Blue River Pump Station, Kamloops Pump Station, Sumas Terminal, Burnaby Terminal, Westridge Marine Terminal), activity at these facilities will occur within the existing industrial facility boundaries thus not causing any physical disturbance to residential areas. Further details on residential areas in the vicinity of the Project can be found in Section 7.3 in the Socio-Economic Technical Report of Volume 5D. The proposed pipeline corridor crosses residential land use areas in the following areas.

- The northern portion of the proposed pipeline corridor in the Town of Edson (approximately RK 230 to RK 235) crosses residential neighborhoods and areas planned for future residential growth (Lemieux pers. comm.).
- The proposed pipeline corridor crosses an area of rural residential developments in the RDFFG from approximately RK 514 to RK 523 (Mceachen pers. comm.).
- In the District of Hope, the proposed pipeline corridor crosses areas zoned for country residential (approximately RK 1038.6, RK 1041.6, RK 1046.6 and RK 1047.6), single family residential approximately RK 1042.6, RK 1045.6, and RK 1046.6), multiple family residential (approximately RK 1044.6) and a mobile home park (approximately 1048.6) (District of Hope 2011).
- The Yarrow area (unincorporated community) of the City of Chilliwack is crossed by the proposed pipeline corridor (approximately RK 1102.5 to RK 1103.6 and RK1103.8 to 1108.0), as well as the Sardis neighbourhood (approximately RK 1098.1 to RK 1099.0 and RK 1099.8 to RK 1100.2) which is zoned for low density residential (City of Chilliwack 1998).
- The proposed pipeline corridor crosses areas zoned as Urban Residential in the City of Abbotsford (approximately RK 1117.5 to RK 1117.8, RK 1118.1 to RK 1118.5, RK 1119.0 and RK 1120.4 to RK 1121.3) (City of Abbotsford 2005).
- The proposed pipeline corridor crosses the Salmon River Uplands area of the Township of Langley (approximately RK 1146.6 to RK 1147.5), which is zoned for residential use (Township of Langley 1979).
- The proposed pipeline corridor crosses the Lougheed Neighbourhood (approximately RK 1173.6 to RK 1175.1), which is zoned for high and medium density apartments (approximately RK 1174.7 to RK 1174.9), compact one-family residential (approximately RK 1174.4 to RK 1174.6) and neighbourhood attached residential (approximately RK 1173.6 to RK 1174.2 and RK 1174.5 to RK 1174.7) (City of Coquitlam 2001a).
- The Westridge neighbourhood of the City of Burnaby is crossed by the proposed pipeline corridor (approximately RK 1181 to RK 1183).

There may be additional or fewer residential areas crossed, depending on right-of-way finalization. In residential use areas, construction may disturb features such as yards, fences, storage sheds, garages, or other features on residential properties. A physical disturbance to residential areas will result in a negative impact to the way in which some community members live, or on developers/municipal governments with plans for residential growth. The presence of construction crews and equipment in addition to aesthetic disturbances and access restrictions will result from construction activities occurring within residential areas. Aesthetic disturbances are assessed below under the aesthetics attributes indicator.

The impact balance for this residual effect is considered to be negative. Physical disturbance to residential areas will occur during the construction phase and short periods of site-specific maintenance and, therefore, is considered to be short-term in duration. The spatial boundary for this residual effect is the Footprint since physical disturbance will only occur in areas directly disturbed by construction and maintenance related activities.

This residual effect will have an impact on specific residential areas within some Socio-economic RSA communities and will affect the daily lives of occupants in those areas during construction. The magnitude of the effect may be severe for some residents in construction areas; however, for the communities as a whole that the Project crosses, the magnitude of the effect is anticipated to be medium given the Project will be focused on only specific areas within the community. Mitigation measures such as avoiding disturbance of built features (*e.g.*, residences, garages) during right-of-way finalization to the greatest extent practical and reduction of the amount of disturbed land by using previously disturbed areas for stockpiles will decrease the magnitude of this residual effect. Other key measures include providing compensation, considering various forms, to private land and property owners according to established industry protocols where losses or damages are proven, and consultation and communications measures with governments and residents regarding specific construction activities and schedules in residential areas. However, physical disturbance to residential areas will occur and, therefore, will result in a disruption to areas where individuals reside. The residual effect is reversible in the short-term (*i.e.,* limited to the construction phase or periods of site-specific maintenance) (Table 7.2.4-3, point 3[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – physical disturbance will only occur in areas directly disturbed by construction activities.
- Duration: short-term – the event causing a physical disturbance to residential areas is construction of the Project or site-specific maintenance.
- Frequency: periodic – the event causing a physical disturbance to residential areas initiates during construction, but will occur intermittently but repeatedly associated with site-specific maintenance.
- Reversibility: short-term – the physical disturbance to residential areas during construction is limited to the construction phase and periods of site-specific maintenance that would occur within any 1 year during operations.
- Magnitude: medium – residential areas and features will be physically disturbed, resulting in a severe impact to select community members; but for a community as a whole, the effect is considered moderate as disturbance will occur only on select areas.
- Probability: high – residential areas are being crossed by the proposed pipeline corridor.
- Confidence: high – based on an understanding of Project information, information from land use plans and stakeholder consultation, and the professional experience of the assessment team.

Change in Land Use Patterns

The construction of the Project, and site-specific maintenance during operations, may result in the disruption to access and use patterns of residential areas. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (point 3[b]). A discussion of this residual effect under the parks and protected areas indicator (point 1[b]), which includes residential use areas as well as several other types of land uses, provides an explanation of the rationale of the significance criteria.

Physical Disturbance to Community Use Areas

Physical disturbance to community use areas during construction will occur in some places along the proposed pipeline corridor. Community use areas are any area utilized widely by community members for personal, social, formal or informal gatherings. This includes schools, playgrounds, outdoor recreation sites and other public facilities.

Community use areas in the proposed pipeline corridor and the HORU LSA include the following.

- The TUC in Strathcona County is used for recreational activities including hiking, dog walking and rugby (approximately RK 3 to RK 11).
- In the Town of Edson, a community use area is utilized for baseball tournaments (Vision Park) in the summer months (approximately RK 228.8 to RK 229.6). It is the preference of the town that

construction avoid the summer months (Lemieux pers. comm.), when these community use areas are in high demand.

- A number of municipal parks are crossed by the proposed pipeline corridor or are in the HORU LSA, as listed in Table 5.4.1-2 in Section 5.4.
- A number of school properties are crossed by the proposed pipeline corridor or are in the HORU LSA, as discussed in Section 5.5.
- Further details on community assets and use areas in the proposed pipeline corridor can be found in Section 6.0 of the Socio-Economic Technical Report of Volume 5D.

The impact balance for this residual effect is considered to be negative, since community use activities would be disrupted, which could have a detrimental effect on community way-of-life during construction. Physical disturbance to community use areas will occur during construction and periods of site-specific maintenance and, therefore, is considered to be short-term in duration. The spatial boundary for this residual effect is the Footprint since physical disturbance will only occur in areas directly disturbed by construction.

This residual effect will have an impact on the lives of residents from across the community who utilize the assets and, therefore, is considered to be of medium magnitude. Mitigation measures such as consultation with affected stakeholders, reduction of the amount of disturbed land through the use of previously disturbed areas for stockpiles, and narrowing of the right-of-way in key areas will decrease the magnitude of the residual effect. Also construction scheduling will consider avoidance of key community events and use of community areas to the extent practical (*e.g.,* fall/winter construction timing in the Town of Edson will avoid disruption of use in parks and baseball diamonds). However, the potential for Project construction to disturb areas such as school fields means that this residual effect is more than a nuisance. The residual effect is reversible in the short-term (*i.e.,* limited to the construction phase or periods of site-specific maintenance occurring within any 1 year of operations) (Table 7.2.4-3, point 3[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – physical disturbance will only occur in areas directly disturbed by construction related activities.
- Duration: short-term – the event causing a physical disturbance to community use areas is construction or periods of site-specific maintenance.
- Frequency: periodic – the event causing a physical disturbance to community use areas initiates during construction but may occur intermittently but repeatedly during the assessment period related to site-specific maintenance.
- Reversibility: short-term – the physical disturbance to community use areas during construction is limited to the construction phase of the Project or periods of site-specific maintenance that would occur within any 1 year of operations.
- Magnitude: medium – community use areas will be physically disturbed, resulting in a detectable effect and moderate modification in the socio-economic environment.
- Probability: high – community use areas are crossed by the proposed pipeline corridor.
- Confidence: high – based on an understanding of Project details and the professional experience of the assessment team.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

The construction of the Project, and site-specific maintenance during operations, may result in the sensory disturbance for inhabitants of residential use areas. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (point 3[d]). A discussion of this residual effect under the aesthetic

attributes indicator (point 8[a]), which includes residential area users as well as several other user types, provides an explanation of the rationale of the significance criteria.

Combined Effects on Residential Use Areas

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for residential use areas evaluated in Section 7.2.4.6 (Table 7.2.4-3, points 3[a] to 3[d]) are of high probability and, consequently, were considered in the evaluation of combined effects on the residential use areas indicator.

The combined Project-related terrestrial effects on residential use areas considers the effects of physical disturbance to residential and community use areas during construction, changes in access and use patterns due to construction activities, and sensory disturbance related to construction and site-specific maintenance. There will be effects on private residential properties, as well as more broadly-used community assets within residential areas (*e.g.,* school fields, municipal parks, other recreation areas).

The overall Project effect on residential use areas is negative. The spatial boundary is regional, as nuisance noise and air emissions from construction and site-specific maintenance may extend beyond the Footprint and HORU LSA, and access to certain residential areas may be altered. While Trans Mountain will be employing best practices in urban construction and numerous noise abatement and traffic control measures, the overall effect is considered medium. Residential areas and features will be physically disturbed, resulting in a substantial effect to select areas; but for a community as a whole, the effect is considered medium as construction and site-specific maintenance will occur only on select areas and many community members will be unaffected. The probability of an effect on residential areas is high given the location of the Project (Table 7.2.4-3, point 3[e]). A summary of the rationale for all of the significance criteria of combined effects on residential use areas is provided below.

- Spatial Boundary: HORU RSA – effects on residential use areas pertaining to access and sensory disruption may extend beyond the Footprint and HORU LSA.
- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – the events causing the effects would occur during construction, but also site-specific maintenance which will occur intermittently but repeatedly throughout the assessment period.
- Reversibility: short-term – effects will be limited to the construction phase or site-specific maintenance that would occur within any 1 year period during operations.
- Magnitude: medium – change will be detectable, but construction and site-specific maintenance will occur only in select residential areas within a community.
- Probability: high – residential and community use areas are crossed by the proposed pipeline corridor.
- Confidence: high – based on an understanding of Project details and the professional experience of the assessment team.

HORU Indicator - Agricultural Use

The following provides the evaluation of significance of potential residual effects on the agricultural use indicator.

Change in Land Use Patterns

The construction of the Project, and site-specific maintenance during operations, may result in changes to access and use patterns within agricultural use areas. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (point 4[a]). A discussion of this residual effect under the parks and protected areas indicator (point 1[b]), which includes agricultural use areas as well as several other types of land uses, provides an explanation of the rationale of the significance criteria.

Effects on Livestock and Agricultural Plants due to the Introduction of Pests and Diseases

The Project passes through various areas of agricultural land use, including natural pasture and grazing areas, field crop areas, organic and specialty crop areas, and areas with livestock and poultry facilities. Trans Mountain will implement mitigation measures that limit or reduce the likelihood of risk to livestock and agricultural plants; however, there is a potential, albeit very low likelihood, for a residual effect related to the introduction of pests and disease.

Other potential risks to livestock and agricultural plants will be reduced through the successful implementation of mitigation measures. Potential effects related to grazing animals include the physical disturbance to grazing areas during construction, restriction of access to grazing areas, isolating livestock from drinking water sources, and issues related to using fences and gates to keep livestock in designated grazing areas. Potential effects associated with animals in facilities include: noise and vibration effects, livestock management disruptions, potential weed infestations, interference with watering systems, and productivity loss. However, the potential effects of disruption or risk to livestock are anticipated to be reduced through the implementation of the proposed agricultural mitigation measures provided in Table 7.2.4-2 which includes enabling grazing livestock to access and use natural pasture and grazing in areas isolated from construction activities; maintaining all fences and gates; keeping watering systems connected during construction or providing alternate water sources for livestock; relocating directly affected paddocks, pens, and other containment areas away from construction; and a wide range of weed management measures. Weed management is discussed further below.

Ensuring that pests do not infest plants or animals on farms and ranches is an important part of agricultural management. Although there is a possibility that pipeline construction activity may introduce pests and diseases to crops, poultry and/or livestock, poultry facilities have stringent biosecurity protocols that have either federal or provincial oversight. General biosecurity measures are in place to prevent diseases from other parts of the world spreading to the Canadian livestock industry; federal restrictions include a quarantine period before entering farm properties after travelling abroad and the disinfection of clothing and footwear. All access to farms during pipeline construction will be managed within these biosecurity protocols. Nurseries operate under biosecurity plans, prepared with federal and/or certifying body oversight, to control the spread of pests and disease. Such plans may restrict entry to the nursery and the importation of soil and plant material. Pipeline equipment and personnel will be required to follow each affected facility's biosecurity plan. During the operations phase, any short-term access to the right-of-way for maintenance purposes could have the same effects on biosecurity, and similar protocols will be followed.

Overall, any risk to, or loss of, livestock or agricultural plants due to the infestation of pests and disease would be considered an accidental breach of biosecurity protocols and mitigation measures and, therefore, is considered to have low probability of occurrence. Mitigation measures have been developed to minimize the risk of pest and disease introduction, including: washing and disinfecting vehicles and equipment arriving from other jurisdictions or that have been used on other operations; banning importation of plants, soils or organic matter to nurseries; restricting staff and vehicle entry to areas with nurseries or livestock facilities, and the use of footbaths (see Table 7.2.4-2 and the Agricultural Management Plan in the Pipeline EPP of Volume 6B). The duration of a potential residual effect of loss of livestock or plants due to the introduction of pests and disease is considered short-term, since the event causing the effect would be construction activities or site-specific maintenance that would occur within any 1 year during operations. The reversibility of the residual effect is considered medium-term, as most pests and diseases can be controlled or supressed within a 10 year period. The magnitude of the effect, if it were to occur, is considered high, as contamination by a pest or disease may lead to loss of poultry, livestock, or plants and quarantine and destruction of poultry, livestock or plants inventory (see Table 7.2.4-3, point 4[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – an introduced infectious disease or pest could spread beyond the Footprint and into the HORU LSA.

- Duration: short-term – the event causing the loss of livestock or plants is the construction of the pipeline or site-specific maintenance occurring within any 1 year during operations.

- Frequency: accidental – the event that could cause a loss of livestock or plants is a breach of biosecurity protocols which would be a rare occurrence.

- Reversibility: medium-term – most pests or diseases can be controlled or supressed within 10 years.

- Magnitude: high – contamination by a pest or disease may lead to loss of poultry, livestock or plants and quarantine and destruction of poultry, livestock or plants.

- Probability: low – the potential residual effect is unlikely to occur given the biosecurity protocols and mitigation measures in place.

- Confidence: high – there is a good understanding of the cause-effect relationship between the introduction of pests and diseases in poultry, livestock and plants based on research and the professional experience of the assessment team.

Reduced Crop Yields Due to Introduction of Weeds

In areas where the proposed pipeline corridor crosses field crop areas, there is the potential for reduced crop yields due to the introduction of weeds. The establishment of weeds on agricultural land can lead to lower crop production as weeds compete for light, water and nutrients with agricultural crops. Early in the growing season, crops and weeds may co-exist without substantially impacting each other. However, as plant size increase, weeds will often out-compete crops. Weeds and weed seeds can be transported by construction equipment and on shoes and clothing of construction workers. Movement of equipment between agricultural operations may also carry topsoil and organic matter between properties. The introduction of weeds can also reduce grass yields on range land since weeds tend to out-compete forage grasses. Weeds and weed seeds can also be transported in vehicles and clothing during routine access along the pipeline right-of-way for maintenance and observations during the operations phase. A number of mitigation measures will be implemented during Project construction and operation to minimize and manage the risk of weed introduction, including: conducting a pre-construction weed survey of agricultural lands; ensuring equipment arrives at all construction sites clean and free of soil or vegetative debris; monitoring weed growth on topsoil/root zone material piles and spraying if allowed and warranted; cleaning equipment involved in topsoil and root zone material handling at weed-infested sites prior to leaving the location; and monitoring the right-of-way as part of the post-construction environmental monitoring program for weed growth and, where warranted, implementation of remedial measures (*e.g.,* mowing, spraying) to control weed growth (see Table 7.2.4-2).

Mitigation measures outlined in the Pipeline EPP of Volume 6B, and Table 7.2.4-2, are proven and effective industry standard measures to reduce the introduction and spread of weeds. These measures will be implemented during both construction and maintenance activities. Experience during past pipeline construction programs on agricultural lands has revealed that, while weed infestations were encountered post-construction, the implementation of appropriate mitigation measures during construction limited weed issues (Alliance Pipeline Limited Partnership 2002; Enbridge Pipelines Inc. 2000, 2002; Interprovincial Pipe Line Inc. 1995; TERA 2012). In addition, the final post-construction environmental monitoring report for the TMX Anchor Loop Project indicated that after 5 years, the post-construction vegetation management program had effectively controlled or suppressed non-native invasive broadleaf species of concern along and off the right-of-way (TERA 2013). The residual effect of reduced crop yields due to weed introduction is considered short-term in duration, as the causal event is construction activity and limited periods of site-specific maintenance. The frequency would be considered periodic since it is related to periods of construction and site-specific maintenance (*e.g.,* integrity digs) which would occur intermittently but repeatedly over the assessment period. The magnitude of crop loss due to weeds is considered low, as any proven economic loss would be compensated for. The probability of crop loss due to weeds, in the context of stringent and effective mitigation, is low; while it is likely that some weeds and invasive species that are known to occur along the pipeline corridor may be exacerbated in crop areas despite mitigation measures, it is unlikely they would substantially effect crop yields (see Table 7.2.4-3, point 4[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – it is possible for weeds in the Footprint to be spread into adjoining agricultural areas.

- Duration: short-term – the events causing weed introduction occur during the construction phase (pipeline installation) or within any 1 year during the operations phase (*e.g.,* site-specific maintenance activities such as integrity digs).

- Frequency: periodic – the events causing reduced crop yield due to the introduction of weeds are confined to the construction phase of the Project and site-specific maintenance activities which occur intermittently but repeatedly over the assessment period.

- Reversibility: medium-term – weeds can be eliminated by mechanical and chemical methods as described in Table 7.2.4-2.

- Magnitude: low – any reduced crop yields due to incremental weed infestation would be detectable and not acceptable to the landowner under normal farming conditions; however, farmers will be compensated for proven crop loss.

- Probability: low – although there are mitigation procedures in place to prevent weed transmittal and establishment as well as to control weeds during operations, weeds and invasive, non-native species are known to occur along the proposed pipeline corridor and some weed transmittal may occur. However, in the context of the successful implementation of effective mitigation measures, it is unlikely that weed introduction or spread arising from Project construction or operations activities would impact crop yield.

- Confidence: high – given the demonstrated success of pipeline-related weed management practices, a good understanding of the cause-effect relationship between weeds and crop yields, and based on research and the professional experience of the assessment team.

Reduced Crop Yields Due to Deep Soil Compaction

For fine-textured or wet subsoils, there is an increased risk of subsoil compaction resulting from pipeline construction and site-specific maintenance, which may cause reductions in crop yield. Types of agricultural production that may be affected include tame pasture and hay fields, corn/grass forage rotation, mixed vegetable crops, dry land field crops (Alberta), irrigated forage, turf production and organic crop production. A range of mitigation measures will be implemented to reduce the likelihood of this effect including: surveying soils in advance of construction to identify fine to medium-textured soils; layering soils back into the trench in the reverse sequence to which they were excavated; compacting soil only where required for geotechnical reasons; reducing vehicle traffic in the Footprint; deep ripping or ploughing to remove compaction prior to replacing topsoil; and deep ploughing (*i.e.,* Paratilling) at locations where subsoil compaction is present and topsoil salvage was not conducted (see Table 7.2.4-2).

Despite mitigation measures, deep soil compaction could occur which may affect crop productivity. This residual effect would be limited to the Footprint. It would be short-term in duration and periodic in frequency (*i.e.,* caused by construction or site-specific maintenance which would occur intermittently and repeatedly over the assessment period). The potential residual effect of crop loss due to deep soil compaction would be reversible in the medium to long-term. Mitigation measures such as paratilling can alleviate most locations where deep compaction has occurred; however, deep soil compaction may affect crop yields beyond the first 10 years of operations depending on the severity of the compaction and the effectiveness of paratilling or other measures. Reduced crop yields due to Project-related compaction are unlikely to occur, given the mitigation measures in place. The magnitude of the potential residual effect if it were to occur is anticipated to be low, since compensation in some form would be negotiated for any proven crop loss (see Table 7.2.4-3, point 4[d]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – soil may be compacted by equipment and vehicles along the construction right-of-way.

- Duration: short-term – the event causing the deep soil compaction occurs during the construction phase (*e.g.,* pipeline installation) or within any 1 year during the operations phase (*e.g.,* site-specific maintenance activities such as integrity digs).

- Frequency: periodic – the event causing the deep soil compaction (*i.e.,* soil handling during construction or during site-specific maintenance activities) occurs intermittently but repeatedly over the assessment period.

- Reversibility: medium to long-term – mitigation measures such a Paratilling can alleviate most locations where deep compaction has occurred; however, deep soil compaction may affect crop yields beyond the first 10 years of operations depending on the severity of the compaction and the effectiveness of Paratilling or other measures.

- Magnitude: low – any reduced crop yields due to deep soil compaction will be detectable and not acceptable to the landowner under normal farming conditions; however, farmers will be compensated in some form for proven crop loss where deep compaction could not be alleviated.

- Probability: low – mitigation measures, such as limiting construction access, will reduce the risk of deep soil compaction.

- Confidence: high – there is a good understanding of the cause-effect relationship between deep soil compaction and crop yields based on research and the professional experience of the assessment team.

Reduced Crop Yields Due to Deep Tillage Restriction

In certain areas of the Fraser Valley and Metro Vancouver regions, farmers regularly use a tillage practice called subsoiling (*e.g.* using paratilling or other subsoiling implements) which is ploughing the land below the normal ploughing depth to break up the subsoil or plough pan. Tillage refers to the preparation of soil for planting or weed control by any mechanical activity. This practice is conducted in fine-textured soils to improve the drainage characteristics of the soil. Deep tillage often extends down to 75 cm below the surface.

Normal agricultural activities on the right-of-way such as disking to a depth of 30 cm (12 inches) are allowed without any special consent from the pipeline company. Any ground disturbances greater that 30 cm (12 inches), such as deep plowing or tilling within 30 m (100 feet) of the pipeline, require written permission from the pipeline company, as per the *NEB Act* and the *NEB Pipeline Crossing Regulations.* In theory, if pipeline depth restricted deep tillage this could result in chronically reduced crop yields in some areas.

However, it is anticipated that the pipeline will be installed at an adequate depth to allow for deep tillage and subsoiling where deep rooted crops are grown and the practice is commonly used. Any instances where pipeline depth may need to vary from standard practice will be determined through working with landowners as per normal industry practice. The construction Line List will identify crop tilling practices that may require deeper pipe burial. Consequently, it is unlikely that reduced crop yields due to restrictions of deep tillage will occur. In the likely event it were to occur, such a residual effect would only occur in the Footprint, specifically on the pipeline right-of-way and at select locations where deep tilling is undertaken. The event causing the effect would be the construction of the pipeline at standard depth, therefore, the duration of the potential residual effect is considered short-term (see Table 7.2.4-3, point 4[e]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – the residual effect is confined to the Footprint and only in certain locations where deep tillage is commonly undertaken.

- Duration: short-term – the event potentially causing the restriction on deep tillage is the installation of the pipeline during construction.

- Frequency: isolated – the event potentially causing deep tillage restriction is inadequate pipeline depth during the construction of the pipeline.

- Reversibility: long-term – the residual effect would be reversed with decommissioning and abandonment of the pipeline. While the inert pipeline may remain in the ground after abandonment, a process will be established to facilitate its removal where there is a compelling reason.

- Magnitude: low – the residual effect is chronic depressed yields only where deep tillage is not allowed.

- Probability: low – soils requiring deep tillage are identified, tillage depth requirements are known, and the pipeline will be buried at adequate depth.

- Confidence: high – there is a good understanding of the cause-effect relationship between deep tillage and crop yields based on research, which indicates deep tillage is needed in some agricultural soils to provide adequate drainage for crops, and the professional experience of the assessment team.

Reduced Crop Yields Due to Future Subsurface Drainage Restriction

If the pipeline is not buried at a depth that allows the installation of subsurface drain lines in areas where drainage is required, the pipe could potentially obstruct existing and future drain lines leading to saturated soils and crop loss. This potential residual effect, however, is unlikely to occur, given the anticipated depth of burial of the pipe and mitigation measures that are in place to identify soils requiring subsurface drainage. Working with landowners as per standard industry practices will identify any locations where future subsurface drainage may be affected and site-specific measures will be identified.

In the unlikely circumstance that crop loss was identified due to future subsurface drainage restriction, compensation in some form would be negotiated to offset proven economic loss, and, therefore, the magnitude is anticipated to be low. The duration of the potential effect is considered short-term as it would be caused by the construction of the pipeline. The frequency is considered isolated, since the event causing the effect (*i.e.,* installation of the pipeline*)* is confined to the construction phase. Reduced crop yields due to residual subsurface drainage restriction could extend beyond the Footprint into the HORU LSA (see Table 7.2.4-3, point 4[f]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – the inability to install subsurface drainage may restrict drainage and affect crop yields beyond the Footprint.

- Duration: short-term – the event causing subsurface drainage restriction in the future is the construction of the pipeline.

- Frequency: isolated – the event causing restricted future installation of subsurface drainage is confined to a specific phase of the assessment period (*i.e.,* construction).

- Reversibility: long-term – the residual effect would be reversed with decommissioning and abandonment of the pipeline. While the inert pipeline may remain in the ground after abandonment, a process will be established to facilitate its removal where there is a compelling reason.

- Magnitude: low – any reduced crop yields due to restriction of future installation of subsurface drainage will be detectable and not acceptable to the landowner under normal farming conditions; however, farmers will be compensated in some form for proven crop loss where drainage restriction could not be avoided or alleviated.

- Probability: low – soils requiring subsurface drainage will be identified in consultation with landowners and appropriate pipe depth installation can be performed.

- Confidence: high – there is a good understanding of the cause-effect relationship between subsurface drainage and crop yields and the professional experience of the assessment team.

Reduced Crop Yields Due to Temperature Effects of the Pipeline in the Root Zone

Anecdotal evidence presented during the Abbotsford ESA Workshop indicated that in the Fraser Valley snow melt occurred earlier over a pipeline (there was no differentiation between gas and oil pipelines) compared to off right-of-way areas. Temperature effects on soil, it was indicated, can affect late harvested crops such as corn and some fall-harvested field vegetables. Due to snow melt, these crops would

germinate earlier and reach harvest size earlier. This differential germination and growth may interfere with the harvesting process.

However, no specific effects have been attributed to oil pipelines. The temperature effect was modeled for the Keystone XL pipeline, a system that is planned to transport 900,000 bpd of crude through a 36 inch line placed at a depth of 5.5' (180 cm) measured from the center of pipe. The results of the modeling work related to the Keystone XL pipeline indicated that some raised soil temperatures were found at the surface and at 6 inches (15 cm) below the ground level in early spring. The Keystone XL pipeline has summer oil temperatures higher than in the winter, and higher temperatures at the end of the line compared to the start of the line (summer: 70°F – 135°F or 21°C – 57°C; and winter: 55°F – 100°F or 12°C to 37°C), It was concluded that Keystone did not anticipate that the operation of the pipeline would result in significant effects to surficial soil temperatures, particularly during the growing season (Keystone XL 2009).

The TMEP pipeline will be operated at temperatures between 10 and 30^{o}C, which is lower that the Keystone XL pipeline. Further the TMEP line will operate in a more northern (cooler) climate than where the effects where anticipated for the Keystone XL pipeline. The pipeline could cause some snow melt during the winter or early spring and early crops may germinate somewhat early, and over wintering crops may initiate growth earlier in the spring. However, effects on late crops such as corn may be beneficial.

In addition, the review of several post-construction environmental monitoring reports of oil pipelines in western Canada (primarily Alberta) indicate that, in general, crop growth on and off right-of-way are comparable and that the construction right-of-way was not visually distinguishable from the rest of the surrounding land use (TERA 1995, 1996, 2000, 2001a, 2002, 2003, 2004, 2009a, 2011a-c, 2012a-c, 2013a-c). Further, Trans Mountain indicates there have been no claims of crop loss due to temperature effects in its 60 year operating history. It is concluded that the effects of soil temperature from an operating oil pipeline on crop growth are limited.

Overall, the probability of reduced crop yields due to temperature effects of the pipeline is low, as the effect is considered unlikely to occur. The effect, if it were to occur, would be limited to the Footprint, specifically the area over and immediately adjacent to the pipeline. The duration of the effect would be long-term, and the frequency continuous, as it would be caused by the operations of the pipeline. The effect would be reversed once the pipeline was decommissioned. If it were to occur, however, any proven crop loss would be compensated for in some form; as such the magnitude of the potential effect is considered low (see Table 7.2.4-3, point 4[g]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary**:** Footprint – temperature effect would occur in soils immediately around the pipe.
- Duration: long-term – the event causing temperature effects on soil is the operations of the pipeline.
- Frequency: continuous – the event causing the potential residual effect is the operation of the pipeline; however, the effect would only occur in areas of frozen ground.
- Reversibility: long term – the potential residual effect on soil temperature and crop yields would last as long as the pipeline operates.
- Magnitude: low – any reduced crop yields due to temperature effects would be detectable and not acceptable to the landowner under normal farming conditions; however, farmers will be compensated for proven crop loss.
- Probability: low – crop loss due to temperature effects of the pipeline are considered unlikely to occur.
- Confidence:moderate – based on available research about cause and effect relationship between crop yield and oil pipeline temperature, information pertaining to current operations, and the professional experience of the assessment team.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

The construction and site-specific maintenance of the Project may result in the sensory disturbance of Aboriginal and non-Aboriginal local residents and land users. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (point 4[h]). A discussion of this residual effect under the aesthetic attributes indicator (point 8[a]), which includes users of agricultural lands as well as several other user types, provides an explanation of the rationale of the significance criteria.

Combined Effects - Agricultural Land Use

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. Only some of the potential residual socio-economic effects for agricultural use areas evaluated in Section 7.2.4.6 are of high probability (Table 7.2.4-3, points 4[a] and 4[h]) and, consequently, only these potential residual effects were considered in the evaluation of combined effects on the agricultural use indicator.

The combined Project-related effects on agricultural use areas considers the effects of physical disturbance to a range of agricultural uses including: natural pasture and grazing areas; disruption to livestock movement and grazing patterns; disturbance to field crop areas and organic/specialty crop areas; and the disruption of farm facilities. The probability that all potential residual effects would affect a given farm is extremely low. The probability of one or more residual effects occurring at some location or locations over the entire length of the pipeline during construction and operations is, however, likely. If crop or animal loss was identified, compensation in some form would be negotiated to offset proven economic loss.

The likely residual effects are anticipated to be changes in access and use patterns for farmers during construction and site-specific maintenance, as well as sensory disturbance for farmers and livestock. In general, it is possible that agricultural land use patterns (*e.g.* grazing) could be disrupted due to restrictions in access to certain parts of properties. There would also be an inability to use land for crops during defined periods of construction and site-specific maintenance, and crops would be lost for specific periods of activity. Access restrictions during these periods may also affect livestock on grazing range and in forest used for grazing, and some livestock operations may have paddocks, corrals or other fenced facilities that may be disturbed which would disrupt the facility's operations. There will unavoidably be periods during construction and site-specific maintenance where agricultural land will be disturbed, but a wide range of mitigation measures has been developed to minimize negative effects on farmers. These are outlined in the Agricultural Management Plan in Volume 6B, and include measures addressing soil disturbance and compaction, potential weed infestations, avoidance of the introduction of pests and diseases, cutting of drainage and irrigation lines, grazing disturbance, public access, livestock management, tillage restrictions, and compensation for crop and productivity loss where required.

For further details on potential effects related to agriculture, refer to the Agricultural Assessment Technical Report in Volume 5D.

The overall combined effect on agricultural use is considered negative, but reversible in the short-term. The events that will cause effects on agricultural use are construction and site-specific maintenance and thus the duration is considered short-term. The frequency of the combined effect is considered periodic, as it will be focused during construction but will occur intermittently but repeatedly during the assessment period due to site-specific maintenance. The magnitude is considered low to medium; sensory disturbance is considered low in magnitude as it is likely to be limited to that of an inconvenience or nuisance for farmers/operators, but physical disruption of agricultural land may cause a moderate change to the socio-economic environment in some instances, in terms of farmers having to alter their farming/harvesting practices to accommodate pipeline activity (Table 7.2.4-3, point 4[i]). A summary of the rationale for all of the significance criteria of combined effects on agricultural use is provided below.

- Spatial Boundary: HORU RSA – effects on agriculture through disruption to use and sensory disturbance may extend beyond the Footprint and HORU LSA.

- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – effects will be caused by construction and site-specific maintenance that will occur intermittently but repeatedly throughout the assessment period.
- Reversibility: short-term – effects will be limited to the construction phase or site-specific maintenance that would occur within any 1 year period during operations.
- Magnitude: low to medium – sensory disturbances may be limited to that of an inconvenience or nuisance (low); disturbance to farming areas and crops will require agricultural users to alter their farming/harvesting practices (medium).
- Probability: high – agricultural land and farms are crossed by the proposed pipeline corridor.
- Confidence: high – based on an understanding of Project details, research, stakeholder interviews, and the professional experience of the consultants.

HORU Indicator – Outdoor Recreation Use

The following provides the evaluation of significance of potential residual effects on the outdoor recreation use indicator.

Decrease in Quality of the Outdoor Recreational Experience of Aboriginal and Non-Aboriginal Resource Users

Construction

The outdoor recreational experiences of Aboriginal and non-Aboriginal resource users, such as camping, quadding, canoeing, trail rides, hunting, wildlife viewing and fishing activities may be affected by the physical disturbance of outdoor recreation areas during pipeline construction. Outdoor water and land based recreation areas - such as trails and trailheads, waterways, parks and protected areas - may be disturbed by construction of the Project. For example, the Hinton Mountain Bike Trails (approximately RK 322 to RK 324), Hope Mountain Trail (approximately RK 1045) and Ledgeview Golf Course (approximately RK 1118.8 to RK 1119.8), several provincial parks, and many municipal parks will be disturbed. Nuisance air emissions, noise and visual effects may also occur during the construction of the Project and affect all land users living, working or recreating in the vicinity of the final right-of-way. Aesthetic disturbances are assessed below under the aesthetics attributes indicator.

The impact balance of this residual effect is considered negative; however, mitigation measures designed to communicate construction locations and timing to the users in the vicinity of the proposed pipeline corridor will lessen the effect, since users will have the opportunity to choose an alternate location for recreational pursuits. Given the relatively short construction period at any given location, use of well-maintained equipment and limiting idling of equipment, the residual effect is considered to be of low magnitude and reversible in the short-term (Table 7.2.4-3, point 5[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU RSA – sensory disturbances caused by construction can extend into the HORU LSA and HORU RSA.
- Duration: short-term – the event causing the effect is construction activity.
- Frequency: isolated – the event causing the effect is confined to a specific period (*i.e.,* construction).
- Reversibility: short-term - the residual effect is limited to the construction phase.
- Magnitude: low – change may be detectable, but will primarily be that of an inconvenience or nuisance.
- Probability: high – Project construction activity will occur in areas used for outdoor recreation.

- Confidence: high – based feedback from stakeholders, location of the Project, and the professional experience of the assessment team.

Site-Specific Maintenance Activities

The outdoor recreational experience of Aboriginal and non-Aboriginal resource users, such as camping, quadding, canoeing, trail rides, hunting, wildlife viewing and fishing activities may be affected by site-specific maintenance. Use of outdoor water and land based recreation areas, such as trails and trailheads and waterways, may be disturbed or disrupted by site-specific maintenance. Site-specific maintenance (*e.g.*, aerial patrols, vegetation management, integrity digs) will occur periodically throughout the operations phase of the Project. These activities will involve workers and equipment that could result in nuisance air and noise emissions.

The impact balance of this residual effect is considered neutral to negative. Where the proposed pipeline corridor is along the existing TMPL right-of-way these activities will be comparable to existing TMPL operations and not considered to be a change. The effect is considered potentially negative only in areas where the proposed pipeline corridor deviates from the existing TMPL right-of-way. The magnitude of this effect will be reduced through the use of well-maintained equipment, by limiting the idling of equipment and by scheduling activities to avoid peak recreational use times where practical. The residual effect is reversible in the short-term since site-specific maintenance activities will be completed within any 1 year of operations (Table 7.2.4-3, point 5[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU RSA – noise and air emissions caused by from site-specific maintenance activities can extend into the HORU LSA and HORU RSA.
- Duration: short-term – site-specific maintenance will be completed within any 1 year during operations.
- Frequency: periodic – the event causing the effect (*i.e.,* site-specific maintenance activities) occurs intermittently but repeatedly over the assessment period.
- Reversibility: short-term – site-specific maintenance will be completed in any 1 year during operations.
- Magnitude: low – change may be detectable, but will primarily be that of an inconvenience or nuisance.
- Probability: high – site-specific maintenance activities will be required as part of regular operations and will involve the use of heavy and light equipment and vehicles.
- Confidence: high – based on Project information and the professional experience of the assessment team.

Change in Land Use Patterns

The construction, site-specific maintenance and ongoing operations of the Project may result in changes to access and use patterns of outdoor recreational use areas. The significance evaluation of these residual effects is provided in Table 7.2.4-3 (points 5[c] and 5[d]). A discussion of these residual effects under the parks and protected areas indicator (points 1[b] and 1[c]), which includes outdoor recreational use areas as well as several other types of land uses, provides an explanation of the rationale of the significance criteria.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

The construction of the Project, and site-specific maintenance during operations, may result in the sensory disturbance for outdoor recreation area users. The significance evaluation of this residual effect

is provided in Table 7.2.4-3 (point 5[e]). A discussion of this residual effect under the aesthetic attributes indicator (point 8[a]), which includes outdoor recreation area users as well as several other user types, provides an explanation of the rationale of the significance criteria.

Combined Effects on Outdoor Recreation Use Areas

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for outdoor recreation use areas evaluated in Section 7.2.4.6 (Table 7.2.4-3, points 5[a] to 5[e]) are of high probability and, consequently, were considered in the evaluation of combined effects on the outdoor recreation use areas indicator.

The combined Project-related effects on terrestrial outdoor recreation use areas considers that construction activities may cause change to access and use patterns, as well as sensory disturbance, that may result in an overall decrease in quality of the outdoor recreational experience for Aboriginal and non-Aboriginal users. During the operations phase, where the proposed pipeline corridor deviates from the existing TMPL right-of-way, new right-of-way may improve access for outdoor recreation use. While there may be improvements in outdoor access in the deviated areas, there are small numbers of re-routes in areas of high outdoor recreation use. On balance, the overall effect is related primarily to short-term disturbance associated with construction and site-specific maintenance and thus is considered negative (Table 7.2.4-3, point 5[f]). A summary of the rationale for all of the significance criteria of combined effects on outdoor recreational use areas is provided below.

- Spatial Boundary: HORU RSA – sensory disturbances for recreationalists from construction and site-specific maintenance may extend into the HORU LSA and HORU RSA.
- Duration: short-term – events causing the effects will be construction activity or site-specific maintenance that would occur within any 1 year period during operations.
- Frequency: periodic – though construction activities are isolated, site-specific maintenance activities will occur intermittently but repeatedly over the assessment period.
- Reversibility: short-term – effect will occur during construction and site-specific maintenance that will be completed in any 1 year during operations.
- Magnitude: low – change will be detectable, but will primarily be that of an inconvenience or nuisance.
- Probability: high – Project activity will occur in outdoor recreation use areas.
- Confidence: high – based on Project information and the professional experience of the assessment team.

HORU Indicator - Other Land and Resource Use

The following provides the evaluation of significance of potential residual effects related to non-traditional, non-recreational trapping, hunting and fishing (including guide-outfitting); managed forest areas; subsurface activities (mineral, aggregates and oil and gas resources); and water-based activities. These activities are included in the other land and resource use indicator.

Disruption of Outfitting and Non-Traditional Non-Recreational Trapping, Hunting and Fishing Activities of Aboriginal and Non-Aboriginal Land Users During Construction

Outfitting, non-traditional non-recreational trapping, hunting and fishing activities occur along the proposed pipeline corridor and throughout the HORU RSA. In the HORU RSA, outfitting primarily occurs in the Fraser-Fort George/Thompson-Nicola Region. Three outfitting tenures are crossed by the proposed pipeline corridor in the Fraser-Fort George/Thompson-Nicola and Fraser Valley regions. Non-traditional non-recreational trapping occurs in the Rural Alberta, Fraser-Fort George/Thompson-Nicola and Fraser Valley regions. The proposed pipeline corridor crosses 49 trapping tenures. Eight trapping tenures are crossed by the new lands associated with the new and expanded pump stations that require additional land and the associated new power lines. Non-traditional non-recreational hunting and fishing occurs

throughout the HORU RSA. A discussion of non-traditional hunting and trapping, guide outfitting and fishing can be found in Section 7.6.1 of the Socio-Economic Technical Report of Volume 5D.

Activities associated with construction, including right-of-way clearing and clean-up, may affect these resource users in the immediate vicinity of construction activities. Construction and clean-up will overlap with hunting seasons and trapping activities. The impact balance of this residual effect is considered negative. For individuals that use land and resources within the HORU RSA for non-traditional non-recreational outfitting, trapping, hunting and fishing as part of their livelihoods, any disruption to these activities could result in a disruption of livelihood or livelihood use patterns for resource users. The magnitude of this residual effect is considered to be medium, as the effect would be detectable and beyond that of a nuisance or inconvenience as it could have livelihood implications. Effects will be managed by advanced notification of construction schedule and consultation. Trans Mountain will provide advanced notification to regulatory authorities responsible for fish and wildlife management with final routing information, including maps, as well as construction schedule information, so they can communicate this information broadly in wildlife and fur management areas. Trans Mountain will also directly notify affected tenure holders so they can select alternate areas for their activities. Compensation, considering various forms, will be provided to affected trappers according to established industry and provincial protocols if reduced fur harvest and lost revenue is proven. Operational activities are not expected to affect non-traditional non-recreational outfitting, hunting, trapping or fishing. While there is some long-term loss of land in trap line areas due to pump station expansion and power lines, the area is quite small and isolated to very specific areas such that alternate use patterns could likely be established in the general vicinity during construction and patterns could be re-established once construction is complete. The disruption of non-traditional non-recreational outfitting, hunting, trapping and fishing activities is considered to be reversible in the short-term (*i.e.,* limited to the construction phase) (Table 7.2.4-3, point 6[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU RSA – construction may displace non-traditional non-recreational outfitting, trapping, hunting and fishing activities to areas beyond the Footprint to the HORU LSA or RSA.

- Duration: short-term – the event causing disruption of non-traditional non-recreational outfitting, trapping, hunting and fishing areas is the construction period.

- Frequency: isolated – the event causing a disruption of non-traditional non-recreational outfitting, trapping, hunting and fishing areas is confined to a specific period (*i.e.,* construction).

- Reversibility: short-term – the disruption of non-traditional non-recreational outfitting, trapping, hunting and fishing activities is limited to the construction phase.

- Magnitude: medium – change will be detectable and may have business/livelihood implications (*i.e.,* more than a nuisance or inconvenience).

- Probability: high – construction activities will overlap with hunting and fishing seasons and trapping activities.

- Confidence: high – based on data pertinent to the Project area and the professional experience of the assessment team.

Loss of Forestry Resources and Reduction of Land Base for Timber Harvest During Construction and Operations

There are numerous forest tenures or land dispositions related to forestry along the proposed pipeline corridor. This includes timber management areas, Crown tenures, other forestry-related tenures, and – in BC only – Old Growth Management Areas (OGMAs).

In Alberta, each Forestry Management Agreement has a single-window referral function in conjunction with AESRD administrators, who must review and approve all proposed Crown land surface activities within their administrative boundaries. The area-based portion of BC's forestry land base is administered by private firms, and each company has an exclusive right to manage and harvest the timber within its limits. In return, the companies are obliged to establish forest inventories and operationally plan and

implement all logging, road building, reforestation and silviculture activities. All larger forestry companies have wood product manufacturing facilities tied to their tenures and have large workforces to produce and harvest the timber supply needed for their mills and wood product manufacturing plants. In Alberta, it is estimated there is approximately 331,530 m^3 of merchantable timer in the proposed pipeline corridor (from Edmonton to Hinton, covering the Edmonton Region and the Rural Alberta Region). In BC, it is estimated there is approximately 1,162,447 m^3 of merchantable timer in the proposed pipeline corridor (including the Fraser-Fort George/Thompson-Nicola, Fraser Valley, and Metro Vancouver Regions and; excluding any BC portions of the reactivated pipeline segments where no new pipeline is being proposed). These preliminary estimates are conservative as they include the entire corridor and only a much narrower part of the corridor will actually be disturbed (approximately 45 m, including an 18 m right-of-way and a 27 m workspace area during construction). Precise volumes of merchantable timber disturbed by the Project will be estimated prior to construction during the timber cruise and timber valuation.

A total of 66 OGMAs are crossed by the proposed pipeline corridor in BC (42 are legal OGMAs and 24 are non-legal OGMAs). Upon finalization of the construction right-of-way, final OGMA disturbance will be calculated and Trans Mountain will work with BC MOE, BC MFLNRO and forest tenure holders to determine associated permitting requirements and appropriate mitigation measures related to OGMAs. This will include the identification of replacement areas, as required prior to construction. A post-construction monitoring program will be undertaken related to OGMAs to identify where actual effects deviate from anticipated effects and recommend appropriate mitigation measures. As a result of the clearing necessary for pipeline construction, it is anticipated there will be a loss of forestry resources and land available for future forest harvesting for the life of the pipeline. Forest resources disturbed for new pipeline right-of-way will be removed from the forest land base for the duration of the Project plus at least one harvest-regeneration cycle for recovery of the forest (60 to 100 years, or long-term); temporary roads and temporary workspace will only be required for 1 to 2 years (short-term). However, recovery of the forest land base will require at least one forest harvest-regeneration cycle (*i.e.,* 60 to 100 years depending on location and forest type. Coniferous species require 80 to 100 years; deciduous species require 60 to 80 years). Reclamation and reforestation measures will be implemented to facilitate recovery of the forest land base, in areas of temporary disturbance.

Exact short-term or long-term loss of forestry resources will be determined when the right-of-way has been finalized. However, substantial lengths of the proposed pipeline corridor parallel existing linear disturbances (including the existing TMPL right-of-way) and could use existing temporary workspace. In addition, wherever possible, existing disturbed areas will be used for temporary construction camps and stockpile sites. These measures will reduce the disturbance of forestry and timber resources and maximize the land available for future timber production. The timber cruise will quantify the amount of and species of timber to be removed from the Footprint, and will be completed subsequent to construction right-of-way finalization. Other measures that will be conducted once the right-of-way has been finalized include: notifying and consulting with all affected licensees or permit holders, the documentation of areas of forest pest potential during the timber cruise, compensating timber tenure holder where loss is proven and necessary and in accordance with provincial standards in effect, and coordinating the advance harvest of timber into forestry stakeholders cut plans, where possible. Trans Mountain will meet with the governments, industry and local Aboriginal communities with respect to the use of merchantable timber. Discussions will continue to determine the appropriate disposal method(s). Given that construction will not occur until 2016, sufficient time is available to finalize decisions related to timber use. It is expected that these discussions will address any further issues identified. Refer to the Managed Forest Areas and Forest Health Technical Report in Volume 5D for further details.

The impact balance of this residual effect is considered negative, but low in magnitude. Mitigation measures, such as using existing disturbed areas and paralleling the existing TMPL right-of-way and other linear disturbances will reduce the footprint of the final right-of-way and any facilities, and compensation agreements with licensees will account for any proven economic loss related to the Project. The loss of land for forestry purposes is considered to be reversible in the long-term (*i.e.,* extends to the operations phase). Given the implementation of mitigation measures, the magnitude of the effect is predicted to be low. Minor residual adverse effects are predicted after mitigation because of the required changes to forest tenure holder harvest and regeneration plans (Table 7.2.4-3 point 6[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – loss of forestry resources will only occur in directly disturbed areas.
- Duration: short-term – the event causing a loss of forestry resources and a reduction of land base for timber harvest is construction of the Project.
- Frequency: isolated – the event causing a loss of forestry resources and a reduction of land base for timber harvest is confined to a specific period (*i.e.,* construction).
- Reversibility: long-term – loss of forestry resources and a reduction of land base for timber harvest will extend until the pipeline is decommissioned.
- Magnitude: low – no economic loss is anticipated for licencees, but there may be some changes in forest tenure holder harvest and regeneration plans.
- Probability: high – construction activities will overlap with managed forest areas, including areas of merchantable timber and OGMAs.
- Confidence: high – based on data pertinent to the Project area and the professional experience of the assessment team.

Reduction of Land Base for Subsurface Activities During Construction and Operations

Land is used for mineral, aggregate, and oil and gas resources development in certain areas along the proposed pipeline corridor, specifically in the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions. Portions of the proposed pipeline corridor are near extensive oil and gas related infrastructure. Further details on mineral and aggregate tenures and dispositions located within the proposed pipeline corridor can be can be found in Section 7.0 of the Socio-Economic Technical Report of Volume 5D.

There will be a reduction in land base for subsurface activities as a result of construction of the Project, including oil and gas activities and mineral and aggregate extraction in select locations. The reduction in land base for subsurface activities will occur along the entire proposed pipeline corridor, but will have more of an effect in the limited areas where the proposed pipeline corridor deviates from the exiting TMPL right-of-way (*e.g.,* approximately RK 93 to RK 99, RK 311 to RK 327, RK 935.6 to RK 946.6 and RK 980.6 to RK 1018.6). Where the proposed pipeline corridor follows the existing TMPL right-of-way and other linear disturbances (approximately 90% of its length) the use of the subsurface has already been sterilized due to the presence of the existing TMPL and the associated restrictions crossing and excavating near NEB-regulated pipelines. The presence of a new pipeline right-of-way will limit future use and access of select areas that could have future subsurface and extraction potential. Subsurface uses will not be able to access areas beneath or close to the pipeline due to the risk of disturbing the pipeline. Permits or permission are necessary in order to construct or install new facilities across, on, along or under an existing pipeline right-of-way. There are also limitations with regard to mechanically excavating within 30 m of the right-of-way. Excavation and construction near pipelines requires compliance with the *NEB Act* and the *NEB Pipeline Crossing Regulations.*

The impact balance of this residual effect is considered negative, but effects will be managed by negotiating agreements with the Crown subsurface rights holders, where required. The disruption of these activities is considered to be reversible in the long-term because the residual effect extends throughout the life of the Project (*i.e.,* throughout the operations phase). A reduction of land base for subsurface activities could have business implications for disposition holders, therefore, the magnitude is considered medium (*i.e.*, more than a nuisance or inconvenience) (Table 7.2.4-3, point 6[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – a reduction of land available for subsurface activities will occur in the general vicinity of the pipeline where the route deviates from the existing TMPL.
- Duration: long-term – the event causing limitations on subsurface extraction is initiated during construction and extends for the life of the operating pipeline.

- Frequency: continuous – the event causing the disruption (*i.e.,* operation of the Project) occurs continually over the assessment period.

- Reversibility: long-term – the residual effect is expected to last throughout the operations phase.

- Magnitude: medium – a reduction of land base for subsurface activities may have negative effects on business operations of subsurface Crown rights holders (*i.e.,* more than a nuisance or inconvenience).

- Probability: high – access and use of subsurface areas around the future right-of-way will be restricted during operations.

- Confidence: moderate – based on information about location of subsurface Crown rights holders, pipeline operations practices, and the professional experience of the assessment team; however, the potential residual effect will depend on route finalization.

Physical Disturbance to Industrial and Commercial Use Areas During Construction and Site-Specific Maintenance

There are a number of industrial and commercial areas crossed by the proposed pipeline corridor. These include:

- the TUC in the City of Edmonton and Strathcona County crosses areas of industrial use (approximately RK 0 to RK 2);

- an area zoned as a Future Commercial Node at approximately RK 44. The Edmonton MDP explains that Future Commercial Nodes need to be designed as transit oriented commercial development to boost accessibility (City of Edmonton 2010);

- an industrial area within Parkland County (approximately RK 49);

- a light industrial and commercial use area in the southern portion of the City of Spruce Grove (RK 57.7 to RK 60.5), including automotive shops and an RV storage site (Irving pers. comm.);

- an area zoned as Commercial/Light Industrial Mix (approximately RK 235) and another zoned as Industrial (approximately RK 228) within the Town of Edson (Town of Edson 2006);

- a commercial area (and areas designated for future commercial development) at approximately RK 615 within the Community of Blue River (TNRD 2011a);

- existing industrial and commercial zones adjacent to the Kamloops Airport in the City of Kamloops (approximately RK 848);

- an airport commercial land use area at the Merritt Airport (Saunders Field) at approximately RK 926.6;

- areas designated by the Hope OCP as highway commercial (at approximately RK 1043.6, RK 1046.6, RK 1048.6 and RK 1050.6). The Hope OCP defines this area as land used to service highway traffic (District of Hope 2004);

- a large area that is zoned for industrial use within the City of Surrey (approximately RK 1156.6 to RK 1160.6 and RK 1163.6 to RK 1168.6) (City of Surrey 2012); and

- land zoned for service and general commercial and service commercial uses from approximately RK 1170.6 to RK 1175.6 in the City of Coquitlam, including business offices, entertainment facilities, tourist accommodation and shopping plazas (City of Coquitlam 1996).

Further details on commercial and industrial areas crossed by and in the vicinity of the proposed pipeline corridor can be found in Section 7.6.4 of the Socio-Economic Technical Report of Volume 5D.

The impact balance of this residual effect is considered to be negative, as physical disturbance to industrial and commercial use areas during construction and site-specific maintenance could disrupt businesses and deter users/customers from visiting a particular location. As a result, industrial and commercial activities could be disrupted, potentially resulting in a loss of income for local industrial and commercial retailers. Potential effects on business disruption are assessed in Section 7.2.7 Employment and Economy. Physical disturbance to industrial and commercial use areas is caused by construction activities and potentially periods of site-specific maintenance, therefore, is considered to be short-term in duration. Due to the potential for an interruption to business, this residual effect is considered to be of medium magnitude (*i.e.,* more than a nuisance or inconvenience). Mitigation measures such as consultation with affected stakeholders, avoiding key use areas to the greatest extent possible during right-of-way finalization, and providing compensation (considering various forms) to private land and property owners according to established industry protocols where losses or damages are proven will decrease the magnitude of this residual effect. However, even after the implementation of proposed mitigation measures, physical disturbance to industrial and commercial areas could still result in some level of disruption. The residual effect is reversible in the short-term (*i.e.,* limited to the construction phase or site-specific maintenance which would occur within any 1 year during operations) (Table 7.2.4-3, point 6[d]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – physical disturbance will only occur in areas directly affected by construction-related activities.
- Duration: short-term – the event causing a physical disturbance to industrial and commercial use areas is construction of the Project.
- Frequency: periodic – the event causing a physical disturbance to industrial and commercial use areas is construction or periods of site-specific maintenance that may occur intermittently but repeatedly over the assessment period.
- Reversibility: short-term – the physical disturbance to industrial and commercial use areas is limited to the construction phase of the Project.
- Magnitude: medium – disturbance may result in an affected business or livelihood practices (*i.e.,* may be considered more than a nuisance on inconvenience).
- Probability: high – industrial and commercial use areas are crossed by the proposed pipeline corridor.
- Confidence: high – based on an understanding of Project details and the professional experience of the assessment team.

Change in Land Use Patterns

The construction, site-specific maintenance, and ongoing operations of the Project may result in the change to access and use patterns of other land and resource use areas (including managed forest areas, guiding/hunting/trapping/fishing areas, subsurface resource use areas, and commercial/industrial areas). The significance evaluation of these residual effects is provided in Table 7.2.4-3 (points 6[e] and 6[f]). A discussion of these residual effects under the parks and protected areas indicator (points 1[b] and 1[c]), which includes the above use types as well as several other types of land uses, provides an explanation of the rationale of the significance criteria.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

The construction and operations of the Project may result in sensory disturbance for other land and resource users. The significance evaluation of this residual effect is provided in Table 7.2.4-3 (points 6[g]). A discussion of this residual effect under the aesthetic attributes indicator (point 8[a]), which includes users of other land and resource use areas as well as several other user types, provides an explanation of the rationale of the significance criteria.

Combined Effects on Other Land and Resource Use Areas

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for other land and resource use areas evaluated in Section 7.2.4.6 (Table 7.2.4-3, points 6[a] to 6[g]) are of high probability and, consequently, were considered in the evaluation of combined effects on the other land and resource use areas indicator.

The combined Project-related terrestrial effects on other land and resource use areas elates to the construction phase disturbance of land and resources used for a variety of purposes, disruption of access and use patterns, as well as sensory disturbance. There are many areas of outfitting, non-traditional non-recreational trapping, hunting and fishing activity along the proposed pipeline corridor and throughout the HORU RSA. Mineral, aggregate, and oil and gas are a dominant land use in certain areas along the proposed pipeline corridor, specifically in the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions. There are a number of industrial and commercial areas, as well as managed forest areas, crossed by the proposed pipeline corridor. Activities associated with construction, including right-of-way clearing and clean-up, may affect outfitting/hunting/trapping/fishing users in the immediate vicinity of construction activities. In areas where the proposed pipeline corridor deviates from the existing TMPL right-of-way, the Project will also result in a long-term reduction in land base for subsurface activities (*e.g.,* including oil and gas activities and mineral and aggregate extraction) and forestry activities, as the presence of a pipeline will limit future use and access of certain areas that could have future subsurface and extraction potential or merchantable timber potential. The magnitude of the overall effect will be reduced by mitigation measures such as consultation with affected stakeholders, avoiding key use areas to the extent possible during right-of-way finalization, conducting a timber cruise to determine merchantable timber losses and strategies, and providing compensation (considering various forms) to private land and property owners or Crown tenure holders according to established industry protocols where losses or damages are proven will decrease the magnitude of the overall effect.

The overall effect of the Project on other land and resource use is considered, on balance, negative, while there could be positive effects, including improved access for hunting/trapping/fishing and guide-outfitting that may occur in some locations of new right-of-way. The spatial boundary of the overall effect is regional since there could be sensory disturbance and changes in access for certain use areas during construction that extend beyond the Footprint and HORU LSA. The overall duration of effects is anticipated to be short-term as they are caused primarily by construction-related land disturbance and activity and site-specific maintenance. However, as noted above, the presence of the final pipeline right-of-way will affect sub-surface use of resources and forestry resources in the long-term; mitigation to establish use and/or access agreements is anticipated to offset the long-term implications. As such, the frequency of overall effects on other land and resource use is considered periodic to continuous; periodic for those related to construction and site-specific maintenance activities, but continuous for effects on sub-surface resource access and forestry. The magnitude of the overall effects are medium; sensory disruption would be considered low in magnitude but as disruption and disturbance could have livelihood or business implications for some users (*e.g.,* guide-outfitters, sub-surface developers), the overall effect is considered to be medium (Table 7.2.4-3, point 6[h]). A summary of the rationale for all of the significance criteria of combined effects on other land and resource use is provided below.

- Spatial Boundary: HORU RSA – sensory disturbances from construction and site-specific maintenance may extend into the HORU LSA and HORU RSA.

- Duration: short to long-term – most effects are caused by construction and site-specific maintenance completed within any 1 year during operations; however, the presence of the final pipeline right-of-way will affect sub-surface use of resources and forestry resources in the long-term.

- Frequency: periodic to continuous – periodic for effects related to construction and site-specific maintenance activities, but continuous for effects on sub-surface resource access and forestry as they will occur throughout operations.

- Reversibility: short to long-term – effects related to construction and site-specific maintenance disruption will be reversible in the short-term; effects related to changed resource access and use patterns for subsurface and forestry resources will extend throughout operations.

- Magnitude: medium – change will be detectable and, though any proven losses will be compensated for, effects may have residual business/or livelihood implications (*i.e.*, could be considered more than a nuisance or inconvenience).

- Probability: high – Project activity will occur in areas of other land and resource use.

- Confidence: high – based on Project information and the professional experience of the assessment team.

HORU Indicator – Water Supply and Use

Alteration of surface water supply and quality, and alteration of well water flow and quality, are discussed in Section 7.2.3 Water Quality and Quantity of Volume 5A.

HORU Indicator - Aesthetic Attributes

The following provides the evaluation of significance of potential residual effects on the aesthetic attributes indicator.

Sensory Disturbance for Aboriginal and Non-Aboriginal Local Residents and Land Users (From Nuisance Air Emissions, Noise and Construction-related Visual Effects) During Construction and Site-Specific Maintenance

Nuisance air emissions and noise will occur during the construction of the Project and may at times affect land users living, working or recreating in the vicinity of Project components. Possible effects may include air emissions (including odours) and noise from construction equipment and vehicles, and dust from vehicles. Also, equipment, areas of land disturbance, and the activity of construction workers will be visible to nearby land and resource users during periods of construction and site-specific maintenance. There may also be periods of night lighting around construction sites. Consequently, the visual quality of the landscape adjacent to the right-of-way or other construction areas may be adversely affected by the Project over the short-term related to construction or maintenance activity.

The high population density in urban areas of the Project will result in more people being potentially affected, due to the increased presence of human receptors. In rural, less populated areas, the effects will be less detectable due to fewer human receptors. The implementation of the proposed mitigation measures will reduce the effects of noise and air emissions (including odours) on land users, including residents. Noise and air emissions levels will adhere to municipal by-laws and stay within regulated levels. Nuisance air and noise emissions will also occur for isolated periods of time at specific locations during periodic site-specific maintenance activities (*e.g.*, aerial patrols, vegetation management, integrity digs) during the operations phase of the Project. Potential effects on the acoustic environment and air emissions are assessed in Section 7.0 of Volume 5A, including those associated with noise and air emissions from operating facilities.

A wide range of mitigation measures will be in place to manage air and noise effects. These include: complying with local noise legislation; notify potentially affected residents of any major construction activities that will occur at night; consideration of noise abatement and construction scheduling at noise-sensitive locations and during noise-sensitive times, to limit disruption to sensitive receptors; watering down construction sites and access roads to control dust; and by limiting the idling of equipment. There are many mitigation measures that can also reduce the short-term visual effects of construction. Generally, narrowing of the construction pipeline right-of-way at shelterbelt locations to reduce the number of trees to be removed will reduce visual effects. Landowners will be consulted with regard to ornamental trees, windbreaks and shelterbelts on their property that may be potentially affected by construction activities. Trees/shrubs will be installed at potential access points and viewsheds to the construction right-of-way to provide a visual screen to the construction right-of-way. Also, lighting for all construction activities will be directed downward, where feasible.

However, even with Trans Mountain's commitment to mitigation measures, some residual sensory disturbance is anticipated. The impact balance of this residual effect is considered negative, as it will likely be undesirable for nearby residents or land/resource users. Given the successful implementation of

the mitigation measures, the residual effect of nuisance air emissions, noise and visual disruption is deemed low in magnitude, as it would be limited primarily to that of a nuisance of inconvenience. The effect would be short-term in duration and periodic in frequency, as sensory disturbance would be primarily caused by construction and intermittent but repeated periods of site-specific maintenance. The potential effect is considered reversible in the short-term (Table 7.2.4-3, point 8[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU RSA – noise and air emissions emanating from the construction can extend into the HORU LSA and HORU RSA.
- Duration: short-term – the event causing the sensory disturbance is construction activity or site-specific maintenance that would occur within any 1 year during operations.
- Frequency: periodic – the event causing the sensory disturbance would be focused during construction, but would occur intermittently but repeatedly due to site-specific maintenance.
- Reversibility: short-term – the residual effect is limited to the construction phase or site-specific maintenance activities that would occur within any 1 year during operations.
- Magnitude: low – the implementation of the proposed mitigation measures would effectively reduce the effects of noise and air emissions to that of a nuisance or inconvenience.
- Probability: high – construction and site-specific maintenance activities will involve the use of heavy equipment and vehicles.
- Confidence: high – based on a good understanding of cause-effect relationships and the professional experience of the assessment team.

Alteration of Viewsheds

The Project is anticipated to have longer term visual effects related the presence of the new pipeline right-of-way in select areas and new or expanded above ground structures during operations. This may affect the quality or experience of certain viewsheds for some land and resource users. The impact balance of this residual effects is considered negative, but low in magnitude as it is considered primarily that of a nuisance or inconvenience.

Potential long-term visual effects of new pipeline right-of-way will be reduced by paralleling an existing linear disturbance (*i.e.,* the existing TMPL right-of-way or other existing rights-of-way) for a majority (90%) of the route, as well as sharing workspace. Maintenance of existing vegetation buffers and reseeding of the right-of-way and temporary workspaces will also reduce the visual intrusion of new areas of right-of-way. Re-seeding of disturbed land during reclamation with native and non-native grass mixtures and at rates identified in the Reclamation Management Plan in the Pipeline EPP will ensure the right-of-way vegetation is visually compatible with adjacent areas over the long term. Ornamental trees and other vegetation disturbed during construction or site-specific maintenance on residential and commercial properties will be replaced, as per landowner agreements. Installing tree/shrub plantings at potential new access points and viewsheds along the right-of-way will minimize the effect in areas of new right-of-way.

Visual effects may also occur related to the expansion and upgrading of pump stations, terminals and the Westridge Marine Terminal. Pump stations to be upgraded will involve additional facilities and new buildings on the existing station properties, depending on design finalization. These upgrades will take place in the context of an existing industrial facility and thus no notable change in visual quality is anticipated.

The construction of the new Black Pines Pump Station will, however, result in a new long-term structure on the landscape. While the design of the Black Pines Pump Station is not finalized, viewshed modelling of a structure of similar potential dimension has been conducted from three locations (observer viewpoints) to indicate how the facility may appear in the context of the surrounding landscape. The proposed Black Pines Pump Station is located on the existing right-of-way in the TNRD, adjacent to Westsyde Road and approximately 130 m west of the North Thompson River. An area of approximately

2.3 ha will be cleared for the pump station. The new land is privately-owned, treed and within the ALR. A new 138 kV power line will also be installed at the proposed Black Pines site. The nearest residence is located 600 m south of the proposed facility location. Existing flora conceals most of the proposed Black Pines facility site from several vantage points considered in the viewshed modelling, allowing the site to have a high Visual Absorption Capacity (VAC). The proposed pump station will be visible by some residences and users of Highway 5. Most traffic along Highway 5 at this location, however, travels at approximately the posted 80 km/hour speed limit, reducing the likelihood of the proposed pump station detracting from a visual experience. Changes resulting from the construction of the Black Pines Pump Station are considered minimal to substantial, depending on the observer viewpoint. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D for more details on the visual analysis of the proposed Black Pines Pump Station.

New tanks will be constructed within the boundaries of the Edmonton, Sumas and Burnaby terminals. New tanks will be located proximate to existing tanks, each within an established industrial complex. These terminals are located in populated areas, and new tanks will be visible from numerous locations in surrounding areas. However, new tanks will be visually similar with the existing tanks and will be in a pre-existing industrial setting where current structures of a similar nature are located. The presence of the new tanks at these terminals has been modelled from a number of public observation viewpoints (two locations for the Edmonton Terminal, one location for the Sumas Terminal, and three locations for the Burnaby Terminal) in the visual modelling analysis to demonstrate how they may appear from locations accessible and in some instances commonly used by the general public. The viewsheds are anticipated to be largely unchanged from the existing viewshed, most anticipated to contain only slightly more visible anthropogenic disturbance than currently exists in the context of the existing industrial facilities. Although the proposed new tanks will be visible from multiple vantage points, they will be situated in existing disturbed industrial areas, which will minimize their visual and aesthetic effects. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D for visual modelling results of the proposed additional tanks at the Edmonton, Sumas and Burnaby Terminals.

The overall residual visual effect of the new pipeline corridor and new or expanded pump stations and terminals is considered to be reversible in the long-term, as any new cleared right-of-way and altered or new above ground structures will be present throughout operations and until the Project is decommissioned and abandoned. However, the magnitude of residual visual effects is considered low. While Project features will be detectable from certain vantage points in the HORU LSA and RSA, the effect is considered to be that of a nuisance or inconvenience particularly given the pre-existing industrial context in which most facility changes are being made (the exception being the Black Pines Pump Station, which is the only greenfield facility proposed). Also, the pipeline right-of-way as not been finalized, and a key principle of route finalization is the minimization of new right-of-way which will inherently reduce incremental visual effects. The duration of the potential residual effect is considered short-term, and the frequency is considered isolated, as the event causing the alterations in viewshed (*i.e.,* clearing of right-of-way and development of new above ground facility structures and tanks) occurs during the construction phase (Table 7.2.3-3, point 8[b]). Trans Mountain will continue to consult with stakeholders regarding visual effects and potential additional site-specific mitigation during the route finalization and detailed facility design. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA to RSA – visual effects related to the pipeline extend beyond the pipeline right-of-way into the HORU LSA; new tanks at terminals and the expanded Westridge Marine Terminal will be visible from various locations in the HORU RSA.

- Duration: short-term – the event causing the alteration of viewsheds (*i.e.*, clearing of the pipeline right-of-way and building of above ground facilities) occurs during the construction phase.

- Frequency: isolated – the event causing the alteration of some viewsheds is confined to a specific period (*i.e.*, construction of the pipeline and facilities).

- Reversibility: long-term – the alteration of select viewsheds due to areas of new right-of-way clearing and new above ground facilities will last throughout the operations phase.

- Magnitude: low – while changes in certain viewsheds will be detectable, the potential effect is considered to be that of an inconvenience or nuisance. The alteration of the local viewsheds is expected to be reduced by the alignment of the pipeline right-of-way adjacent to existing linear features and by the location most new above ground features within pre-existing industrial sites.

- Probability: high – the Project will involve clearing and construction activities and new above ground features will be built.

- Confidence: high – based on data pertinent to the Project area, viewshed modelling results, and the professional experience of the assessment team.

Combined Effects on Aesthetic Attributes

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for aesthetic attributes evaluated in Section 7.2.4.6 (Table 7.2.4-3, points 8[a] and 8[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the aesthetic attributes indicator.

The combined terrestrial Project-related effects on aesthetic attributes consider sensory disturbances related to nuisance air and noise emissions, temporary visual effects due to construction activity, as well as alterations in viewshed due to the presence of new or altered above ground facilities or limited areas of new pipeline right-of-way. The combined impact balance is considered negative, but low in magnitude as it is primarily considered to be limited to that of a nuisance and inconvenience for land and resource users. The duration of the combined effect is considered short-term, as the events causing aesthetic disturbance (*i.e.*, clearing of the pipeline right-of-way, construction activities, and building of above ground facilities) occurs during the construction phase. The frequency is considered isolated to periodic; certain events causing aesthetic disturbance (*i.e.*, clearing of the pipeline right-of-way, construction activities, and building of above ground facilities) occur during the construction period (isolated), while sensory disturbance during site-specific maintenance will occur intermittently but repeatedly over the assessment period (periodic) (Table 7.2.4-3, point 8[d]). A summary of the rationale for all of the significance criteria of combined effects on aesthetic attributes is provided below.

- Spatial Boundary: HORU LSA to RSA – aesthetic effects (nuisance sensory disturbance or visual effects) may extend beyond the proposed pipeline corridor into the HORU LSA and RSA; new tanks at terminals will be visible from various locations in the HORU RSA.

- Duration: short-term – the event causing aesthetic disturbance (*i.e.*, clearing of the pipeline right-of-way, construction activities, and building of above ground facilities) occurs during the construction phase.

- Frequency: isolated to periodic – certain events causing aesthetic disturbance (*i.e.*, clearing of the pipeline right-of-way, construction activities, and building of above-ground facilities) are confined to the construction period (isolated); sensory disturbance during site-specific maintenance will occur intermittently but repeatedly over the assessment period (periodic).

- Reversibility: short to long-term – sensory disturbance related to pipeline and facility construction and site-specific maintenance will be short-term; alteration of certain viewsheds will continue through the operations phase.

- Magnitude: low – while aesthetic disturbance will be detectable, it is considered to be that of an inconvenience or nuisance.

- Probability: high – the Project will involve clearing and construction activities, and new above-ground features will be built.

- Confidence: high – based on data pertinent to the Project area, noise and air assessment results, viewshed modelling results, and the professional experience of the assessment team.

7.2.4.7 Summary

As identified in Table 7.2.4-3, there are no situations for HORU indicators that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of Project construction and operations on HORU indicators will be not significant.

7.2.5 Infrastructure and Services

This subsection discusses the potential effects of the Project on physical infrastructure and capacity of community infrastructure and services, including: transportation infrastructure (*e.g.,* roads, rail, air and, where applicable, ports); linear infrastructure (*e.g.*, subsurface lines) and power supply; waste and water infrastructure; housing; educational services; emergency, protective and social services (health infrastructure and services are discussed in Section 7.2.8 Community Health); and recreational amenities. Discussion is focused on infrastructure that may be physically disturbed by the Project, as well as the overall capacity of community infrastructure and services to meet Project-related changes in demand. This subsection does not discuss navigable watercourses used for transportation; navigation and navigation safety is discussed in Section 7.2.6.

The discussion of infrastructure and services presents effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the terrestrial component of the Westridge Marine Terminal), since the communities and regions in which the Project is located will experience Project-related activities in a combined manner. It is not meaningful from a community perspective to discuss the infrastructure and services effects of each Project component on a stand-alone basis. If there is a unique infrastructure effect associated with a particular Project component it has been highlighted.

7.2.5.1 Assessment Indicators and Measurement Endpoints

Table 7.2.5-1 summarizes the assessment indicators, measurement endpoints and their rationale for infrastructure and services. The indicators selected represent components of the socio-economic environment that are of particular value or interest to, Aboriginal communities, regulatory authorities, local communities, and other interested groups and individuals. The indicators have been selected based on: the NEB *Filing Manual* guidelines; experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, regulatory authorities, stakeholders; feedback from participants in ESA Workshops; public issues raised through the media; and the professional experience of the assessment team.

The measurement endpoints used to assess Project effects on the indicators include a combination of qualitative and quantitative parameters. These parameters have been chosen based on available socio-economic information and previous experience in assessing the effects of similar projects.

TABLE 7.2.5-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR INFRASTRUCTURE AND SERVICES

Infrastructure and Services Indicators	Measurement Endpoints	Rationale for Indicator Selection
Transportation infrastructure	• Traffic volumes • Rail, port, airport use • Transportation infrastructure disturbance or improvement	The selection of indicators and measurement endpoints considered NEB *Filing Manual* requirements for the infrastructure and services element in Table A-3 and key issues and interests identified during stakeholder engagement. They also considered feedback from participants in the ESA Workshops.
Linear infrastructure and power supply	• Linear infrastructure (*e.g.*, sub-surface lines, power lines) • Regional power capacity and demand	
Waste and water infrastructure	• Water and waste infrastructure capacity and demand	
Housing	• Accommodation capacity and demand	
Educational services	• Educational services capacity and demand	
Emergency, protective and social services	• Emergency, protective and social services capacity and demand	

TABLE 7.2.5-1 Cont'd

Infrastructure and Services Indicators	Measurement Endpoints	Rationale for Indicator Selection
Recreational amenities	• Recreational amenity capacity and demand	See above

7.2.5.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for social and cultural well-being considered one or more of the following areas:

- a Footprint Study Area (as defined in Section 7.1.3 of this ESA); and
- a Socio-economic RSA.

No LSA is being considered for infrastructure and services. The relevant study area is defined by the areas potentially directly disturbed by Project activities (*i.e.*, Footprint Study Area) and communities and regions in which people potentially affected by and benefitting from the Project reside.

The spatial boundaries associated with the Socio-economic RSA are described in Section 7.2.3 Social and Cultural Well-being and shown on Figures 5.0-1 to 5.0-7.

7.2.5.3 Infrastructure and Services Context

Communities along the proposed pipeline corridor and in the Socio-economic RSA are serviced by a wide range of infrastructure and services. Potential interactions may occur with transportation, linear infrastructure and power supply, waste and water infrastructure, housing, emergency/protective/social services, educational services and recreational amenities.

There is a well-developed all-season access road system servicing the proposed pipeline corridor that parallels the existing TMPL right-of-way. It is anticipated that from the point of manufacture, pipe and materials will be transported by ship or by rail to temporary stockpile sites along the construction right-of-way. From temporary stockpile sites, pipe will be transported by truck to the construction right-of-way. It is anticipated that key road transportation to be used for the movement of Project-related equipment, materials and people includes Highways 16 (Yellowhead), 5 (Coquihalla) and 1 (Trans-Canada).

The Alberta section of the proposed pipeline corridor, and communities along the corridor, are serviced by Highway 16 which is part of Canada's National Highway System and forms the Yellowhead branch of the Trans-Canada Highway. The proposed pipeline corridor in BC roughly follows Highway 5, part of Canada's National Highway System, until the District of Hope. From the City of Kamloops south, Highway 5 is known as the Coquihalla Highway. From Hope to Burnaby, the communities are serviced by Highway 1, which is also part of Canada's National Highway System.

A wide range of emergency and protective services are available in communities across the Socio-economic RSA, Including 9-1-1 services. Emergency services, RCMP and fire department services are available in numerous communities along the proposed pipeline corridor. Communities along the proposed pipeline corridor also have social, community health, educational, recreational, municipal utilities and airport services commensurate with the size and needs of their populations. The capacity of housing supply in communities along the proposed pipeline corridor varies depending on regional demand.

The proposed pipeline corridor terminates at the Westridge Marine Terminal, which is located within Port Metro Vancouver (PMV).

Given its operating history, Trans Mountain has established emergency response protocols, programs, and protocols at the community and regional level. Trans Mountain delivers its Community Awareness and Emergency Response (CAER) program to emergency services organizations and regulatory

authorities along the TMPL system. The objectives of the program are to familiarize first responders with the pipeline location, explain the properties of the pipeline's contents, and promote information exchange and coordination of response efforts in the event of an incident. As part of the response management system, Trans Mountain employees are trained in the emergency response procedures and conduct regular emergency exercises, some of which include local first responders. Trans Mountain also has standing agreements for contract resources to provide response equipment and labour, air and human health monitoring, environmental assessment and emergency management. Trans Mountain has adopted the ICS as the basic response structure for its emergency response teams. The ICS, developed in the US almost 30 years ago, is now the system preferred by emergency response organizations around the world to handle a wide variety of emergency situations, including oil spills.

7.2.5.4 Potential Effects and Mitigation Measures

Effects Considerations

Housing effects during the operations phase were considered for inclusion in this assessment, but were scoped out due to the small size of the anticipated incremental operations workforce (an estimated 90 additional workers throughout the Socio-economic RSA), many of which are likely to be current residents of the Socio-economic RSA. As such, operations phase housing effects are not carried through the assessment.

Effects on water and waste infrastructure during the operations phase were considered for inclusion in this assessment, but were scoped out due to the limited incremental effect of the expanded facilities compared to current operations. Except for the Black Pines Pump Station and the Westridge Marine Terminal, Trans Mountain indicates the Project will not result in any changes to the handling and/or disposal of grey water and sewage. Additional grey water and sewage will be generated from the Black Pines operator building and the Westridge dock control building located on the foreshore. A septic tank and vacuum truck clean-out is expected to be required for handling and disposal of grey water and sewage (similar to the existing pump station operator buildings and the existing control building at the Westridge dock). For the Westridge Marine Terminal, the option to connect to a city sewer line will be examined during detailed engineering design.

Effects of the Project on airport use during the construction phase were considered for inclusion in this assessment, but were scoped out due to the limited anticipated Project-related use of airports in the Socio-economic RSA. The main anticipated Project interaction with airports is their use by temporary workers traveling to a Project region during the construction phase. The airports likely to be used by Project-related workers are national and regional destinations with regular commercial flights and adequate anticipated capacity. As such, construction phase airport use effects are not carried through the assessment. Potential physical disturbance to airports is carried through the assessment in Table 7.2.5-2.

Effects of the Project on primary and secondary educational services and capacity during the construction and operations phase were considered for inclusion in the ESA, but were scoped out due to the transient nature of the temporary construction workforce, the short-term nature of anticipated construction employment opportunities and the small number of operations employment opportunities. It is unlikely that temporary workers will bring their families during construction of the Project, and as such, a Project effect related to an increase in primary and secondary school-aged children is not anticipated. The possibility that workers associated with indirect and induced employment needs could relocate to the region with their families, thereby contributing to growth of the school-aged population was considered, since these industries will be serving the needs of general growth in the region. However, any incremental population growth associated with such decisions could not be directly attributed to the Project.

Concerns have been raised during community meetings and other engagement activities about the potential effects of the Project on residential property values. In the discussion of housing, potential effects on residential property values were not predicted or evaluated in a quantitative manner. It is understood that property values are affected by numerous market forces, and there is no known or widely accepted cause and effect relationship between the presence of oil pipelines and property values in the Alberta and BC context. It is appreciated that many homes along the proposed pipeline corridor were built after the existing pipeline and facilities were in place and the easement and the presence of the pipeline

would have been disclosed to the buyer at the time of purchase. Under the *NEB Act*, companies can enter into land acquisition agreements with landowners to acquire new lands required for a pipeline and are required to compensate landowners for any damages associated with the new pipeline. Any direct effects on individual properties will be managed through individual compensation arrangements, and effects on housing prices in general are not considered further in the assessment. Factors that may be of concern to residential property owners/occupants, however, are considered in various parts of the ESA, including noise (Section 7.2.6 Acoustic Environment of Volume 5A), air quality (Section 7.2.4 Air Emissions, of Volume 5A), sensory/visual disturbance (Section 7.2.4 HORU of Volume 5B), and community way-of-life (Section 7.2.3 Social and Cultural Well-being of Volume 5B).

Effects of the Project on emergency, protective and social services during the operations phase (under normal operations) were considered for inclusion in this assessment, but were scoped out due to the understanding that Trans Mountain's current emergency response regime will not change or need to change to accommodate the expanded operating system. Trans Mountain will continue to use the ICS which is designed to adapt to changing operational circumstances. While the emergency response regime will not change, Trans Mountain anticipates it will increase the amount of its own Project-specific emergency response equipment (*e.g.*, skimmers, booms, absorbent, upgrades of fire water systems at expanded terminals), to reflect the expanded operating system. Trans Mountain will continue with its existing interfaces with community emergency response services as part of maintaining its normal operations ERP. Community-based emergency response initiatives that Trans Mountain is involved in include CAER, whereby it collaborates with regional emergency services to review emergency response procedures and community monitoring. Trans Mountain will also be part of a forthcoming collaborative mutual aid protocol between members of the energy pipeline industry, spearheaded by the Canadian Energy Pipeline Association, to support each other's emergency response efforts as needed Trans Mountain is also working with interested Aboriginal communities regarding involvement in emergency preparedness and spill prevention.

Trans Mountain will continue its existing relationships with local and regional first responders and cooperative emergency response initiatives. Also, given the small number of incremental workers associated with the operations phase of the Project, no operations phase increased pressure on local services due to Project-related population growth is anticipated. Potential effects of the Project on emergency, protective and social services during the construction phase are carried through the assessment in Table 7.2.5-2. Accidents and malfunctions are addressed in Section 7.9. The evaluation of the effects of a large pipeline spill and associated emergency response is provided in Volume 7.

Identified Potential Effects

Potential effects associated with the construction and operations of the Project on infrastructure and services indicators are listed in Table 7.2.5-2. These interactions are based on the results of the literature review, desktop analysis, interviews, engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and general public (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.2.5-2 was principally developed in accordance with Trans Mountain standards as well as industry best practices.

TABLE 7.2.5-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON INFRASTRUCTURE AND SERVICES

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
1. Infrastructure and Services Indicator –Transportation Infrastructure				
1.1 Increased traffic due to transportation of workers and supplies	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	Footprint to RSA	• Use of rail for major equipment deliveries to regional centres will reduce the Project-related traffic. • Develop estimates of Project-related traffic volumes associated with all Project components, related to both the movement of workers and the movement of equipment and materials [SEMP Section 8.4.3]. • Continue to consult with the BC Ministry of Transportation, the Alberta Ministry of Transportation and relevant municipalities regarding traffic volumes anticipated and traffic management protocols [SEMP Section 8.4.3]. • Develop a Traffic and Access Control Management Plan for the Project, and Traffic Control Plans for particular contracts [SEMP Section 8.4.3]. • Where possible, provide daily shuttle bus service from designated staging areas to work sites [SEMP Section 8.4.3]. • Actively encourage carpooling for times when shuttles/buses is not practical or available [SEMP Section 8.4.3]. • Communicate with local police and emergency services personnel to keep these organizations informed of traffic schedules [SEMP Section 8.4.3]. • Develop a communication plan for activities that impact normal traffic flow, such as road closures, detours [SEMP Section 8.4.3]. • Apply all other transportation and traffic related measures outlined in the EPPs (Volumes 6B to 6D).	• Increase in traffic on highways and access roads during construction. • Increase in rail volume/traffic during construction. • Sensory disturbances for Aboriginal and non-Aboriginal local residents and land uses (refer to Section 7.2.4 HORU). • Traffic safety effects (refer to Section 7.2.8 Community Health).
1.2 Physical disturbance to roads	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities	Footprint to RSA	• See mitigation for potential effect 1.1 of this table. • Follow acceptable heavy truck routes and approved access routes [SEMP Section 8.4.3]. • Bore under paved and high-use roads, where practical [SEMP Section 8.4.6]. • Where minor roads are crossed that may affect established community use/access routes, complete open cut crossing within one day, to the extent practical [SEMP Section 8.4.6]. • Inspect roads periodically during construction and repair them as needed. • All roads cut open will be fully reinstated to the satisfaction of the road owner. • Roads that deteriorate during Project construction as a result of Project traffic will be maintained by the contractor subject approval to of the road owner, on the basis of a pre and post-construction condition assessment. • Work with regulatory authorities to determine the necessary road crossing agreements prior to construction; meet all conditions of such agreements [EPP Section 6.0].	• Physical disturbance to roads during construction due to pipeline road crossings. • Increased need for maintenance on roads due to increased traffic and heavy equipment vehicles.
1.3 Disturbance to railway lines	All regions, except Jasper National Park Region / New pipeline segments	Footprint	• Rail lines will be crossed using a trenchless crossing method (*e.g.*, bore or HDD). • Crossing details will be negotiated with rail line owners in advance of construction. • Work with regulatory authorities to determine the necessary rail crossing agreements prior to construction; meet all conditions of such agreements [EPP Section 6.0].	• No residual effect identified.

TABLE 7.2.5-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
1.4 Physical disturbance to airports	Fraser-Fort George/ Thompson-Nicola Region: Merritt Airport / New pipeline segment	Footprint	• The Project will work with the Merritt Airport owner to coordinate construction activity around periods of airport use.	• Physical disturbance to airports.
1.5 Increased use of PMV during construction	Metro Vancouver Region / New pipeline segments / Westridge Marine Terminal	Marine HORU RSA	• See recommended mitigation measures outlind in Table 7.2.6-2 Navigation and Navigation Safety.	• Disruption to navigable water (Burrard Inlet) (refer to Section 7.6.6 Navigation and Navigation Safety).
2. Infrastructure and Services Indicator – Linear Infrastructure and Power Supply				
2.1 Effects on linear infrastructure (*e.g.*, sub-surface lines, power lines)	All regions / New pipeline segments	Footprint	• Work with regulatory authorities to determine thenecessary utility crossing agreements prior to construction; meet all conditions of such agreements [EPP Section 6.0]. • Continue discussions with municipalities and regional authorities regarding restrictions related to the presence of the proposed pipeline in relation to municipal sub-surface infrastructure and future infrastructure planning [SEMP Section 8.4.9]. • Notify pipeline and utility companies with lines that cross the construction right-of-way prior to commencing mainline pressure testing [EPP Section 4.0].	• Small scale accidents and malfunctions are assessed under Section 7.9 Accidents and Malfunctions while large scale pipeline spills are assessed in Volume 7. • No residual effects identified related to linear infrastructure disturbance. • Limitations to future municipal linear infrastructure planning.
2.2 Increased demand for power	All regions / New pipeline segments / Pump stations / Terminal activities / Reactivated pipeline segments / Westridge Marine Terminal	RSA	• Trans Mountain has met with BC Hydro and the Alberta Electric System Operator to discuss their power needs and is working toward ensuring any required upgrades in the transmission and distribution networks are developed at no cost to the rate payer. • Ensuring the provincial electrical systems meet the needs of industrial and residential customers is in the purview of the provincial electric system operators of BC and Alberta.	• Upward pressure on power supply/capacity in localized areas.
3. Infrastructure and Services Indicator – Waste and Water Infrastructure				
3.1 Increase water infrastructure demand	All regions / New pipeline segments / Temporary facilities / Pump stations / Terminal activities / Reactivated pipeline segments / Westridge Marine Terminal	RSA	• Consider municipal/regional water capacity issues as part of the Worker Accommodation Strategy [SEMP Section 8.4.4]; work closely with municipal and regional officials to identify and implement actions to prevent workforce demands exacerbating any municipal water supply capacity issues. • Include information about camp potable water and sewage needs projections in Project information shared with local municipalities [SEMP Section 8.4.9]. • Enter into water use agreements with the appropriate regulatory authorities as the Project develops. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11]. • Apply all measures in EPPs pertaining to water withdrawl and discharge.	• Temporary increase in water demand during construction. • Alteration of surface water supply and quality and alteration of well water flow and quality (refer to Section 7.2.3 Water Quality and Quantity of Volume 5A).

TABLE 7.2.5-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
3.2 Increased need for waste management during construction	All regions / New pipeline segments / Temporary facilities / Pump stations / Terminal activities / Reactivated pipeline segments / Westridge Marine Terminal	RSA	• Include information about camp potable water and sewage needs projections in Project information shared with local municipalities [SEMP Section 8.4.9]. • Communicate with operators of pre-approved waste facilities to determine options for Project-related waste disposal [SEMP Section 8.4.9]. • Sewage and grey water will be treated in a temporary treatment facility, including any related to construction camps, onsite at each facility and hauled to regional facilities for disposal. • Ensure any temporary construction camps' detailed waste management protocols are established in conjunction with regional officials. • Ensure wastes are recycled where practical [EPP Section 7.0]. • Apply all measures in EPP Waste Management Standard (EPP Appendix C) and Spill Contingency Standard (EPP Appendix B). • Apply all measures in EPPs pertaining to water withdrawl and discharge. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11].	• Temporary increase in solid and liquid waste flow to regional landfills, transfer station sites and wastewater treatment facilities during construction.
4. Infrastructure and Services Indicator – Housing				
4.1 Demand for housing during construction	All regions, except Jasper National Park Region / New pipeline segments / Temporary facilities / Pump stations / Terminal activities / Reactivated pipeline segments / Westridge Marine Terminal	RSA	• Continue to refine Project workforce estimates, construction schedule and construction hub locations, in order to plan for direct Project accommodation needs [SEMP Section 8.4.4]. • Monitor temporary, short-term and rental housing and accommodation availability in potential construction hub communities [SEMP Section 8.4.4]. • Develop and implement a Worker Accommodation Strategy in collaboration with contractors and local municipalities, which considers a range of worker housing options, including: – temporary construction camps in select locations (*e.g.*, Edson, Blue River and Clearwater/Vavenby); – pre-booking hotel and motel space; and – working with regional organizations to identify anticipated extended-stay recreational vehicle spaces [SEMP Section 8.4.4]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11].	• Increased demand for short-term accommodation during construction. • Upward pressure on price of rental and/or short-term accommodations during construction.
5. Infrastructure and Services Indicator – Educational Services				
5.1 Demand for post-secondary educational services/training	All regions / New pipeline segments / Temporary facilities / Pump stations / Terminal activities / Reactivated pipeline segments / Westridge Marine Terminal	RSA	• Initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project [SEMP Section 8.4.2]. • Continue to collaborate with regional training providers to identify ongoing opportunities for Trans Mountain to facilitate, support or participate in delivery of training for Aboriginal communities [SEMP Section 8.4.2]. • Provide information in a timely manner to educators and governments about the types of Project-related jobs that will be available, and the required skills and qualifications, to assist training providers in developing and implementing appropriate training [SEMP Section 8.4.2].	• No residual effect identified. • Enhancement of training opportunities for Aboriginal Communities (refer to Section 7.2.7 Employment and Economy).

TABLE 7.2.5-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
5.1 Demand for post-secondary educational services/training (cont'd)	See above	See above	• Work with contractors and labour organizations to encourage Project contractors to provide training and apprenticeship opportunities related to the work they perform, including opportunities for on-the-job training on the Project [SEMP Section 8.4.2]. • While some use of training services is anticipated related to Project-specific training and job preparation for Aboriginal residents, all training programs that are supported by the Project will be mutually agreeable with particular training providers.	• See above
6. Infrastructure and Services Indicator – Emergency, Protective and Social Services				
6.1 Demand for emergency, protective and social services during construction	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Prepare a Project Emergency Response Plan (ERP) that covers the Project construction phase [SEMP Section 8.4.8]. • Develop site-specific ERPs [SEMP Section 8.4.8]. • Consult with emergency response agencies and municipal emergency planners regarding ERPs, as required, to ensure understanding of potential Project-related service needs [SEMP Section 8.4.8]. • Provide key Project contact numbers, pipeline route maps, the construction schedule and emergency response program information to local and regional police services, fire departments and medical/health services [SEMP Section 8.4.8]. • Provide appropriate levels of security at camps and worksites. This will minimize the potential for external events to impact Project personnel, at the same time reducing diversion of emergency services from regional residents [SEMP Section 8.4.8]. • Communicate with local health authorities, emergency medical service authorities, social service authorities on the timing of the Project, duration of stay in the local community, expected number of people coming into the area and onsite health care plans [SEMP Section 8.4.9]. • To reduce response requirements related to Project worker / community integrations, develop a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions [SEMP Section 8.4.11]. • To reduce response requirements related to Project worker / community integrations, adhere to a policy of no tolerance of use or being under the influence of illicit drugs or alcohol during work hours [SEMP Section 8.4.11]. • Establish and enforce a policy whereby workers who disregard mitigation measures will be subjected to appropriate disciplinary measures including, if appropriate, removal from the work site and/or dismissal [SEMP Section 8.4.11]. • Ensure camp residents have access to information about worker assistance and social services support systems [SEMP Section 8.4.4]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11]. • Apply all measures in SEMP and EPPs related to Emergency Response, Worker Accommodation, Community Way-of-Life, Worker Health and Traffic Management.	• Increased demand on emergency, protective and social services during construction. • Accidents and malfunctions are assessed in Section 7.9 Accidents and Malfunctions. • Public safety effects and health services effects (refer to Section 7.2.8 Community Health).

TABLE 7.2.5-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
7. Infrastructure and Services Indicator – Recreational Amenities				
7.1 Use of recreational amenities by workers during construction	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Provide recreational amenities in camps (*e.g.,* leisure/fitness areas) [SEMP Section 8.4.4]. • Develop a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions [SEMP Section 8.4.11]. • Develop and implement an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities that emerge during construction and reclamation [SEMP Section 8.4.11]. • Establish a process by which community members can raise complaints or concerns related to Project activities or workers [SEMP Section 8.4.11].	• Use of recreational amenities by workers during construction.

Notes: 1 RSA = Socio-economic RSA.

2 Detailed mitigation measures are outlined in the SEMP (Volume 6B) or the EPPs (Volumes 6B and 6C). EPP referenced is the Pipeline EPP, except where otherwise noted.

7.2.5.5 Potential Residual Effects

The potential residual socio-economic effects on infrastructure and services indicators associated with the construction and operations of the Project (Table 7.2.5-2) are:

- increase in traffic on highways and access roads during construction;
- increase in rail volume/traffic during construction;
- physical disturbance to roads during construction due to pipeline road crossings;
- increased need for maintenance on roads due to increased traffic and heavy equipment/vehicles;
- physical disturbance to airports;
- limitations to future municipal linear infrastructure planning;
- upward pressure on power supply/capacity in localized areas;
- temporary increase in water demand during construction;
- temporary increase in solid and liquid waste flow to regional landfills, transfer station sites and wastewater treatment facilities during construction;
- increased demand for short-term accommodation during construction;
- upward pressure on price of rental and/or short-term accommodations during construction;
- increased demand on emergency, protective and social services during construction; and
- use of recreational amenities by workers during construction.

No potential residual effects were identified related to construction in the vicinity of rail lines. It is anticipated that all rail lines will be crossed using a trenchless crossing method (*e.g.*, bore or HDD) and that all details will be negotiated with rail line owners in advance of construction. As such, no disruption to

rail infrastructure or traffic is anticipated, and, therefore, construction in the vicinity of rail lines is anticipated to have no residual effect.

No potential residual effects were identified related to linear infrastructure disturbance, as route finalization and construction methods will consider locations of subsurface lines and power lines. Utility crossing agreements will be established as necessary. For example, BC Hydro indicated they would review and approve the placement of the pipeline on their property.

No potential residual effects were identified related to demand for post-secondary educational services/training. Given the short-time frame of construction, the Project is not anticipated to contribute directly to long-term population growth nor are workers anticipated to utilize post-secondary services or training; therefore, no potential residual effect in terms of demand pressure on post-secondary educational services is identified. While some use of training services is anticipated related to Project-specific training and job preparation for Aboriginal people, all training programs that are supported by the Project will be mutually agreeable with particular training providers and thus anticipated to be desirable from a community perspective.

7.2.5.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method is considered to be the appropriate method. Consequently, a qualitative assessment for infrastructure and services was determined to be the most appropriate. The evaluation of significance of each of the potential residual effects relies on the professional judgment of the assessment team.

Table 7.2.5-3 provides a summary of the significance evaluation of the potential residual socio-economic effects of the construction and operations of the Project on infrastructure and services. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below. An evaluation of significance is not required for those potential effects where no residual effect is identified (*i.e.,* construction in the vicinity of rail lines and demand for post-secondary educations services/training).

TABLE 7.2.5-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON INFRASTRUCTURE AND SERVICES

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Infrastructure and Services Indicator – Transportation Infrastructure									
1(a) Increase in traffic on highways and access roads during construction.	Negative	RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
1(b) Increase in rail volume/traffic during construction.	Neutral	RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
1(c) Physical disturbance to roads during construction due to pipeline road crossings.	Negative	Footprint	Short-term	Isolated	Short-term	Low	High	High	Not significant
1(d) Increased need for maintenance on roads due to increased traffic and heavy equipment/vehicles.	Negative	RSA	Short-term	Isolated	Short- to medium-term	Medium	High	Moderate	Not significant
1(e) Physical disturbance to airports.	Negative	Footprint	Short-term	Isolated	Short-term	Medium	High	High	Not significant
1(f) Combined effects on the transportation infrastructure indicator (1[a] to 1[e]).	Negative	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
2. Infrastructure and Services Indicator – Linear Infrastructure and Power Supply									
2(a) Limitations to future municipal linear infrastructure planning.	Negative	Footprint	Long-term	Continuous	Long-term	Low to medium	High	Moderate	Not significant

TABLE 7.2.5-3 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
2(b) Upward pressure on power supply/capacity in localized areas.	Neutral to negative	RSA	Long-term	Continuous	Long-term	Negligible	High	High	Not significant
2(c) Combined effects on the linear infrastructure and power supply indicator (2[a] and 2[b]).	Neutral to negative	Footprint to RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
3. Infrastructure and Services Indicator – Waste and Water Infrastructure									
3(a) Temporary increase in water demand during construction.	Neutral to negative	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
3(b) Temporary increase in solid and liquid waste flow to regional landfills, transfer station sites and wastewater treatment facilities during construction.	Negative	RSA	Short-term	Isolated	Short-term	Low	High	Moderate	Not significant
3(c) Combined effects on the waste and water infrastructure indicator (3[a] and 3[b]).	Negative	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
4. Infrastructure and Services Indicator – Housing									
4(a) Increased demand for short-term accommodation during construction.	Negative and positive	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
4(b) Upward pressure on price of rental and/or short-term accommodations during construction.	Negative and positive	RSA	Short-term	Isolated	Short-term	Medium	High	Moderate	Not significant
4(c) Combined effects on the housing indicator (4[a] and 4[b]).	Negative and positive	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
5. Infrastructure and Services Indicator – Educational Services									
No residual effects identified.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6 Infrastructure and Services Indicator – Emergency, Protective and Social Services									
6(a) Increased demand on emergency, protective and social services during construction.	Negative	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
7. Infrastructure and Services Indicator – Recreational Amenities									
7(a) Use of recreational amenities by workers during construction.	Neutral	RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Infrastructure and Services Indicator - Transportation Infrastructure

The following provides the evaluation of significance of potential residual effects related to the transportation infrastructure indicator.

Increase in Traffic on Highways and Access Roads During Construction

During construction, there will be an increase in traffic on highways and access roads due to Project-related vehicles. Construction-related traffic will include vehicles used for the transportation of equipment, supplies and workers to various locations along the proposed pipeline corridor. National, provincial and municipal highways, municipal roads, access roads and forestry roads within the

Socio-economic RSA will be used. Major highways that are likely to be used include Highways 16 (Yellowhead), 5 (Coquihalla) and 1 (Trans-Canada).

Construction workers for the Project will be dispersed along the proposed pipeline corridor, spread over an anticipated 15 construction spreads and 25 facility locations (pump stations and auxiliary facilities). Ground transport to particular spreads/work sites and accommodation hubs would be primarily via key highways noted above. It is anticipated that most regionally-based personnel would use ground transport from their home community to work locations. Pipeline staging areas will have a combination of work vehicles and crew buses. Existing Annual Average Daily Traffic (AADT) varies in the Project regions from approximately 2,500 vehicles on Highway 16 north of Valemount to over 100,000 vehicles at the entry of the Port Mann Bridge in the City of Coquitlam. The addition of several hundred Project-related vehicles will more likely be perceptible on highways or highway sections with lower AADT values. Highway 16 in Alberta and BC in the Hinton, Jasper and Valemount areas have lower recorded AADT values than Highways 5 and 1.

At the time of writing, detailed traffic estimates and logistics plans were not available for the proposed movement of Project workers, equipment and materials. Project effects on regional highway traffic, and how Project traffic compares to overall daily traffic volumes, will ultimately depend on the source of construction equipment, construction camp modules and other supplies and materials (especially pipe), as well as the methods used to transport these items to construction sites. Pipe and other materials obtained from Canadian or North American suppliers can be transported by rail, offloaded at rail sidings at key points within the Socio-economic RSA and transported relatively short distances by truck to construction sites.

Trans Mountain will develop detailed traffic estimates as construction and Project planning related to the movement of people, materials and equipment continues. Trans Mountain will also develop further logistics information on transportation modes and routes to be used during the construction phase, as well as timing transportation movements to each construction spread and/or facility location. This information will be further evaluated in the context of existing regional traffic volumes, and will become part of the overall information that is shared with local governments, Aboriginal communities, resource users and other stakeholders. This information will also be discussed with provincial transportation authorities during the course of the ongoing consultation planning and construction.

Trans Mountain will employ a number of measures to reduce Project-related vehicles and limit the effects associated with construction-related traffic, including providing daily shuttle bus services from staging areas to work sites and for local workers from pre-determined regional staging areas. It is anticipated that many major equipment deliveries will come to the region via rail or ship to temporary stockpile sites along the proposed pipeline corridor which will limit the distances travelled by heavy loads on regional highways. The increase in traffic will occur during the construction phase and the residual effect is considered to be reversible in the short-term (*i.e.*, limited to the construction phase). The frequency will be isolated since the increase in traffic is confined to a specific phase of the assessment period (*i.e.*, construction phase). An increase in traffic over current operational movements related to workers and maintenance is not anticipated during the operations phase.

The impact balance of an increase in traffic during construction is considered to be negative, as it may contribute to disruption of existing traffic movement patterns and highway/road users. Some highways that will be used by the Project, including sections of Highways 16 and 5, are the single or main access routes for communities such as Edson, Hinton, Valemount, Clearwater, Barriere and Merritt. An increase in traffic on these highways, particularly during summer months when there is a noticeable increase in traffic in some communities due to the tourist season, would be more than a nuisance or inconvenience to residents, travellers and other road users. It was noted during the Valemount Community Workshop that traffic congestion during construction was a concern, as Highway 5 is the only road in and out of the community. Highway 5 is also heavily used by several river rafting companies in the summer, which already creates some traffic congestion in Valemount. Concerns about traffic congestion were also raised in the Blue River Community Workshop, where it was noted that traffic is already congested at times around a scenic lookout point on the highway. In Hope, particular concerns were raised about the use of Othello Road by heavy equipment vehicles, since it is steep on either side and is a key road for residents, and for access to a key tourist area (the Othello Tunnels) (Fortoloczky pers. comm.). The section of the Trans-Canada Highway that is located in the Lower Mainland is consistently busy. While an increase in

traffic due to the Project on the Trans-Canada Highway is not anticipated to be perceived by residents and other road users in the context of its heavy current use, any impediments to the movement of traffic in this busy area caused by the Project could be problematic. Certain sections of the Trans-Canada Highway, such as between Hope and Chilliwack, experience substantial traffic congestion and delays on summer long weekends; any Project construction occurring on long weekends would compound this issue (Simmill pers. comm.). However, Trans Mountain will employ mitigation measures to ensure the effects are reduced.

Traffic disruptions could be more than a nuisance or inconvenience to residents, travelers and other road users in some areas. The disruption could result in the need for detours or the inability to access particular locations. For example, Mission Flats Road in Kamloops is the single access to the city's wastewater treatment facility, landfill and a Weyerhaeuser landfill. Inability to access the facility could result in service disruptions to the city. Therefore, the magnitude of the residual effect is anticipated to be medium. Disruption to existing traffic movement on single-lane sections of highways, such as Highway 16 between Barriere and Valemount, could also result in a disruption to residents, travelers and other road users such as delays due to the presence of larger, slower vehicles and temporary road closures resulting in single-lane traffic movement. In Project areas such as the Edmonton and Metro Vancouver regions where there are numerous national, provincial and municipal highways and other roads, options are available to road users, therefore, the magnitude of the residual effect in the Edmonton and Metro Vancouver regions is also anticipated to be low.

The probability of occurrence of the residual effect is high, since daily travel will be required to and from the work sites and materials, equipment and workers must be brought to work sites at key points during construction. The level of confidence in the prediction is also high based on the limited number of alternative transportation routes in some socio-economic regions and since daily travel will be required to and from work sites. In the Metro Vancouver and Edmonton regions, there are numerous national, provincial and municipal highways and other roads, providing options for road users, but smaller communities are likely to be more affected (Table 7.2.5-3, point 1[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – highways and access roads anticipated to be used by Project vehicles are located in various locations across the Socio-economic RSA.

- Duration: short-term – the movement of Project-related equipment, materials and workers during construction will cause the effect; no perceptible increases in traffic are anticipated during the operations phase.

- Frequency: isolated – the movement of equipment, materials and workers on regional highways resulting in increases in traffic is confined to a specific phase of the assessment period (*i.e.,* construction phase).

- Reversibility: short-term – the Project-related increase in traffic is limited to the construction phase.

- Magnitude: low to medium – low in larger communities with other transportation route options; medium in smaller communities with single access routes or where the increase in construction traffic coincides with summer tourist months.

- Probability: high – Project-related traffic on highways and access roads will be present during construction.

- Confidence: high – transporting equipment and supplies will result in an increase in traffic, assuming that non-Project related traffic will remain constant.

Increase in Rail Volume/Traffic During Construction

During construction, Trans Mountain will be transporting various equipment and supplies by rail, where practical. The rail lines that will transport Project equipment and supplies are located in the Socio-economic RSA. Transporting construction-related equipment and supplies by rail may result in an increase in rail volume/traffic. Most of the pipe will be transported via rail to various sidings that are close

to the proposed pipeline corridor; other supplies and equipment will be transported by rail where practical. Detailed discussions with rail companies will commence once material sources have been determined.

An increase in rail volume/traffic could result in negative safety implications such as the possibility of injury or fatality at a railroad crossing or on or near tracks; however, these kind of incidents are highly unlikely. Increased rail volume/traffic could also cause traffic delays. Some communities have expressed concern that an increase in rail volume/traffic will result in longer delays at railway road crossings. Municipal staff at the City of Spruce Grove expressed concern regarding the ability of emergency services to reach their destination in time when crossing a railway (Irving pers. comm.). An increase in rail volume/traffic could be a nuisance to residents and travelers who may have to wait at railroad crossings or hear train noises more frequently. Although the overall effect may be detectable in certain communities, it is primarily that of a nuisance or inconvenience; consequently, any negative implications are considered to be of low magnitude. Increased use of rail is also likely to be considered a positive effect by rail companies. Therefore, the overall impact balance is anticipated to be neutral. The potential increase in rail volume/traffic will occur during the construction phase and is considered to be reversible in the short-term (*i.e.*, limited to the very specific periods of transport and pipe stockpile during construction phase) (Table 7.2.5-3, point 1[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – rail lines and stations within the Socio-economic RSA will be used by the Project for delivery of equipment and materials.
- Duration: short-term – the need to move materials and equipment by rail will be limited to the construction of the Project.
- Frequency: isolated – the need to move materials and equipment by rail will be limited to the construction of the Project, and will happen only at certain times during the construction phase.
- Reversibility: short-term – the increase in rail volume/traffic is limited to the construction phase.
- Magnitude: low – the effects of an increase in rail volume/traffic will be detectable in some communities, but are considered to be that of an inconvenience or nuisance.
- Probability: high – it is likely that Project equipment and supplies will be transported by rail during the construction phase.
- Confidence: high – based on current information provided by Trans Mountain.

Physical Disturbance to Roads During Construction Due to Pipeline Road Crossings

During construction, the pipeline will cross various road types, including national, provincial and municipal highways, municipal roads and other access roads. Examples of highway crossings include: Highway 16 in Alberta and BC; Highway 5 in BC; Highway 5A in Merritt; Highway 1 in the Fraser Valley and Metro Vancouver regions; Highway 11 in Abbotsford; and Highway 7 (Lougheed Highway) in the Metro Vancouver Region. Key road crossings include: Baseline Road in Strathcona County; Range Road 41 north of the Village of Wabamun; Westsyde Road, Tranquille Road, Ord Road and Mission Flats Road in the City of Kamloops; Vedder Road in the City of Chilliwack; Golden Ears Way in the Township of Langley; the South Fraser Perimeter Road in the City of Surrey; Brunette Avenue in the City of Coquitlam; and Burnaby Mountain Parkway and Barnet Road in the City of Burnaby. More details about particular municipal and other access road crossings will be finalized during detailed engineering and right-of-way finalization.

Trans Mountain will employ a range of standard mitigation measures to limit physical disturbance to roads during construction, including negotiating road and highways crossing agreements, boring under paved and high use roads where practical, placing notices announcing the Project location and construction schedule, and rebuilding non-temporary roads physically disturbed by construction. While paved and high use road crossings will be bored, other roads will be crossed using an open-cut method when approved by the municipal authority and/or the road owner. Even with the application of these and other mitigation

measures (Table 7.2.5-2), there will be a physical disturbance to road crossings that will not be bored, which will require users to find alternate routes and could result in temporary impeded access for users.

The impact balance of physical distribution to roads during construction is considered to be negative since any physical disturbance to roads will result in an inability to use certain roads during specific periods. This potential residual effect is considered to be reversible in the short-term since roads will be re-established to existing condition following construction. In locations where roads will be crossed, crossing agreements will be negotiated with the disposition holders and appropriate arrangement made for alternate access by Trans Mountain, where possible. Agreements with road owners and transportation authorities will be negotiated closer to the planned construction date based on right-of-way finalization. In addition, it is assumed that alternative routes will be available to road users and that key single access roads such as those in Kamloops and Wabamun will be bored under or crossings will be completed in one day where possible.

The magnitude of the residual effect is considered to be low since Trans Mountain will bore high use road crossings where any physical disturbance would be more than a nuisance. As a general principle, Trans Mountain will avoid physical disturbances to highways or major roads with high community use. Any minor roads that affect community use or access will be crossed in one day using an open cut method to minimize community effects. The probability of occurrence of the predicted residual effect is high, since Trans Mountain has indicated that minor roads may not be bored under (Table 7.2.5-3, point 1[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – physical disturbances to roads will occur in the Footprint.
- Duration: short-term – the event causing physical disturbances to roads is the construction of the Project.
- Frequency: isolated – the event causing physical disturbances to roads is confined to a specific phase of the assessment period (*i.e.,* specific periods during the construction phase).
- Reversibility: short-term – physical disturbances to roads is limited to specific periods during the construction phase. Roads will be re-established post-construction.
- Magnitude: low – road crossing strategy will be suitable to each road type (*e.g.,* bore under all paved and high-use gravel roads where practical) and will ultimately be no more than a nuisance to road users.
- Probability: high – roads crossed by the pipeline will be physically disturbed, unless they are bored under.
- Confidence: high – based on Project information and the professional experience of the assessment team.

Increased Need for Maintenance on Roads Due to Increased Traffic and Heavy Equipment

The increase in traffic and heavy equipment during construction of the Project could result in an increased need for maintenance of some smaller roads used by Project-related vehicles.

As noted, Highway 16 in both BC and Alberta and Highway 5 and Highway 1 will provide primary access to specific points and staging areas along the proposed pipeline corridor. Potential effects to road surfaces will vary along the proposed pipeline corridor. No highway/major road improvements are expected to be required for major public roads that will be used during construction. The BC Ministry of Transportation noted that highways are engineered and constructed to withstand legal load, therefore, large/oversize vehicles are not an issue related to highway maintenance (Atkins pers. comm.).

Some secondary, non-public roads, or roads that typically have limited use (*i.e.,* gravel, dirt roads) may need to be modified to accommodate large and heavy construction equipment. Modifications may include gravel to increase load-bearing capacity, grading of rough areas, widening roadbeds and installing culverts. Trans Mountain will inspect roads periodically during construction and repair them as needed.

Following construction, all roads that are open cut will be fully restored to the satisfaction of the road owner. If existing roads are not readily available, or do not provide adequate access, Trans Mountain may build new temporary or permanent access roads. A permanent new access road will be constructed to the Black Pines Pump Station from Westsyde Road north of the City of Kamloops. All temporary access roads developed by Trans Mountain for construction will be reclaimed. There are some roads that require upgrades or maintenance and the Project use could exacerbate road maintenance issues. Examples of roads currently requiring upgrades or maintenance include Highway 779 and Highway 627 west of the City of Edmonton and Othello Road east of the District of Hope (Misumi pers. comm.). Responsibility for road maintenance and upgrading varies depending on road type and jurisdiction. On the basis of a pre and post-construction condition assessment, roads that deteriorate during Project construction as a result of Project traffic will be maintained by the Trans Mountain subject to approval of the road owner.

Road maintenance requirements due in part to Project-related traffic increase and heavy equipment could potentially increase costs, or advance the maintenance schedules, of various jurisdictions. Therefore, the impact balance is considered to be negative. The increase in traffic will occur during the construction phase and an increased need for road maintenance is considered to be reversible in the short to medium-term and of low magnitude. It is expected that maintenance needs on roads as a result of the Project would likely be resolved within 1 year.

The probability of occurrence of the residual effect is high since daily travel will be required to and from the works sites, and heavy equipment vehicles will be used. Materials and equipment must be brought to the work site and some roads likely to be used for access have been identified as requiring maintenance. The level of confidence in the prediction is moderate based on limited information of the current condition of all access roads that may be utilized during Project construction and lack of detailed Project-related traffic volume estimates (Table 7.2.5-3, point 1[d]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – highways and access roads anticipated to be used by Project vehicles are located in the Socio-economic RSA.
- Duration: short-term – the event causing an increased need for road maintenance is the construction of the Project.
- Frequency: isolated – the event causing an increased need for road maintenance is confined to a specific phase of the assessment period (*i.e.,* construction phase).
- Reversibility: short to medium-term – the increase in traffic is limited to the construction phase and potential remedial road maintenance would likely occur within the first few years of operations.
- Magnitude: medium – while highways/major roads are designed and constructed to withstand heavy equipment vehicles, secondary/smaller roads could require increased additional maintenance.
- Probability: high – traffic on highways and access roads will increase during construction and is likely to contribute to road maintenance needs.
- Confidence: moderate – based on limited information about current conditions of all roads that may be used by the Project and lack of detailed Project traffic volume estimates.

Physical Disturbance to Airports

The proposed pipeline corridor crosses the edge of the Merritt Airport (Saunders Field) runway within the municipal boundary of the City of Merritt at RK 926.9. This is the only known incidence where airport lands will be physically disturbed by the Project. Physical disturbance during pipeline construction in the vicinity of the Merritt Airport could restrict the ability for flights to take off and land. The spatial boundary of this potential residual effect is the Footprint. Disruption to the Merritt Airport is considered to be reversible in the short-term (*i.e.*, limited to the construction phase) and the frequency is isolated as the disturbance will end once pipeline construction in that particular area is complete (about a three month construction period) and the land is reclaimed. Physical disturbance to airports will not occur during the operations phase.

The impact balance is considered to be negative, but short-term in duration. Construction near the Merritt Airport can also be scheduled during a smaller construction window to limit the period of disturbance. Trans Mountain will work with the airport owner to coordinate construction activity around periods of airport use. Although there is no regularly scheduled commercial service at the Merritt Airport, the airport is tied to business operations and a disruption of services has the potential to affect those businesses and services. Merritt has received recent approval to be a BC forest fighting centre and use of the airport will likely increase with wildfire training (Umpherson pers. comm.). The physical disturbance to the Merritt Airport could also be a nuisance to recreational flyers who use Saunders Field because they may not be able to use the airport during the period of construction in that area. Consequently, the physical disturbance to airport lands is considered to be of medium magnitude (Table 7.2.5-3, point 1[e]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – physical disturbance to the Merritt Airport will occur in the Project Footprint.
- Duration: short-term – the event causing physical disturbance is construction of the Project during a specific construction window.
- Frequency: isolated – the event causing physical disturbance is confined to a specific phase of the assessment period (*i.e.,* construction phase).
- Reversibility: short-term – physical disturbance to the Merritt Airport is limited to a very specific period during the construction phase.
- Magnitude: medium – physical disturbance of the Merritt Airport could disrupt flights for business use and firefighting service operations, which would be more than a nuisance since this could have implications for livelihoods and service delivery.
- Probability: high – the Merritt Airport will be physically disturbed by the proposed pipeline corridor, unless it is bored under.
- Confidence: high – based on Project information and the known location of the proposed corridor in relation to the Merritt Airport.

Combined Effects – Transportation Infrastructure

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for transportation infrastructure evaluated in Section 7.2.5.6 (Table 7.2.5-3, points 1[a] to 1[e]) are of high probability and, consequently, were considered in the evaluation of combined effects on the transportation infrastructure indicator.

Overall, the Project will contribute to an increased use of transportation infrastructure in the Socio-economic RSA. During construction, there will be an increase in traffic on highways and access roads. Construction-related traffic will include vehicles used for the transportation of equipment, supplies and workers to various locations along the proposed pipeline corridor and facilities locations. National, provincial and municipal highways, municipal roads, access roads and forestry roads within the Socio-economic RSA will be used. As noted above, major highways that are likely to be used include Highways 16 (Yellowhead), 5 (Coquihalla) and 1 (Trans-Canada). It is anticipated that rail will be used to transport major equipment and material to key staging areas within the Socio-economic RSA and materials will then be transported to worksites via heavy trucks. This will reduce the number of construction-related vehicles on the roads, as will Trans Mountain's plans to use buses to transport workers from construction camps (where used) or regional staging areas to worksites. Project-related traffic and construction activity close to highways and roads is likely to cause some disruption to existing traffic movement patterns and may cause some delays or constricted or altered access. Given that parts of the Project will be built in highly populated urban environments, there may be considerable complexities with minimizing disruptions, but disruptions will nonetheless be limited to specific construction periods. During construction, the pipeline will cross various road types, including national, provincial and municipal highways, municipal roads and other access roads. Trans Mountain will use various construction methods, including boring, to ensure physical disturbance to roads is minimized and

will ensure that all disturbed roads are repaired to at least their original state. The one exception is the Merritt Airport, where the edge of the runway is crossed by the proposed pipeline corridor meaning that airport lands could be disturbed during construction for a limited period.

Overall, Project effects on the transportation infrastructure indicator are considered to be negative, since increased traffic volumes and traffic disruptions on regional roads and highways will not be desirable for existing users. The magnitude of the residual effect is anticipated to be medium; construction traffic could disturb more users in larger centres such as Edmonton, Metro Vancouver and Kamloops, but in those centres there are more options for alternate driving routes. While there may be few users disturbed in smaller communities, alternate access routes in these communities are limited (*e.g.*, Valemount, Blue River, Clearwater) so overall effects may be greater from a community perspective. Trans Mountain will have a Traffic and Access Control Management Plan and will direct contractors to have Traffic Control Plans, and the Project employ numerous measures to reduce its transportation footprint. However, some residual disruption and disturbance effects on transportation infrastructure is likely, as some disruption is likely to occur during focused periods of construction. Daily travel will be required to and from the work sites and materials and equipment must be brought to the work site, and certain construction spreads will take place in densely populated environments. Concerns about construction-related traffic disruption and congestion were common during stakeholder engagement. However, traffic and transportation infrastructure disruptions will be isolated to very specific periods during the construction period in each place and in many instances will result in only a short-term nuisance or inconvenience (Table 7.2.5-3, point 1[f]). A summary of the rationale for all of the significance criteria of combined effects on transportation infrastructure is provided below.

- Spatial Boundary: Socio-economic RSA – construction-related traffic will be present on various roads and highways, and will use various rail stations, in the Socio-economic RSA.
- Duration: short-term – the events causing the overall effect are construction activities.
- Frequency: isolated – the events causing the effect is limited to a specified phase of the assessment (*i.e.,* construction phase).
- Reversibility: short-term – the effect will occur during specific periods of construction in certain areas.
- Magnitude: medium – despite mitigation measures, increased traffic will be detectable and in some smaller communities may tend to result in a moderate modification in the socio-economic environment.
- Probability: high – use of regional transportation infrastructure by the Project and Project workers will occur.
- Confidence: high – based on Project information, feedback from stakeholders, and the professional experience of the assessment team.

Infrastructure and Services Indicator – Linear Infrastructure and Power Supply

The following provides the evaluation of significance of potential residual effects on the linear infrastructure and power supply indicator.

Limitations to Future Municipal Linear Infrastructure Planning

In certain areas, the proposed pipeline corridor crosses existing sub-surface linear infrastructure (*e.g.,* water and sewer lines) operated by municipalities. Operationally, municipalities carry out general maintenance to these sub-surface facilities. As infrastructure ages or populations grow, municipalities plan for future sub-surface facilities to meet the demand of users. As a result of Project construction, limitations to future municipal linear infrastructure planning and maintenance to existing sub-surface facilities may occur because of the necessity to obtain permits or permission to construct or install new facilities across, on, along or under an existing pipeline right-of-way. There are also limitations with regard to mechanically excavating within 30 m of the right-of-way. Excavation and construction near pipelines requires adherence to the *NEB Act* and the *NEB Pipeline Crossing Regulations.* Communities such as

Chilliwack and Coquitlam have expressed concerns regarding the potential limitations to future municipal infrastructure, operational rights, ground disturbance and working around the TMPL system (Blain, Sanderson, Soong pers. comm.).

To address these concerns, during detailed engineering and route finalization, Trans Mountain will generate a full inventory of municipal sub-surface linear infrastructure crossings. Trans Mountain will continue its dialogue with communities throughout right-of-way finalization, planning, construction and operations to ensure issues, restrictions and limitations are communicated, understood, and addressed by all affected parties.

The impact balance of this residual effect is considered to be negative since it will affect the planning of and access to municipal infrastructure in some areas. Larger municipalities such as the City of Coquitlam and the City of Surrey have a higher density of existing underground linear infrastructure, including sewage and water pipes. The addition of a 914 mm OD (NPS 36) pipeline to the underground network in these municipalities could limit future municipal linear infrastructure planning and maintenance activities. The limitations could exist in smaller communities with less-dense underground infrastructure, however, to a lesser degree. Mitigation measures such as communicating the location of the pipeline to municipal engineers and planners and negotiating agreements regarding access in the pipeline right-of-way during operations will decrease the magnitude of this potential residual effect. Trans Mountain will also consider future municipal planning objectives in the route finalization and detailed design of the pipeline. For example, on the exiting TMPL in the Northridge area of the City of Burnaby there are two NPS 30 (762 mm OD) pipelines.

The residual effect will begin during the construction phase of the Project and extend into operations. Once installed, the proposed pipeline will become an additional underground pipe that municipalities must incorporate and take into consideration in their infrastructure planning. The residual effect will continue as long as the pipeline remains in place.

The probability of occurrence of limitations to future municipal linear infrastructure planning is high in some locations due to feedback from municipalities regarding density of underground infrastructure (Blain, Sanderson, Soong pers. comm.). However, the level of confidence in the prediction is moderate due to a lack of specific knowledge of which municipal underground infrastructure will be affected by the final location of the pipeline right-of-way within the proposed pipeline corridor. Trans Mountain will have knowledge of the locations of all municipal infrastructure and known plans for future infrastructure in the pipeline right-of-way based on routing finalizations and detailed engineering studies, and crossing agreements will be established as appropriate (Table 7.2.5-3, point 2[a]). When crossing buried infrastructure, it will be exactly located by exposing it using Hyrdo-vac or hard digging before starting Project-related ground disturbance. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint – municipal planning and engineering will need to consider the new pipeline within the final right-of-way in future planning.
- Duration: long-term – the residual effect will begin during construction and continue as long as the pipeline is underground.
- Frequency: continuous – the residual effect begins during construction and extends through the life of the Project.
- Reversibility: long-term – the residual effect can be reversed with removal of the pipeline.
- Magnitude: low to medium – depending on the size of the community and density of underground infrastructure.
- Probability: high – due to feedback from municipalities.
- Confidence: moderate – full knowledge of all underground municipal infrastructure and final right-of-way location will be confirmed during detailed routing and further discussion with municipalities.

Upward Pressure on Power Supply/Capacity in Localized Areas

For the additional and upgraded pump stations, Trans Mountain has identified that the Project will require an additional 37.5 MW of power in Alberta, an additional 16.9 MW of power in the BC North Thompson Region, 10.8 MW of additional power in the BC Kamloops Nicola Valley Region, and a reduction of 26.3 MW of power in the BC Lower Mainland Region. In addition, the Burnaby Terminal expansion will have an incremental power demand of approximately 3.2 MW over current demand, and the Westridge Marine Terminal expansion will have an incremental power demand of approximately 2.7 MW. The power demand of the Project was noted as a concern by stakeholders in certain regions, particularly in the Fraser-Fort George/Thompson-Nicola Region. BC MFLNRO identified that the North Thompson has a need for power and that BC Hydro is looking to bring in an extra power line to the area, with a connection at Blue River (Lishman, McQueen pers. comm.). Specifically, north from Kamloops, BC Hydro operates a 138 kV circuit that ends at Rearguard, north of Valemount. At Rearguard, the line ends and does not connect with another circuit. BC Hydro also operates a line that ends at Merritt. BC Hydro is planning the Merritt Area Transmission Project to meet increased demand for power in the Merritt Area (BC Hydro 2013).

While the Project will require an increase in power over current operations, it is understood that the power needs of the Project and any other industry are accounted for in the long-term load planning of the BC and Alberta electrical systems. Trans Mountain has met with BC Hydro and the Alberta Electric System Operator to discuss Project power needs and is working toward ensuring any required upgrades in the transmission and distribution networks are developed at no additional cost to the rate payer. Ensuring the provincial electrical systems meet the needs of industrial and residential customers is in the purview of the provincial electric system operators of BC and Alberta.

The residual effect of any increased demand for power is neutral to negative. Any increased demand in power is being managed in the context of overall load growth in the Alberta and BC electrical systems and through transmission and distribution enhancement projects. The residual effect is considered to be reversible in the long-term since the expanded Project facilities will require incremental power over current day throughout the life of the Project. The probability of occurrence of the predicted residual effect is high since the expansion of facilities will require an increase in power supply, but the magnitude is negligible since it is being directly managed by enhancement projects with electrical system operators. No change in the existing socio-economic environment for other system users is anticipated (Table 7.2.5-3, point 2[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the incremental power needs of the Project will be drawn from regional transmission networks.
- Duration: long-term – the event causing the residual effect will be the need for power throughout operations.
- Frequency: continuous – the requirement for additional power continues through operations.
- Reversibility: long-term – the residual effects begins during construction and extends through operations.
- Magnitude: negligible – electrical system planning for load growth considers industrial needs, and Trans Mountain is working with Alberta and BC electrical system operators to ensure required system upgrades. No detectable change in the socio-economic environment is anticipated.
- Probability: high – the expansion of facilities will require an increase in power.
- Confidence: high – based on knowledge of Project power needs, and plans to develop to substations and power lines to support Project needs.

Combined Effects – Linear Infrastructure and Power Supply

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects related to linear infrastructure and power supply

evaluated in Section 7.2.5.6 (Table 7.2.5-3, points 2[a] to 2[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the linear infrastructure and power supply indicator.

The overall Project effects on linear infrastructure and power supply are tied to crossing of sub-surface linear infrastructure which may impede future use. In certain areas, the proposed pipeline corridor crosses existing sub-surface linear infrastructure (*e.g.,* water and sewer lines) operated by municipalities. Operationally, municipalities carry out general maintenance to these sub-surface facilities and will have future expansion needs as communities grow. Limitations to future municipal linear infrastructure planning and maintenance to existing sub-surface facilities as a result of the construction of the Project may occur, due to the necessity of obtaining permits or permission.

While concerns were raised during consultation about the effect of the Project on the regional power supply in the Fraser-Fort George/Thompson-Nicola Region, the incremental power needs of the Project are being managed in the overall context of system and load growth within the Alberta and BC electrical networks. Trans Mountain will be supporting the enhancement of the regional transmission network to meet its incremental needs at no cost to rate payer.

The overall Project effect on the linear infrastructure and power supply indicator is anticipated to be neutral to negative. Limitations to future municipal linear infrastructure will extend into operations, as once installed the proposed pipeline will become an additional underground pipe that municipalities must consider and avoid in their infrastructure planning. The spatial boundary for this residual effect is the Footprint to Socio-economic RSA, since municipal planning and engineering will need to consider the pipeline and pipeline right-of-way in future planning, but implications for regional power supply would occur at a regional level. Mitigation measures such as communicating the location of the pipeline to municipal engineers and planners, negotiating agreements regarding access in the pipeline right-of-way during operations, considering future municipal plans in pipeline detailed design, and working with Alberta and BC electrical system operators to enhance power transmission and distribution in Project areas will decrease the magnitude of this potential residual effect. The overall magnitude of the effect is considered low to medium as only a certain type of linear infrastructure has long-term anticipated effects; the probability of effects on sub-surface infrastructure is high (Table 7.2.5-3, point 2[c]). A summary of the rationale for all of the significance criteria of combined effects on linear infrastructure and power supply is provided below.

- Spatial Boundary: Footprint to Socio-economic RSA – effects on future municipal subsurface infrastructure planning would occur in the Footprint while effects on power supply would occur at the regional scale.

- Duration: long-term – limitations to future municipal linear infrastructure and need for power will extend into operations.

- Frequency: continuous – the effects on linear infrastructure and power supply begin during construction and extend through operations.

- Reversibility: long-term – the effects will extend throughout operations.

- Magnitude: low to medium – depending on the size of the community and the density of underground infrastructure; however, the magnitude of effects on power supply are considered to be negligible.

- Probability: high – predicted effects on linear infrastructure and power supply are considered likely to occur.

- Confidence: high – due to feedback from municipalities and information provided by Trans Mountain about power supply needs and discussions.

Infrastructure and Services Indicator - Waste and Water Infrastructure

The following provides the evaluation of significance of potential residual effects on the waste and water quality indicator.

Temporary Increase in Water Demand During Construction

The Project is expected to cause a temporary increase in demand for water during construction due to direct water needs of the Project and the indirect potable water needs of the construction workforce.

The Project will require water directly for construction-related activities such as hydrostatic testing and dust suppression. Trans Mountain has identified the following potential water sources for Project use during construction: North Saskatchewan River; Pembina River; McLeod River; Fraser River; Canoe River; North Thompson River; Thompson River; Coldwater River; Coquihalla River; and Sumas River. The specific locations where Trans Mountain may draw from these water supply sources and construction water volume demand estimates will be addressed as detailed design and construction planning advances.

There will also be an increased demand for water or use by temporary workers in construction hubs. The increased population in construction hubs during the construction phase will vary, due depending on the activities in each location. See Section 7.2.3 Social and Cultural Well-being for a discussion on the number of anticipated non-regional temporary workers anticipated in the Socio-economic RSA. While details will be refined, it is currently estimated that each non-resident worker housed in a construction hub will require approximately 100 litres per day of potable water.

Water infrastructure and services are generally dictated by demand and are planned by municipalities or regional districts for certain population thresholds. If the addition of several hundred temporary workers in a community surpasses these thresholds, there could be implications for a particular system's ability to supply its water users. Some communities, such as those located in the Metro Vancouver Region, have not identified issues related to water service capacity. However, other communities, such as the City of Kamloops and District of Clearwater, have identified current capacity issues. The City of Kamloops' water plant is currently close to maximum capacity, particularly during summer months (Fretz pers. comm.). The city is implementing a metering program to offset the need for major additional infrastructure; however, emergency intakes exist (Fretz pers. comm.). The District of Clearwater indicated it was developing a master water plan and that its current system was unlikely to be able to support additional workers associated with Trans Mountain's construction workforce especially with a large mine project being proposed for a similar timeframe (Groulx pers. comm.). Generally, a temporary increase in construction workers could result in the need for a community to upgrade their water supply, purification and/or distribution system.

As part of the Worker Accommodation Strategy, Trans Mountain will work closely with municipal and regional officials to identify and implement actions to prevent workforce demands exacerbating any municipal water supply capacity issues. Municipal sources will generally be used for supplying construction camps and Project offices. Trans Mountain will enter into water use agreements with the appropriate regulatory authorities as the Project develops.

The impact balance for this residual effect is considered negative for specific locations (but neutral in others), since the presence of Project-related construction workforce will create upward pressure on the supply capacity of regional water systems which may have implications for municipal or regional infrastructure planning in certain communities. This residual effect is considered to be reversible in the short-term (*i.e.*, effect is limited to specific periods during the construction phase) and is of low to medium magnitude, depending on individual communities' water capacity. There is a moderate confidence in the determination of significance since information regarding Project water needs during construction has not been finalized (Table 7.2.5-3, point 3[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – increase in water demand will be from water sources in the Socio-economic RSA.

- Duration: short-term – the event causing an increase in water demand is the construction of the Project.

- Frequency: isolated – the event causing an increase in water demand is confined to a specific phase of the assessment period (*i.e.,* construction phase).

- Reversibility: short-term – an increase in water demand is limited to the construction phase.
- Magnitude: low to medium – the magnitude of the residual effect depends on the size of community and its current water capacity, but will be managed by providing Project water intake for key potable water needs or trucking in potable water.
- Probability: high – construction of the Project will result in an increase in water demand.
- Confidence: moderate – the Project's water needs will be confirmed during detailed design.

Temporary Increase in Solid and Liquid Waste Flow to Regional Landfills, Transfer Station Sites and Wastewater Treatment Facilities During Construction

During construction, the Project is expected to cause a temporary increase in solid and liquid waste flow due to construction waste and the waste needs of temporary facilities and the increased population demand associated with temporary workers. Various facilities such as landfills, transfer stations and wastewater treatment plants located in the Socio-economic RSA could be affected. Solid waste generated during construction of the Project will be hauled to the appropriate landfill sites. Any hazardous waste will be disposed of according to provincial legislation. Trans Mountain will use the waste facilities where it has use agreements in place (see Table 5.5-1), some of which are within the Socio-economic RSA and some of which are in other parts of BC and Alberta. Discussions will occur with specific waste facility and hazardous waste operators when the Project details are finalized to determine appropriate hauling locations associated with Project needs.

There will be an increased use of waste services, including solid and liquid wastes during construction, related to the presence of temporary workers in construction hub communities. Sewage and grey water will be treated in an onsite temporary treatment facility, and hauled to regional facilities for disposal. Power at temporary facilities will be supplied from the regional grid where practical and by generators elsewhere. As noted in Section 7.2.3, the increased temporary population in construction hubs during the construction phase will vary, depending on the activities in each location. The residual effect is not expected to extend past the construction phase.

Waste infrastructure and services are generally dictated by demand and are planned by municipalities or regional districts for certain population thresholds. If the addition of several hundred temporary workers in a community surpasses these thresholds, this could affect a particular system's ability to provide waste services to its users. Some communities, such as those located in the Metro Vancouver Region, have not identified issues related to waste service capacity, partly since the responsibility lies with the Greater Vancouver Sewerage and Drainage District. However, other communities, such as the District of Clearwater and the Village of Valemount have identified capacity issues. The sewage infrastructure in the District of Clearwater is close to capacity and the system can only handle approximately 100-130 new houses. The District of Clearwater indicated that their sewer system likely would not be able to handle both Trans Mountain construction workforce and that of a larger mine (Groulx pers. comm.). The Village of Valemount has indicated that liquid waste treatment can be affected by power outages as a result of the use of lift stations to move sewage (LaBoucane pers. comm.).

The impact balance of this potential residual effect is considered to be negative. Ensuring any temporary construction camps' detailed waste management protocols are established in conjunction with regional officials will help to reduce the effect. This residual effect is considered to be reversible in the short-term (*i.e.*, effect is limited to the construction phase) and is of low magnitude, as mutually agreeable waste management agreements will be developed with service providers and Trans Mountain has existing agreements in place with multiple waste facilities. The confidence in this evaluation is moderate, since specific landfills and hazardous waste operators will be identified closer to construction and precise waste needs of the Project are still being determined. However, waste capacity was not identified as a key issue during consultation. Trans Mountain has existing agreements with many waste facilities in the context of its current operations (Table 7.2.5-3, point 3[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – facilities in various parts of the Socio-economic RSA may receive increased waste flow due to the Project.

- Duration: short-term – the event causing an increase in waste flow is the construction of the Project.
- Frequency: isolated – the event causing an increase in waste flow is confined to a specific phase of the assessment period (*i.e.,* construction phase).
- Reversibility: short-term – an increase in waste flow is limited to the construction phase.
- Magnitude: low – mutually acceptable waste management agreements will be developed with service providers and Trans Mountain has existing agreements in place with many waste facilities.
- Probability: high – construction of the Project will result in an increase in waste flow within the Socio-economic RSA that will need to be managed.
- Confidence: moderate – specific landfills and hazardous waste operators to be used for the Project will be identified closer to construction and the waste needs of the Project are still being determined.

Combined Effects – Water and Waste Infrastructure

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects related to water and waste infrastructure evaluated in Section 7.2.5.6 (Table 7.2.5-3, points 3[a] and 3[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the water and waste infrastructure indicator.

The overall effect of the Project on water and waste infrastructure is related to the Project's needs for water and waste disposal during construction activities and increased demands of a temporary workforce particularly in smaller construction hubs. The Project will require water directly for construction-related activities such as hydrostatic testing and dust suppression. Specific water sources will vary depending on the location of construction spreads and worker accommodations and may include rivers, streams, existing points of diversion and municipal sources located in the Socio-economic RSA. Trans Mountain will enter into water use agreements with the applicable jurisdictions as the Project develops. The Project will also cause a temporary increase in solid and liquid waste flow due to direct and indirect Project activities and components, construction waste and the waste needs of temporary facilities, and increased population demand associated with temporary workers. Solid waste generated during construction of the Project could be hauled to the appropriate landfill sites in socio-economic regions depending on the type of waste. Various facilities such as landfills, transfer stations and wastewater treatment plants located in the Socio-economic RSA could be used, but only by agreement.

Mitigation measures will be implemented to limit water use and to manage the Project's own water and waste needs, including finding mutually acceptable sites for hauling of waste. However, given that the Project will contribute to a general demand and pressures at the regional level, the overall effect on waste and water infrastructure is anticipated to be negative. The spatial boundary for any overall effects is regional since waste and waste infrastructure from across the Socio-economic RSA could be utilized or indirectly affected by the Project. The duration of overall effects on waste and water infrastructure is short-term as it is related directly to construction needs and the demands of the construction workforce. These effects are reversible in the short-term as they are related to construction activities. The overall magnitude is low to medium, depending on the size of the construction hub and water and waste system capacity within the Socio-economic RSA at the time of construction. The probability of the overall effects on water and waste infrastructure is high given knowledge of the Project's needs and the size of the anticipated non-regional workforce in relation to the size of certain Project regions. Confidence in this evaluation is moderate, as specific water supply options and landfills/hazardous waste operators will be identified closer to construction (Table 7.2.5-3, point 3[c]). A summary of the rationale for all of the significance criteria of combined effects on water and waste infrastructure is provided below.

- Spatial Boundary: Socio-economic RSA – waste and waste infrastructure from across the Socio-economic RSA could be utilized or indirectly affected by the Project.
- Duration: short-term – the effect is related directly to construction needs and the demands of the construction workforce.

- Frequency: isolated – incremental waste and water demands are associated with the construction phase.
- Reversibility: short-term – the effect will occur during the construction phase.
- Magnitude: low to medium – depending on the regional capacity of water and waste infrastructure at the time of construction.
- Probability: high – the Project will require water and waste services.
- Confidence: moderate – specific water supply options and landfills/hazardous waste operators will be identified closer to construction.

Infrastructure and Services Indicator - Housing

The following provides the evaluation of significance of potential residual effects on the housing indicator.

Increased Demand for Short-Term Accommodation During Construction

The size of the direct temporary workforce anticipated in the Socio-economic RSA during construction and the population effects associated with Project-related indirect and induced employment growth during construction, may lead to an increased demand for short-term accommodation during the construction phase.

The housing capacity in the construction hubs varies depending on available commercial and rental accommodation in the community. Table 7.2.5-4 summarizes housing capacity of the construction hubs.

TABLE 7.2.5-4

SUMMARY OF HOUSING CAPACITY OF CONSTRUCTION HUBS

Community/ Construction Hub	Non-Regional Workers per Month (High)	Non-Regional Workers per Month (Avg.)	Commercial Accommodation	Rental Accommodation	Stakeholder Feedback Related to Housing Capacity
Edmonton Area	514	264	Edmonton: No. hotels/motels: 50 Hotel/motel units: approx. 13,000 Campgrounds/RV parks: 5 (approx. 700 sites) Town of Stony Plain: No. hotels/motels: 6 Hotel/motel units: approx. 800 Campgrounds/RV parks: 2 (130 sites)	Edmonton: Rental units: approx. 60,000 Vacancy rate (2012):1.7% Town of Stony Plain: Rental units: approx. 435 Vacancy rate (2012): 3.9%	• No feedback to-date from the City of Edmonton. • Town of Stony Plain would prefer workers to integrate into local housing, rather than a construction camp. However, commercial accommodation capacity would be an issue. There is a demand for RV-type developments in area due to number of people working in and around the town. Four hotels/motels built within last 8 years due to demand of transient workers.
Town of Edson	806	345	No. hotels/motels: 20 Hotel/motel units: approx. 1,000 Campgrounds/RV parks: 20 (300 sites)	Rental units: approx. 626 Vacancy rate (2012): 9.4%	• Labour force capacity is tight, but more workers are now available than before 2007/2008 boom. There are a lot of temporary foreign workers which leads to crowding in housing. There are currently rooms available to house workers. However, during last boom, temporary camps emerged due to lack of hotel/motel rooms.

TABLE 7.2.5-4 Cont'd

Community/ Construction Hub	Non-Regional Workers per Month (High)	Non-Regional Workers per Month (Avg.)	Commercial Accommodation	Rental Accommodation	Stakeholder Feedback Related to Housing Capacity
Town of Hinton	302	91	No. hotels/motels: 20 Hotel/motel units: approx. 800 Campgrounds/RV parks: 14	Rental units: approx. 613 Vacancy rate (2012): 7.7%	• There has been a big increase in temporary foreign workers to meet labour demand. In order to benefit local hotel/motel, temporary camps are discouraged. Though in 2007/2008 boom, temporary camps emerged due to lack of hotel/motels; new hotels/motels were built during the boom and now operate at high vacancy rate (60-70% vacant). No capacity issues with commercial accommodation.
Village of Valemount	598	275	No. hotels/motels: 25 Hotel/motel units: approx. 540 Campgrounds/RV parks: 10	Rental units: unknown Vacancy rate (2012): unknown	• Valemount does not have experience with construction camps. During the TMX Anchor Loop there was increased hotel/motel revenue, but a shortage of low income housing as rents increased. There was also housing crowding issues. A number of local campgrounds were upgraded to accommodate workers' trailers and mobile homes. Large tourism base means wide range of commercial accommodation. There is little to no rental housing available.
Blue River	258	109	No. hotels/motels: 5 hotels (in Blue River) Hotel/motel units: unknown Campgrounds/RV parks: 1 (42 sites)	Rental units: unknown Vacancy rate (2012): unknown	• TNRD indicates Blue River has capacity to house additional workers and residents would not be opposed to housing temporary workers. It would be seen as an economic opportunity. However, land is available in Blue River to establish a work camp. There are approximately 150 seasonal workers that come in the winter; winter is the busy season and winter recreationalists fill up the hotels.
District of Clearwater	513	294	<u>Vavenby:</u> No. hotels/motels: none known Hotel/motel units: none known Campgrounds/RV parks: none known <u>Clearwater:</u> No. hotels/motels: 10 Hotel/motel units: approx. 231 in summer and 175 in winter Campgrounds/RV parks: 4 (330 sites)	<u>Vavenby:</u> Rental units: unknown Vacancy rate (2012): unknown <u>Clearwater:</u> Rental units: unknown Vacancy rate (2012): unknown	• There is private housing availability in Vavenby. There are no hotels/motels listed. No information is available on the rental market in Vavenby. • The District of Clearwater indicated that integration of Project workers (rather than a camp) would be preferred. There is sufficient land designated to handle projected growth and room for new subdivisions. However, there is little to no rental housing in the District of Clearwater. Some hotels and motels only operate seasonally (during summer).

TABLE 7.2.5-4 Cont'd

Community/ Construction Hub	Non-Regional Workers per Month (High)	Non-Regional Workers per Month (Avg.)	Commercial Accommodation	Rental Accommodation	Stakeholder Feedback Related to Housing Capacity
City of Kamloops	800	267	No. hotels/motels: 50 Hotel/motel units: approx. 3,000 Campgrounds/RV parks: 4 (more than 180 sites)	Rental units: approx. 3,629 Vacancy rate (2012): 3.9%	• Local businesses would not want a camp; they would prefer workers to reside in the city. Local hotels and motels taking in crews as it guarantees a 30 day stay. There is limited vacancy in rental units. The city expressed concern about low-income housing being taken up by workers, effectively pushing residents out. There is high hotel/motel occupancy in summer months and rates are higher during the summer. Kamloops' Tournament Capital Program means that big events often take up a lot of hotel space.
City of Merritt	738	291	No. hotels/motels: 15-17 Hotel/motel units: approx. 300 Campgrounds/RV parks: 3 RV parks (75-80 sites each)	Rental units: unknown Vacancy rate (2012): unknown	• The City of Merritt has previous experience with temporary work crews with the development of the Coquihalla Highway. The city noted that the community is very open to newcomers and temporary workers. Hotels and motels tend to be at capacity during special events and busier during summer due to road tourists. The city noted the need for an additional hotel. There are some developers considering building housing for temporary workers.
District of Hope	359	225	No. hotels/motels: 20 Hotel/motel units: approx. 422 Campgrounds/RV parks: 6 (459 sites)	Rental units: unknown Vacancy rate (2012): unknown	• Having workers integration into community housing is preferred over a construction camp. If proposed, the District indicated there is plenty of hotel/motel capacity for workers.
City of Chilliwack	182	134	Chilliwack No. hotels/motels: 9 Hotel/motel units: more than 400 Campgrounds/RV parks: 15 (about 320 sites) Harrison Hot Springs No. hotel/motels: 22 Hotel/motel units: approx. 500 Campgrounds/RV parks: 13	Chilliwack Rental units: approx. 3,051 Vacancy rate (2012): 5.5% Harrison Hot Springs Rental units: unknown Vacancy rate (2012): unknown	• City of Chilliwack noted that if crews used rental accommodations, affordability may be affected for residents.
City of Abbotsford	236	135	No. hotels/motels: 9 Hotel/motel units: approx. 500 Campgrounds/RV parks: none known	Rental units: approx. 3,562 Vacancy rate (2012): 3.7%	• City of Abbotsford is familiar with temporary workers; it is common in the agricultural sector for seasonal farm workers to reside in the city on a temporary basis. The Abbotsford Air Show occurs annually in the second week of August; during this time every hotel in Abbotsford, Surrey, Langley and Chilliwack is usually fully booked. The city is amenable to some form of temporary work camp if that is required.

TABLE 7.2.5-4 Cont'd

Community/ Construction Hub	Non-Regional Workers per Month (High)	Non-Regional Workers per Month (Avg.)	Commercial Accommodation	Rental Accommodation	Stakeholder Feedback Related to Housing Capacity
Metro Vancouver	843	459	Langley No. hotels/motels: 16 Hotel/motel units: approx. 800 Campgrounds/RV parks: 5 (60 sites) Coquitlam No. hotels/motels: 5 Hotel/motel units: approx. 300 Campgrounds/RV parks: 0 Surrey No. hotels/motels: 34 Hotel/motel units: approx. 1,000 Campgrounds/RV parks: 9 (380 sites) Burnaby No. hotels/motels: 10 Hotel/motel units: approx. 1,200 Campgrounds/RV parks: 1 (217 sites)	Langley Rental units: approx. 2,326 Vacancy rate (2012): 4.3 Coquitlam Rental units: approx. 4,941 Vacancy rate (2012): 3.2% Surrey Rental units: approx. 5,907 Vacancy rate (2012): 5.7 Burnaby Rental units: approx. 12,954 Vacancy rate (2012): 2.2%	• Metro Vancouver has one of the lowest rental vacancy rates in BC. In Burnaby, the Simon Fraser University's Burnaby Mountain Campus also provides seasonal dormitory units. There are no annual events affecting hotel availability in Burnaby. • No housing availability issues have come forward in socio-economic consultations with the City of Langley or City of Surrey to date.

Sources: Atfield, Blain, Clause, Dawson, Fortoloczky, Fretz, Frostad, Gill, Groulx, Johnston, Kreiner, Kwitkowski, Lambright, Latimer, Lemieux, Lerigny, Lukasiewich, Lyons, Macdonald, Mattheis, McCracken, McDonagh, Morris, Noble, Pagely, Perog, Ramme, Reid, Roline, Sanderson, Stewart, Te, Teichroeb, Tepasse, Umpherson, Williams, Wilson pers. comm., Advantage Hope 2011, Alberta Municipal Affairs 2011, BC Stats 2012, Blue River Campground 2013, Blue River 2013, Canadian Mortgage and Housing Corporation 2012a,b,c, 2013a,b,c, Chilliwack and District Real Estate Board 2012, City of Burnaby 2013, City of Chilliwack 2012, City of Coquitlam 2013, City of Edmonton 2013, City of Kamloops 2012a,b, Edmonton Real Estate Board 2013, Edmonton Tourism 2013, Fraser Valley Real Estate Board 2012, FVRD 2011a, Kamloops and District Real Estate Association 2013, Real Estate Board of Greater Vancouver 2013, Tourism Abbotsford 2012, Tourism BC 2013, Tourism Burnaby 2013, Tourism Chilliwack 2013, Tourism Harrison 2013, Tourism Langley 2013, Tourism Surrey 2013, Town of Edson 2013, Town of Hinton 2013, Town of Stony Plain 2013, Venture Kamloops 2012, Village of Valemount 2013

In some areas, Trans Mountain anticipates that direct construction-related workers will use existing housing and accommodations in construction hubs (*e.g.,* hotels, campgrounds, rental housing) or commute from other communities in the Socio-economic RSA during the 2 year construction period.

Trans Mountain will develop a Worker Accommodation Strategy in collaboration with local municipalities, which will consider local housing market development during the pre-construction period, evolving rental/commercial accommodation capacity, and preferences of host communities. Careful management of the housing strategy will avoid the potential issue of contributing to crowding in local housing markets. Depending on the level of local accommodation and refined workforce estimates available closer the commencement of the construction period, Trans Mountain's Worker Accommodation Strategy will explore a range of options including:

- expanding the supply of temporary accommodation by providing long-stay RV spaces (seeking private or local government partnerships);
- pre-booking hotel and motel space;
- renting existing housing/apartment units; and
- establishing temporary construction camps in locations where available local accommodations are limited and/or it is a preferred worker accommodation option by the construction hub. This may be considered in smaller construction hubs such as Edson, Valemount, Blue River, and Clearwater/Vavenby.

In construction hubs where temporary construction workers are expected to find their own accommodations, there will be a short-term increased demand for accommodations including hotels, motels, rental suites and campgrounds. The impact balance of this residual effect is considered both negative and positive. Depending on the time of year of the construction spread, the increased demand in

accommodations may fill a void of tourists and other visitors during 'off season' and would have positive economic affects for local hotels, motels or other commercial temporary accommodation owners. In this instance, the residual effect would be positive. Conversely, the increased demand in accommodations during 'on season' may disrupt the availability of accommodation for tourists and other visitors. In this instance, the residual effect is negative. The Project also may facilitate expansion and increased capacity of certain commercial accommodations, which would be considered positive. For example, during the TMX Anchor Loop Project, a number of local campgrounds in Valemount were upgraded to accommodate workers' trailers and mobile homes.

Early coordination of the commercial accommodation needs of direct Project workers will be conducted to ensure necessary rooms are available. If reserved accommodations are not required for Project construction personnel, contractors will be requested to consider releasing unneeded rooms. There will also be additional housing demand related to indirect or induced employment opportunities and associated regional in-migration; however, this is beyond the control of Trans Mountain. The increased demand for housing is reversible in the short-term (*i.e.,* effect is limited to the construction phase) and of low to medium magnitude depending on the community and availability of local accommodations at the time of construction (Table 7.2.5-3, point 4[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – accommodations which may be used by Project workers are located in communities across the Socio-economic RSA.
- Duration: short-term – the event affecting accommodation demand is construction of the Project.
- Frequency: isolated – the event affecting accommodation demand is confined to a specific phase of the assessment period (*i.e.*, the particular months of construction activity).
- Reversibility: short-term – the change in accommodation demand is limited to the construction phase.
- Magnitude: low to medium – depending on the size of the community and availability of accommodations at the time of construction.
- Probability: high – construction camps will not be used in all locations along the proposed pipeline corridor, thereby requiring temporary workers to utilize available short-term or commercial accommodation.
- Confidence: moderate – based on good understanding of supply-demand relationships, feedback from stakeholders, and housing information pertinent to the Project area, but uncertainty about the details of the Project Worker Accommodation Strategy.

Upward Pressure on Price of Rental and/or Short-Term Accommodations During Construction

There will be short-term increased demand for accommodations including hotels, motels, rental suites and campgrounds in construction hubs where temporary construction workers are expected to find their own accommodations. Increased demand for accommodations is anticipated to cause an upward pressure on the price of rental and/or short-term accommodations. For example, construction for the TMX Anchor Loop Project had a notable impact on accommodations in the Municipality of Jasper. Local officials indicated that there was an increase in housing prices; people's expectations about housing values changed and prices have remained high since the project. Some residents were displaced and had to leave town. Many services could not retain staff due to a lack of housing availability (Waterworth pers. comm.). The impact balance of this residual effect can be considered both negative and positive. It would be negative from the perspective of community residents not benefitting from Project employment/contracting opportunities and associated income and/or who may be on fixed incomes who rely on rental accommodation. However, the effect may be positive for hotel/motel business owners and landlords, who may benefit from increased business and revenues. The Worker Accommodation Strategy will consider the capacity of the housing (commercial and rental) market in each construction hub when making decisions about direct worker housing needs; the Project may use construction camps in select locations with limited housing capacity which will reduce demand pressure on local accommodations. The housing decisions made by the workers associated with Project-related indirect and induced employment

growth during construction will not be covered by the Worker Accommodation Strategy, and may contribute to upward pressure on the housing market across the Socio-economic RSA.

The increased demand for accommodation and, consequently, upward pressure on price will occur during the construction phase and, therefore, is reversible in the short-term. However, due to the multiple factors that can affect housing prices, the upward pressure on price of accommodations may extend into the longer term. For example, consultations with the Municipality of Jasper indicated that the increase in rental rates and housing costs experienced during the construction of the TMX Anchor Loop Project extended well past the end of construction and have remained relatively high (Waterworth pers. comm.). However, longer term housing prices would not be directly attributable to Project-related demand (Table 7.2.5-3, point 4[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – accommodations which may be used by Project workers are located in communities across the Socio-economic RSA.

- Duration: short-term – the event affecting upward pressure on price of rental and/or short-term accommodations is construction of the Project.

- Frequency: isolated – the event affecting housing is confined to a specific phase of the assessment period (*i.e.*, construction).

- Reversibility: short-term – the change in demand for accommodation associated with the Project is limited to the construction phase.

- Magnitude: medium – depending on the community and availability of accommodations at the time of construction.

- Probability: high – a shift in demand without a commensurate response in supply will lead to upward price pressure in the short-term. Increased housing prices are often seen in communities where demand increases due to incoming and speculative workers associated with the construction of major capital projects.

- Confidence: moderate – moderate confidence in cause-effect relationships. There are other factors that influence housing prices in a given region which may contribute to or off-set upward price pressure (*e.g.*, response by private developers and hoteliers, development of public housing).

Combined Effects – Housing

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects related to housing evaluated in Section 7.2.5.6 (Table 7.2.5-3, points 4[a] and 4[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the housing indicator.

Overall, Project effects on housing are tied to the construction workforce demands of the Project, the estimation of temporary non-regional labour that will be required to meet the Project's needs and the capacity of the regional housing market to accommodate temporary workers. While construction camps will be used in some areas, in other areas Trans Mountain anticipates that direct construction-related workers will use existing accommodations in construction hubs (*e.g.,* hotels, campgrounds, rental housing) or commute from other communities in the Socio-economic RSA. In such circumstances, considerable upward pressure on short-term rental or commercial accommodation would be anticipated, particularly for smaller communities. While the use of local hotels and rental units would be considered positive by hotel and apartment owners, housing price inflation, even if short-term, could have negative effects for people on fixed incomes or not experiencing income-related benefits associated with the Project. In smaller construction hubs, this may contribute to crowding issues. Many large urban centres along the proposed pipeline corridor, however, have not raised concerns about short-term housing capacity and indicate that temporary workers could be absorbed by existing temporary accommodations.

The overall effects on the housing indicator are considered negative and positive, depending on the construction hub. Trans Mountain will develop a Worker Accommodation Strategy in collaboration with

local municipalities, which will consider local housing market development during the pre-construction period, evolving rental/commercial accommodation capacity and preferences of host communities. Trans Mountain's accommodation strategy will consider the use of construction camps in select locations to avoid the potential issue of contributing to crowding in regional housing markets. The spatial boundary of the overall effect is regional, as workers may choose to reside anywhere in the Socio-economic RSA as most communities are in commuting distance to the Project. The duration and reversibility of overall effects are short term as Project-related housing effects are tied only to the accommodation needs of the construction workforce. The frequency of the overall effect is isolated, as the event causing the effect is the presence of temporary construction-phase workforce. The small number of incremental operations phase workers will be absorbed into communities across the Socio-economic RSA. Assuming the successful implementation of the Worker Accommodation Strategy, the magnitude of the overall effect is low to medium depending on the community and availability of local accommodations closer to construction. The probability of an overall effect on housing is high, given information about the number of temporary workers and regional housing capacity (Table 7.2.5-3, point 4[c]). A summary of the rationale for all of the significance criteria of combined effects on housing is provided below.

- Spatial Boundary: Socio-economic RSA – temporary construction phase workers may choose to reside anywhere in the Socio-economic RSA.
- Duration: short-term – housing effects are directly related to accommodation needs of temporary construction-phase workers.
- Frequency: isolated – housing effects are confined to the construction phase.
- Reversibility: short-term – housing effects will only occur during the construction phase.
- Magnitude: low to medium – depending on the community and availability of local accommodations closer to construction.
- Probability: high – where construction camps are not provided, Project workers will require regional housing.
- Confidence: moderate – based on Project information, information about regional housing capacity, feedback from stakeholders, the professional experience of the assessment team, but a lack of detail about the location of construction camps and the Worker Accommodation Strategy.

Infrastructure and Services Indicator – Educational Services

No residual effects of the Project were identified for the educational services indicator (Table 7.2.5-3). Consequently, no further assessment is warranted.

Infrastructure and Services Indicator - Emergency, Protective and Social Services

The following provides the evaluation of significance of potential residual effects on the emergency, protective and social services indicator.

Increased Demand on Emergency, Protective and Social Services During Construction

During construction, the Project may increase the demands put on regional emergency, protective and social services due to direct Project activities and the indirect demands of the temporary construction workforce.

The Project could directly affect service demand due to unforeseen or accidental events during the physical construction of the pipeline and facilities that require a service response. Unforeseen construction-related events requiring emergency services are difficult to predict. Trans Mountain is committed to constructing the Project safely and responsibly. Kinder Morgan's Environment, Health and Safety (EHS) policy articulates the company's commitment to conducting its activities in a safe and environmentally responsible manner. Moreover, Trans Mountain will develop specific Emergency Response Plans for the construction of the Project.

Despite these mitigation measures, incidents during the construction phase may arise where emergency services are required (*e.g.*, ambulance, fire, police and hospital). In the event of an incident, emergency services located in the Socio-economic RSA are likely to be involved in the response. Incidents could occur at the work site, at temporary construction camps, or on highways or roads used by the Project. The residual effect would be limited to the construction phase on a sporadic basis due to a combination of unplanned accidents and potential for worker behaviour issues within construction hubs (*i.e.*, increases in alcohol misuse or crimes) that require a service response.

There are examples in the Socio-economic RSA where emergency service providers are experiencing capacity constraints. In the Edmonton Region, the City of Spruce Grove identified some RCMP capacity issues and is in the process of looking at a new unit detachment. The Town of Stony Plain indicated that there is need for increased RCMP presence and indicated that there are some issues with having a volunteer fire department, including an increased risk of daytime (when most volunteers work a paying job) fires going undetected (Frostad pers. comm.). The RCMP detachments in the Hamlet of Evansburg, the Town of Edson and the Town of Hinton are fully manned with no identified need for expansion (Ramme pers. comm.). The Town of Edson identified that finances are not available to expand fire services further, although the town has a strong police presence because along with transient workers comes increased social problems (Lemieux pers. comm.). In the Town of Hinton, although there are no capacity issues with the fire and ambulance services, there is not a lot of capacity in the event of spilled liquid (Kreiner pers. comm.). In the Fraser-Fort George/Thompson-Nicola Region, the City of Merritt indicated that fire and emergency response services have some capacity issues, but the community is over serviced with police officers (Noble, Roline pers. comm.).

An increase in demand on emergency, protective and social services could also be driven by general population growth associated with temporary construction workers and new-comers to the region responding to indirect and induced employment opportunities. As noted in Section 7.2.3, temporary workers will likely not have family or their regular community supports in place during their period on construction crews, and as previously discussed may tend to be young and male with larger than average disposable incomes. These factors often result in workers being more readily drawn into behaviours that may lead to the need for service intervention. For example, in the Rural Alberta Region, Yellowhead County identified past issues with temporary construction camps; which resulted in an increase in social issues and certain crime, putting increased pressure on policing service (Ramme pers. comm.). Available RCMP are placed based on the current population which does not account for the population of workers living in temporary construction camps and hotels. To the extent that construction hubs may experience an increase in negative community-worker interactions, social service providers and local policing services may experience an increase in capacity pressure during construction. During Project engagement in the Valemount and Jasper, no issues related to social service capacity during the TMX Anchor Loop Project were brought forward. The potential increased traffic safety issues due to increased traffic volumes (see Section 7.2.8 Community Health) may further contribute to capacity pressure on policing and emergency services. However, Trans Mountain will have mitigation in place to reduce such effects, including: developing a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions; developing an issues-tracking process to monitor and respond to Project-related socio-economic issues that emerge during construction; and developing a process by which community members can raise complaints or concerns related to Project activities or workers. Trans Mountain will also communicate with local protective and social service authorities on the timing of the Project, duration of stay in the local community, expected number of people coming into the area.

The impact balance of this potential residual effect is considered to be negative, as increased demands may be placed on certain service providers. The magnitude of the potential effect is medium, as it is considered to be more than an inconvenience to communities since emergency services responding to a Project-related incident, particularly in smaller communities, could result in service implications for residents and other existing users. Moreover, existing emergency services capacity issues have been identified in some construction hubs, including the Town of Stony Plain and the Town of Hinton. The probability of the residual effect is high, based on feedback from communities and experience of the assessment team (Table 7.2.5-3, point 6[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – emergency, protective and social services exist in the Socio-economic RSA.
- Duration: short-term – the event causing increased demand on emergency, protective and social services is the construction of the Project (*e.g.,* construction activity, traffic, and temporary workers).
- Frequency: isolated – the event that could affect demands on emergency, protective and social services is confined to a specific phase of the assessment period (*i.e.,* construction).
- Reversibility: short-term – increased demand on emergency, protective and social services is limited to the construction phase.
- Magnitude: medium – the residual effect is more than an inconvenience to communities, as it could result in service implications for current residents and other users.
- Probability: high – the effect is considered likely.
- Confidence: high – based on feedback from communities and the professional experience of the assessment team.

Infrastructure and Services Indicator - Recreation Amenities

The following provides the evaluation of significance of potential residual effects on the recreation amenities indicator.

Use of Recreation Amenities by Workers During Construction

Workers will require access to recreation and leisure facilities for stress relief and leisure activities between work shifts. Although construction camps might address some of these requirements for communities where temporary construction camps are established (as camps will have onsite recreational facilities for residents), recreation amenities in communities are expected to be used by temporary construction workers.

As discussed in Section 7.2.3, based on the capacity of the regional labour force and the *average* workforce requirements over the construction period, it is anticipated that the influx of temporary workers, will range from a low of about 264 construction workers in the Edmonton Region to a high of about 1,221 construction workers in the Fraser-Fort George/Thompson-Nicola Region. Based on *peak* construction workforce requirements, it is anticipated that the influx of temporary workers could range from a low of 514 workers in the Edmonton Region to a high of 2,876 workers in the Fraser-Fort George/Thompson-Nicola Region. Where construction hubs do not have construction camps, and particularly in smaller construction hubs, a number of temporary construction workforce personnel could seek use of regional recreation amenities when off-shift. In regions where construction camps are established, minimal Project-related demand on recreational amenities is anticipated. The residual effect of increased demand put on recreational amenities is confined to the construction phase of the Project and will be reversed when the construction phase is complete and the temporary workers relocate.

Recreation amenities potentially used by construction workers are located in communities across the Socio-economic RSA. Facilities that could be affected include: hiking and biking trails, golf courses, fitness gyms, sports fields and swimming pools, amongst others. Generally, the capacity of recreational amenities in each of the socio-economic regions is sufficient for residents as well as some use by temporary workers.

To mitigate any potential negative effects, prior to construction, Trans Mountain will develop worker Code of Conduct policies, which will cover guidance on the safe and respectful use of community facilities. Any construction camps will have onsite recreational facilities. During the TMX Anchor Loop Project it was noted that some temporary workers joined local baseball and hockey teams which was regarded by the community as positive.

The residual effect is considered to be neutral (*i.e,* not net benefit or loss to the indicator). The magnitude of this residual effect is low, since use of recreation amenities by construction workers, while potentially detectable, is anticipated to primarily be that of an inconvenience or nuisance to residents and other users. No issues have been raised by potential construction hub communities about capacity of recreational infrastructure. Further, the Worker Accommodation Strategy will consider the amenity and capacity constraints of construction hubs. The probability and confidence of the use of recreation amenities by construction workers are both high based on previous project experience and community feedback (Table 7.2.5-3, point 7[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – recreation amenities that may be used by Project workers exist throughout the Socio-economic RSA.
- Duration: short-term – the event causing a use of recreation amenities is the construction of the Project.
- Frequency: isolated – the event causing use of recreation amenities is confined to a specific phase of the assessment period (*i.e.,* construction phase).
- Reversibility: short-term – the increased use of recreation amenities by Project workers is limited to the construction phase.
- Magnitude: low – any increased use of recreation amenities by Project may be detectable by host community residents but at most would have nuisance effects in most areas.
- Probability: high – recreation amenities are very likely to be used by construction workers during construction, when off or between shifts, particularly in regions were construction camps are not used for accommodating workers.
- Confidence: high – based on a good understanding of the cause and effect relationship and the professional experience of the assessment team.

7.2.5.7 Summary

As identified in Table 7.2.5-3, there are no situations for infrastructure and services indicators that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of Project construction and operations on infrastructure and services indicators will be not significant.

7.2.6 Navigation and Navigation Safety

This subsection describes the potential Project effects on navigation and navigation safety. This refers to the use of watercourses for transportation, whether for recreational, commercial or traditional purposes. Given the linear length of the Project, there are numerous navigable watercourses (including navigable wetlands) that are crossed by the Project.

The discussion of navigation and navigation safety presents effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities, and the terrestrial component of the Westridge Marine Terminal), since the communities and regions in which the Project occurs will experience Project-related activities in a combined manner. It is not meaningful from a community perspective to discuss navigation and navigation safety effects of each Project component on a stand-alone basis.

Navigation and navigation safety pertaining to the marine waters of Burrard Inlet are discussed in Section 7.6.7 in relation to the expansion of the Westridge Marine Terminal. While traditional Aboriginal use of watercourses for navigation is touched on briefly in this section, it is discussed further in Section 7.2.2 Traditional Land and Resource Use.

The Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report in Volume 8B provides further information about marine use patterns and navigation in the Burrard Inlet.

7.2.6.1 Assessment Indicators and Measurement Endpoints

Table 7.2.6-1 summarizes the assessment indicator, measurement endpoint and their rationale for navigation and navigation safety. The indicator selected represents components of the socio-economic environment that are of particular value or interest to regulators, Aboriginal communities, local communities, and other interested groups and individuals. The indicator has been selected based on: the NEB *Filing Manual* guidelines; experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, regulatory authorities and stakeholders; feedback from participants in ESA workshops; public issues raised through the media; and the professional experience of the assessment team. In essence, the indicator selected mirrors the element itself, as navigable watercourses are the distinct resource being examined in this newly established element which was previously examined as a sub-component under HORU.

The measurement endpoint used to assess Project effects on the indicator is qualitative in nature, but is based on a technical analysis of the characteristics and navigability of watercourses crossed by the Project as discussed in Volume 5A. This parameter has been chosen based on available information and previous experience in assessing the effects of similar projects.

TABLE 7.2.6-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR NAVIGATION AND NAVIGATION SAFETY

Navigation and Navigation Safety Indicator	Measurement Endpoints	Rationale for Indicator Selection
Navigable watercourses	• Use of navigable watercourses	The selection of this indicator and measurement endpoint considered NEB *Filing Manual* requirements for the navigation and navigation safety element in Table A-3 and key issues and interests identified during stakeholder engagement and Aboriginal engagement. They also considered feedback from participants in the ESA Workshops. Navigation and navigation safety was not a commonly identified issue during stakeholder engagement or Aboriginal engagement.

7.2.6.2 Spatial Boundaries

The spatial boundaries associated with the Project Footprint, the HORU LSA and HORU RSA used for the effects assessment for navigation and navigation safety are described in Section 7.2.4 Human Occupancy and Resource Use.

7.2.6.3 Navigable Water Use Context

In Alberta, the proposed pipeline corridor Project crosses 4 watercourses that are considered navigable, 34 watercourses that are considered potentially navigable and 92 potentially navigable wetlands. In BC, the proposed pipeline corridor crosses 49 watercourses that are considered navigable, 70 watercourses that are considered potentially navigable and 84 potentially navigable wetlands. The Pipeline EPP (Volume 6B) provides a summary of the watercourses crossings, including a determination of navigability for each watercourse.

Key navigable watercourses crossed by the Project that have known traditional and non-traditional human uses and were identified as valued watercourse resources during stakeholder and Aboriginal engagement and at the various Community Workshops and ESA Workshops are presented in Table 5.6-1 in Section 5.6. These include the:

- North Saskatchewan River (Edmonton Region);

- Pembina River (Rural Alberta Region);
- McLeod River (Rural Alberta Region);
- Maskuta Creek (Rural Alberta Region);
- Fraser River (Fraser-Fort George/Thompson-Nicola Region and Metro Vancouver Region);
- Swift River (Fraser-Fort George/Thompson-Nicola Region);
- Raft River (Fraser-Fort George/Thompson-Nicola Region);
- Thompson River (Fraser-Fort George/Thompson-Nicola Region);
- Coldwater River (Fraser-Fort George/Thompson-Nicola Region);
- Nicola River (Fraser-Fort George/Thompson-Nicola Region);
- Coquihalla River (Fraser Valley Region);
- Chilliwack/Vedder River (Fraser Valley Region); and
- Sumas River (Fraser Valley Region).

Types of use on watercourses crossed by the Project include commercial and non-commercial recreation and tourism uses, such as fishing, tubing, kayaking, jet boating, canoeing, white-water rafting and swimming. Coastal and deep sea cargo transport, log sorting and moorage occur on the Fraser River in the Metro Vancouver Region. Vessels and craft used on watercourses crossed by the Project include fishing boats, canoes, kayaks, rafts, tubes, row boats, cargo ships, tugs and sailboats. There are also a number of unnamed navigable creeks, tributaries and wetlands crossed by the Project. Particular uses on such creeks could include commercial and non-commercial fishing activities, kayaking, canoeing, boating and rafting. Shore-side use for commercial and non-commercial fishing is also common along watercourses crossed by the Project.

For the purposes of this assessment, use of the term watercourse includes all named and unnamed rivers, creeks, streams, tributaries and wetlands.

7.2.6.4 Potential Effects and Mitigation Measures

Identified Potential Effects

Potential effects associated with the construction and operations of Project on the navigation and navigation safety indicator are listed in Table 7.2.6-2. These interactions are based on the results of the literature review, desktop analysis, TEK, engagement with Aboriginal communities, regulatory authorities, landowners and other stakeholders (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures to reduce the potential effects of the construction and operations of the Project on navigation and navigation safety are provided in Table 7.2.6-2. These measures were developed in accordance with several industry and regulatory guidelines including Transport Canada's *Navigable Waters Protection Act* (*NWPA),* as well as in accordance with Trans Mountain standards. In addition, these measures have been considered acceptable by the NEB for past pipeline projects, including the TMX Anchor Loop Project (NEB 2006) and Enbridge Alberta Clipper Expansion Project (NEB 2008).

TABLE 7.2.6-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PIPELINE CONSTRUCTION AND OPERATIONS ON NAVIGATION AND NAVIGATION SAFETY

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][2]	Potential Residual Effect(s)
Navigation and Navigation Safety Indicator – Navigable Watercourses				
1.1 Disruption of watercourse users on navigable watercourses	Navigable watercourses All regions, except Jasper National Park region / New pipeline segments Pump Stations (Blackpool Pump Station; Black Pines and Kingsvale Pump Stations' power lines)	LSA	• Ensure temporary vehicle crossing structures do not disrupt fish passage at fish-bearing watercourses and do not interfere with or impede flow or navigation at any location [EPP Section 8.7]. • Limit instream construction to the shortest duration practical given the characteristics of the watercourse and the construction season [EPP Section 8.7]. • Ensure streamflow is maintained at all times when trenching through a watercourse [SEMP Section 8.4.10]. • Restore natural contours of bed of watercourse [SEMP Section 8.4.10]. • Stabilize disturbed shoreline to prevent erosion [SEMP Section 8.4.10]. • Keep channel clear upon completion of construction [SEMP Section 8.4.10]. • Allow navigation through the construction site where practical, assisting if necessary (*e.g.*, have the ability to transport watercourse users around construction activity to a downstream watercourse re-entry point [SEMP Section 8.4.10]. • Apply all measures in the EPP pertaining to watercourse crossing and navigability.	• Impediments to watercourse users on navigable watercourses during construction or site-specific maintenance activities.
1.2 Concern for safety of watercourse users on navigable watercourses	Navigable watercourses All regions, except Jasper National Park region / New pipeline segments Pump Stations (Blackpool Pump Station; Black Pines and Kingsvale Pump Stations' power lines) Westridge Marine Terminal	LSA	• Notify recreational boaters of the hazards associated with instream construction [EPP Section 4.0]. • Place warning signs (*e.g.*, Warning – Pipeline Construction Ahead) up and downstream of all navigable crossings. The signs are to be legible at a distance recommended by the conditions of permit approval(s) granted by the NEB [EPP Section 4.0]. • Maintain signage and other warning systems required by the NEB in place until navigational hazards are removed [EPP Section 8.7]. • Contact appropriate regulatory authorities and municipal tourism offices prior to construction activities and provide maps and schedules of the proposed construction activities to enable them relay information about possible recreational use area closures [SEMP Section 8.4.6]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [SEMP Section 8.4.6].	• The safety of watercourse users on navigable watercourses may be affected in the event the user enters the construction zone.

Notes: 1 LSA = HORU LSA.

2 Detailed mitigation measures are outlined in SEMP (Volume 6B) the EPPs (Volumes 6B to 6C).

7.2.6.5 Potential Residual Effects

The potential residual socio-economic effects on navigation and navigation safety associated with the construction and operations of the Project (Table 7.2.6-2) are:

- impediments to watercourse users on navigable watercourses during construction or site-specific maintenance activities; and

- the safety of watercourse users on navigable watercourses may be affected in the event the user enters the construction zone.

7.2.6.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method that is considered to be the appropriate method. Consequently, qualitative assessment for navigation and navigation safety was determined to be the most appropriate. The evaluation of significance of the potential residual effects relies on the professional judgment of the assessment team.

Table 7.2.6-3 provides a summary of the significance evaluation of the potential residual socio-economic effects of the construction and operations of the Project on navigation and navigation safety. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below.

TABLE 7.2.6-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON NAVIGATION AND NAVIGATION SAFETY

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Navigation and Navigation Safety Indicator – Navigable Watercourses									
1(a) Impediments to watercourse users on navigable watercourses during construction or site-specific maintenance activities.	Negative	LSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
1(b) The safety of watercourse users on navigable watercourses may be affected in the event the user enters the construction zone.	Negative	LSA	Immediate	Accidental	Short-term	Low to high	Low	Moderate	Not significant

Notes: 1 LSA = HORU LSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Navigation and Navigation Safety Indicator – Navigable Waters

The following provides the evaluation of significance of potential residual effects related to the navigable waters indicator.

Impediments to Watercourse Users on Navigable Watercourses.

The degree of potential effect depends on the method of construction, the season of construction and the state of the watercourse (frozen or unfrozen). Impediments to watercourse users on navigable watercourses may occur during construction and site-specific maintenance. Watercourse users vary depending on the watercourses and location of each crossing. In general, activities on watercourses crossed by the Project include commercial and non-commercial rafting, kayaking, fishing, boating and tubing. The Fraser River is crossed three times by the Project, twice in the Fraser-Fort George/Thompson-Nicola Region and once in the Metro Vancouver Region. In the Metro Vancouver Region, the Project crosses the Fraser River along the Sapperton Channel Segment. Log sorting and booming are the primary activities taking place on this segment of the river. Moorage for tugs and barges, marine traffic consisting of scows, barges, tugs and fishing and recreational vessels also take place on this segment of the river (Burrard Inlet Environmental Action Program [BIEAP] 2006).

The navigability of some watercourses along the Project may be affected if open water conditions occur during a trenched crossing or installation of a temporary vehicle crossing as part of construction or site-specific maintenance activities (*e.g.*, integrity dig). Notification to watercourse users and installation of warning signs will reduce the magnitude of the effect. For example, during the Alberta Clipper Project, warning signs were installed up and downstream of the pipeline crossing of Pipestone Creek. During this project, instream construction occurred during non-frozen conditions and recreational boat traffic was not a concern (TERA 2011b, 2012b, 2013b). However, watercourse crossings that occur during winter will have a reduced effect on navigation and navigation safety, as some types of uses may be reduced during winter and in some areas no navigation use will occur during the winter due to frozen conditions.

Construction through watercourses will utilize a number of appropriate pipeline watercourse crossing methods selected in consideration of the size, environmental sensitivities of each watercourse and the season/timeframe of the construction period of each particular crossing. Pipe installations at watercourse crossings can be classified as either wet (trenched) or dry (trenched with water flow control or trenchless) crossings. With a wet crossing (*e.g.,* open cut), the trench can be excavated through flowing water, if present. With a dry crossing, excavation of the trench normally occurs through the streambed once the water flow has been isolated, either by a dam and pump-around mechanism, or by using a flume over the excavated trench. Trenchless crossings (*e.g.,* bore or horizontal directional drill) techniques could also be used for watercourse crossings, where feasible (see Volume 4A for more detail on watercourse crossing methods).

The navigability of watercourses will generally not be affected during the operations phase since the pipeline will be buried under watercourses and the usage of new permanent vehicle crossings is not anticipated. However, impediments to navigation may occur during the operation phase if site-specific maintenance activities occur during open water conditions. The residual effect of impediments to watercourse use on navigable waters is reversible in the short-term and of a low magnitude (Table 7.2.6-3, point [1a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – the potential impediments to navigation may extend beyond the Footprint into the HORU LSA.

- Duration: short-term – the event causing impediments to navigation is installation of watercourse crossings during construction of the pipeline or site-specific maintenance activities occurring within any 1 year during operations.

- Frequency: periodic – the event causing the impediments to navigation is installation of watercourse crossings during pipeline construction or site-specific maintenance activities which would occur intermittently but repeatedly during the assessment period.

- Reversibility: short-term – the impediments to navigation are limited to the portions of the construction phase or site-specific maintenance activities which are completed in any 1 year during operations.

- Magnitude: low – implementation of the proposed mitigation measures is expected to effectively reduce the magnitude of the residual effect on navigation of navigable watercourses.

- Probability: high – instream work and/or the installation of temporary vehicle crossing are planned for navigable watercourses during open water conditions. Additionally, in the event that the trenchless crossing of a navigable watercourse is unsuccessful and a trenched crossing is implemented, the probability of impediments with navigation on the watercourse would be high in open water conditions.

- Confidence: high – based on good understanding of cause-effect relationships and data pertinent to the Project area.

Safety of Watercourse Users on Navigable Watercourses

If watercourse users enter the construction zone, the safety of users may be affected if open water conditions occur during a trenched crossing or installation of a temporary vehicle crossing as part of construction or site-specific maintenance activities (*e.g.*, integrity dig). The impact balance of this residual

effect is considered negative. Installation of warning signs and provision of safe passage through the work area will reduce the likelihood of an incident that would affect the safety of watercourse users. A review of post-construction environmental monitoring reports of past projects, including the TMX Anchor Loop Project (TERA 2009b) and the Alberta Clipper Project (Enbridge 2011), indicated that no accidents affecting watercourse users had occurred. Therefore, it is anticipated that the safety of watercourse users on navigable watercourses will generally not be affected during the operations phase since the pipeline will be buried under the watercourse and the usage of new permanent vehicle crossings is not anticipated. However, safety of watercourse users may be affected during the operation phase if site-specific maintenance activities occur during open water conditions. The residual effect of the safety of watercourse users on navigable watercourses is reversible in the short-term and of low probability (Table 7.2.6-3, point [1b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – the safety of watercourse users may extend beyond the construction footprint into the HORU LSA.
- Duration: immediate – the event causing concern for safety of watercourse users is an accident, the duration of which is less than or equal to two days.
- Frequency: accidental – an accident resulting in harm or safety concern to watercourse users is rare.
- Reversibility: short-term – potential effects on the safety of users on navigable watercourses is limited to the construction phase or site-specific maintenance activities which are completed in any 1 year during operations.
- Magnitude: low to high – depending on the severity of the accident involving a watercourse user.
- Probability: low – it is unlikely that an accident would occur which would result in harm to a watercourse user given implementation of the proposed mitigation measures.
- Confidence: moderate – based on good understanding of cause-effect relationships and the professional experience of the assessment team; however, there is inherent uncertainty associated with human behaviour.

7.2.6.7 Summary

As identified in Table 7.2.6-3, there are no situations for navigation and navigation safety that would result in a significant socio-economic residual effect. Consequently, it is concluded that the residual socio-economic effects of Project construction and operations on navigation and navigation safety will be not significant.

7.2.7 Employment and Economy

This subsection discusses the potential Project related effects on employment and economy. This considers effects related to provincial and national economies, regional employment, municipal economic benefits, training and capacity development, procurement and contracting, and as well as the possibility for business or livelihood disruption.

The discussion of employment and economy presents potential effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the Westridge Marine Terminal), since the communities and regions in which the Project is located will experience Project-related activities in a combined manner. It is not meaningful from a community perspective to discuss the employment and economic effects of each Project component on a disaggregated basis.

The Socio-Economic Technical Report of Volume 5D provides further detail on the existing conditions related to employment and economy, including information on existing economic activities and key sectors, labour force characteristics and educational attainment.

The Conference Board of Canada's report entitled Expansion of the Trans Mountain Pipeline: Understanding the Economic Benefits for Canada and its Regions in Volume 2 provides further detail on the anticipated quantitative economic effects related to the Project.

The Worker Expenditures Along the Pipeline Corridor Technical Report in Volume 5D provides further information on potential local economic benefits associated with Project workers. These technical reports should be referred to in conjunction with the following discussion.

7.2.7.1 Assessment Indicators and Measurement Endpoints

Table 7.2.7-1 summarizes the assessment indicators, measurement endpoints and their rationale for employment and economy. The indicators selected represent components of the socio-economic environment that are of particular value or interest to Aboriginal communities, regulatory authorities, local communities, and other interested groups and individuals. The indicators have been selected based on: the NEB *Filing Manual* guidelines; experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, regulatory authorities and stakeholders; feedback from participants in ESA Workshops; public issues raised through the media; and the professional judgment of the assessment team.

The measurement endpoints used to assess Project effects on the indicators include a combination of qualitative and quantitative parameters. These parameters have been chosen based on available socio-economic information and previous experience in assessing the effects of similar projects.

TABLE 7.2.7-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR EMPLOYMENT AND ECONOMY

Employment and Economy Indicators	Measurement Endpoints	Rationale for Indicator Selection
National and provincial economies	• Economic output • Gross Domestic Product • Federal and Provincial taxes • Provincial and national employment	The selection of indicators and measurement endpoints considered NEB *Filing Manual* requirements for the employment and economy element in Table A-3 and key issues and interests identified during stakeholder engagement. They also considered feedback from participants in the ESA Workshops and the professional experience of the assessment team.
Regional employment	• Regional employment opportunities • Project-related income	
Municipal economies	• Municipal taxes paid • Project worker expenditures	
Contracting and procurement	• Local and regional participation in contracting	
Training and capacity development	• Training programs and capacity development	
Business and livelihood disruption	• Disruption to businesses and livelihoods	

7.2.7.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for employment and economy considered one or more of the following areas:

- a Socio-economic RSA;
- the Provincial Area (which includes Alberta and BC); and
- the National Area.

No LSA was considered for employment and economy. The relevant study area is defined by communities and regions in which people potentially directly and indirectly affected by and benefitting from the Project reside (not by a particular land area), as well as at the Provincial and National level.

The spatial boundaries associated with the Socio-economic RSA are described in Section 7.2.3 Social and Cultural Well-being and shown on Figures 5.0-1 to 5.0-7.

7.2.7.3 Employment and Economic Context

The regions through which the Project crosses have a diverse range of economic activity. The prevalent economic activities in the Alberta portions of the Socio-economic RSA include oil and gas, and agriculture. Oil and gas exploration and development activities include seismic, well sites, pipelines, access roads and associated facilities such as gas processing plants. Predominant agricultural crops in the region include wheat, canola, alfalfa and hay. Larger communities crossed by the proposed pipeline corridor, such as Edmonton, Spruce Grove and Stony Plain, have more diversified economies, with a wider range of secondary and tertiary industries.

The prevalent economic activities in the BC portion of the Socio-economic RSA include forestry, agriculture, tourism/recreation and mining. Larger communities traversed by the proposed pipeline corridor, such as those in the Lower Mainland and Metro Vancouver areas have more diversified economies, with a wider range of secondary and tertiary industries.

The labour force characteristics vary across the Socio-economic RSA. Based on 2011 data (see Section 5.7 Table 5.7-1), the total labour force across the Socio-economic RSA is approximately 2.2 million workers. The labour force of a region is the population aged 15 or older who are working, looking for work, or willing to work. It does not include those who are retired, full-time students, engaging in full-time traditional livelihoods, or who choose not to engage in (or seek) wage employment for any reason. The Alberta regions of the Socio-economic RSA exhibit higher participation rates and lower unemployment rates than the BC regions, but generally have a smaller pool of labour. Based on 2011 data, the Edmonton Region's labour force has approximately 696,600 workers, with an unemployment rate of 5.6% and participation rate of 73.2%. The Rural Alberta Region has a labour force of approximately 17,000 workers with an unemployment rate of 5.9% and a participation rate of 73.2%. The Jasper National Park Region has a labour force of approximately 2,500 workers, with an unemployment rate of 1.6% and a participation rate 84.3% (Statistics Canada 2013a). In BC based on 2011 data, the Fraser-Fort George/Thompson-Nicola Region has a labour force of approximately 63,200 workers, with an unemployment rate of 9.3% and a participation rate of 63.7%. The Fraser Valley Region has a labour force of approximately 138,500 workers, with an unemployment rate of 8.0% and a participation rate of 64.7%. The Metro Vancouver Region has the largest labour pool of almost 1.3 million workers, representing a participation rate of 66.1%, and with an unemployment rate of 7.1% (Statistics Canada 2013a).

Both Alberta and BC are in a period of economic growth resulting in growing employment and a tightening in labour supply. The Construction Sector Council (CSC) anticipates that the construction industry in Alberta will continue to expand. Recruiting challenges have been reported in both the residential and non-residential construction sectors. It is anticipated that the construction labour force will expand by 14,000 workers from 2013 to 2021 in Alberta, which may lead to a gap of 21,000 workers which will need to be found outside the industry (CSC 2013a). The CSC also anticipates that job gains will continue in most sectors of the construction industry in BC to 2016 and that by 2016, most of the skilled workforce will be absorbed (CSC 2013b).

While more recent data specific to Socio-economic RSA communities are not available, recent labour force information for the provincial Economic and Development Regions in which the socio-economic regions are located indicate further employment growth and tightening of the labour market since 2011. In June 2013, the unemployment rates in relevant Alberta Economic Regions were between 4.0% and 4.6%; unemployment rates in the relevant BC Economic Regions were between 5.0% and 6.6% (see Table 7.2.7-10).

Quantitative provincial and national Project-related economic effects were estimated by the Conference Board of Canada using the most current and comprehensive Project costs. Full details on the economic modelling are found in the Conference Board of Canada's report entitled Expansion of the Trans Mountain Pipeline: Understanding the Economic Benefits for Canada and its Regions in Volume 2.

Construction will involve various work crews constructing the pipeline and upgrades to the pump stations, terminals and the Westridge Marine Terminal expansion. Construction plans include the pipeline being constructed in seven spreads. It is anticipated that all seven spreads will generally be constructed concurrently during the following consecutive construction seasons: summer 2016; winter 2016/2017; and summer 2017. Construction of the proposed facilities will occur concurrently and continuously during the construction period in distinct locations. Contracting and employment opportunities and the need for local benefits have been identified as important issues by Aboriginal and non-Aboriginal communities in the Socio-economic RSA.

The extent to which regional residents and businesses will participate in Project construction opportunities will depend on a number of factors. These factors include the size of the available regional workforce, the proportion of the labour force with relevant qualifications and experience, the range and capacity of regional businesses to provide goods and services, and the extent to which other projects will be competing for labour, goods and services during the time of construction.

Trans Mountain anticipates its Project-wide construction activities will be based out of 12 communities or regional centres along the proposed pipeline corridor. These construction hubs will be places from which construction activities are staged, including worker accommodation. Construction hubs are anticipated to be: Edmonton Region (including the Town of Stony Plain), the Town of Edson, the Town of Hinton, the Village of Valemount, the Community of Blue River, the District of Clearwater (including the Community of Vavenby), the City of Kamloops, the City of Merritt, the District of Hope, the City of Chilliwack, the City of Abbotsford and Metro Vancouver. While the precise locations will be determined during detailed construction planning, these construction hubs have been used for assessment purposes in terms of workforce estimates and labour force analysis.

7.2.7.4 Potential Effects and Mitigation and Enhancement Measures

Effects Considerations

A range of macro-level, global economic issues was raised during the course of stakeholder engagement and in the media related to the Project. These include:

- the effect of the Project on expanding foreign access to Canadian oil products;
- the potential associated effect of the Project on Canadian oil and gas commodity values;
- the potential associated effect of the Project on local gasoline prices; and
- the economic effect of the increased movement of oil tankers to and from the Westridge Marine Terminal in PMV to offload the product from the pipeline.

These global issues are not addressed in this assessment, since they are matters of public policy and wider economic/market forces, and are more appropriately addressed by government bodies and other commodity owners or organizations. However, such issues have been acknowledged by Trans Mountain during the Stakeholder Consultation and Engagement program related to the Project and are discussed in Volume 3. The economic justification of the Project is described in detail in Volume 2, which does consider the effect of the Project on expanding foreign access to Canadian oil products and the fiscal

effects related to higher netback values for Canadian oil producers. Although legislation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in Volume 8A in accordance with the NEB's direction from their List of Issues for the Project, released on July 29, 2013.

It is also recognized that, due to the Project's procurement needs, economic spin-off effects of a project of this size occur beyond the Socio-economic RSA. The economic modelling that has been conducted demonstrates that direct, indirect, and induced effects are anticipated to occur beyond Alberta and BC and that employment and labour income are anticipated in other provinces. The way in which Project-related employment effects may influence labour supply and demand in regions beyond the Socio-economic RSA are not assessed in this application, because such effects are influenced by economic factors in other parts of Canada that are beyond the control of Trans Mountain.

To reduce the Project's footprint, most of the proposed pipeline corridor is on or adjacent to the existing TMPL right-of-way or other existing rights-of-way. However, certain areas of the proposed pipeline corridor deviate from the existing TMPL right-of-way to avoid physical disturbance to residences, community-use facilities and business establishments that have been built on or near the existing right-of-way since the original TMPL was constructed, or to avoid other sensitive areas. While the potential for disruption to livelihoods is examined, the assessment does not evaluate the economic ripple effect of the potential change in business income in a particular community economy. Use/easement agreements will be negotiated with directly affected parties once the Project right-of-way has been finalised. Agreements may contain a one-time payment that offsets land costs and proven impacts. When determining appropriate compensation, Trans Mountain will consider the potential for proven livelihood or economic loss during pipeline construction and, where applicable, operations. Consequently, any direct quantifiable effects on businesses or income due to construction-related land disturbance will be managed through individual use/easement agreements.

Concerns have been raised during community meetings and other engagement activities about the potential effects of the Project on property values. In the discussion of housing (Section 7.2.5), potential effects on residential property values are not considered. It is understood that property values are affected by numerous market forces and there is not a known or widely accepted cause and effect relationship between the presence of oil pipelines and property values in the Alberta and BC context. It is acknowledged that many homes along the proposed pipeline corridor were built after the pipeline was in place and the easement would have been disclosed to the buyer at the time of purchase. Under the *NEB Act*, companies can enter into land acquisition agreements with landowners to acquire new lands required for a pipeline and are required compensate landowners for any damages associated with the new pipeline. Any unique effects on individual properties will be managed through individual compensation arrangements. As such, effects on housing prices in general will not be assessed. Factors that may be of concern to residential property owners/occupants, however, are considered in various parts of the ESA, including noise (Section 7.2.7 Acoustic Environment of Volume 5A), air quality (Section 7.2.4 Air Emissions of Volume 5A), sensory/visual disturbance (Section 7.2.4 HORU) and community way-of-life (Section 7.2.3 Social and Cultural Well-being).

Identified Potential Effects

Potential effects associated with the construction and operations of the Project on employment and economy indicators are listed in Table 7.2.7-2. These interactions are based on the results of the literature review, desktop analysis, interviews, economic modelling, engagement with Aboriginal communities, regulatory authorities, landowners and other stakeholders (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.2.7-2 was developed in accordance with Trans Mountain standards as well as industry best practices.

TABLE 7.2.7-2

POTENTIAL EFFECTS, MITIGATION AND ENHANCEMENT MEASURES AND RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON EMPLOYMENT AND ECONOMY

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation and Enhancement Measures [SEMP Reference][2]	Potential Residual Effect(s)
1. Employment and Economy Indicator – National and Provincial Economies				
1.1 Contribution to provincial and national growth during construction	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	Provincial National	• See recommended mitigation measures pertaining to procurement and contracting for potential effect 4.1 in this table.	• Provincial and national economic benefits.
1.2 Contribution to provincial and national growth during operations				
2. Employment and Economy Indicator – Regional Employment				
2.1 Employment opportunities during construction	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Develop and implement a program to enhance awareness of pipeline and facilities construction and operations jobs and career opportunities in cooperation with business, industry, community and education and training organizations [Section 8.4.2]. • Create an online employment communications tool where potential workers who are interested in employment can register to receive regular updates [Section 8.4.2]. • Continue to communicate with Aboriginal communities to discuss issues and interests related to employment opportunities [Section 4.2]. • Include regional employment clauses in all Project contracts [Section 8.4.2]. • Give first consideration for employment opportunities to qualified regional and Aboriginal residents with appropriate skills and qualifications, where possible [Section 8.4.2]. • Develop and provide typical job descriptions, including skills and qualifications required to support employment opportunities [Section 8.4.2]. • Ensure contractors communicate upcoming employment opportunities directly to Project area employment offices, women's organizations and Aboriginal communities and organizations [Section 8.4.2]. • Require that contractors report to Trans Mountain their steps taken to attempt to hire within the Project area and nationally and report the number of hires from Project area Aboriginal residents and other regional residents [Section 8.4.2]. • Develop a mentorship program for Aboriginal workers to encourage work site integration and retention [Section 8.4.2]. • Apply other measures in the SEMP related to employment and training.	• Opportunities for regional Project-related employment during construction and associated increases in labour income. • Reduced availability of labour for other regional industries due to workers taking Project-related opportunities during construction.
2.2 Employment opportunities during operations	All regions / New pipeline segments Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• See recommended mitigation measures pertaining to potential effect 2.1 in this table.	• Opportunities for regional Project-related employment during operations and associated increases in labour income.

TABLE 7.2.7-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation and Enhancement Measures [SEMP Reference][2]	Potential Residual Effect(s)
3. Employment and Economy Indicator – Municipal Economies				
3.1 Increased municipal taxes	All regions / New pipeline segments Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	Footprint	• No mitigation required. Trans Mountain will pay increased municipal taxes as per standard business practice.	• Increased municipal taxes in Footprint communities.
3.2 Personal spending by Project workers during construction	All regions, except Jasper National Park Region/ New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• As part of ongoing communications in advance of construction, provide updated information at the community level on anticipated Project workforce, detailed construction schedule and Worker Accommodation Strategy so that local businesses can plan accordingly [Section 8.4.1].	• Increased personal spending by Project workers during construction and associated increased opportunities for businesses.
4. Employment and Economy Indicator – Contracting and Procurement				
4.1 Contracting and procurement opportunities	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Provide information about procurement opportunities to potential Aboriginal, regional, provincial and Canadian suppliers using various communication means [Section 8.4.1]. • Maintain an online procurement registry where interested parties can register their capabilities and express interest in providing goods or services to the Project [Section 8.4.1]. • Develop and implement a process to share information at the regional level in a timely manner about general Project procurement needs and required qualifications, so businesses can prepare [Section 8.4.1]. • Work with contractors to give first consideration to qualified regional suppliers of goods and services, where practical and in conformance with procurement policies [Section 8.4.1]. • Require Project contractors to identify, track and report Aboriginal, regional, provincial and Canadian content in their regular reporting to Trans Mountain [Section 8.4.1]. • Continue to engage with Aboriginal communities regarding regional Aboriginal businesses/contractors, including available business services and capacity [Section 8.4.1]. • Establish and implement a process for the use of qualified regional Aboriginal contractors for operations phase maintenance contracts [Section 8.4.1]. • Apply all measures in the SEMP pertaining to procurement and contracting.	• Increased regional contracting and procurement opportunities.

TABLE 7.2.7-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation and Enhancement Measures [SEMP Reference][2]	Potential Residual Effect(s)
5. Employment and Economy Indicator – Training and Capacity Development				
5.1 Training opportunities	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• Initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project [Section 8.4.2]. • Continue to collaborate with regional training providers to identify ongoing opportunities for Trans Mountain to facilitate, support or participate in delivery of training for Aboriginal communities [Section 8.4.2]. • Provide information in a timely manner to educators and governments about the types of Project-related jobs that will be available, and the required skills and qualifications, to assist training providers in developing and implementing appropriate training [Section 8.4.2]. • Work with contractors and labour organizations to encourage Project contractors to provide training and apprenticeship opportunities related to the work they perform, including opportunities for on-the-job training on the Project [Section 8.4.2]. • Training fund available to create increased access for Aboriginal employment opportunities in the industry; focus will be on transferrable skills and links to employment.	• Enhancement of training opportunities for Aboriginal communities.
5.2 Skill and capacity development	All regions / New pipeline segments Temporary facilities Pump stations Terminal activities Reactivated pipeline segments Westridge Marine Terminal	RSA	• All Project-related employment, contracting and training will create opportunities for skill and capacity development transferrable to other endeavours. • See recommended mitigation measures pertaining to potential effects 2.1, 4.1 and 5.1 in this table.	• Increased skills due to Project-supported training for Aboriginal communities and Project-related employment or contract experience.
6. Employment and Economy Indicator – Business and Livelihood Disruption				
6.1 Disruption to business or commercial establishments	All regions, except Jasper National Park Region / New pipeline segments Temporary facilities	RSA	• Avoid disturbance of built features during final route refinement, to the extent practical [Section 8.4.6]. • For construction in urban areas that impacts traffic routes, establish alternate access routes for commercial or residential areas where applicable and practical [Section 8.4.6]. • Where minor roads are crossed that may affect established community use/access routes, complete open cut crossing within one day, to the extent practical [Section 8.4.6]. • Provide compensation, considering various forms, to private land and property owners according to established industry protocols where losses or damages are proven [Section 8.4.6]. • Develop and implement a communication plan for sharing information about key Project construction milestones and information with the general public in affected areas [Section 8.4.6]. • Develop Traffic Control Plans for site-specific sections of roads affected by the Project [Section 8.4.3]. • See recommended mitigation measures outlined in Table 7.2.4-2 Human Occupancy and Resource Use for sensory disturbance.	• Physical disruption of commercial and industrial use (refer to Section 7.2.4 HORU). • Reduced business or commercial income due to disruption of business.

TABLE 7.2.7-2 Cont'd

Potential Effect	Socio-economic Region/Project Component	Spatial Boundary[1]	Key Recommendations/Mitigation and Enhancement Measures [SEMP Reference][2]	Potential Residual Effect(s)
6.2 Disruption to resource-based livelihoods	Rural Alberta Region Fraser-Fort George/ Thompson-Nicola Region Fraser Valley Region Metro Vancouver Region / New pipeline segments Temporary facilities	RSA	• Contact the following prior to clearing and construction activities, providing maps and schedule information to enable them to select alternate areas for their activities: – trappers of affected registered fur management areas and traplines; – guide-outfitters in relevant wildlife management units; and – commercial recreation tenure holders [Section 8.4.6]. • Provide compensation, considering various forms, to affected trappers according to established industry and provincial protocols if reduced fur harvest and lost revenue is proven [Section 8.4.6]. • Apply all mitigation pertaining to Agricultural areas in the EPPs (see Agricultural Management Plan). • Apply all mitigation measures pertaining to timber and timber salvage in the EPPs. • Coordinate pipeline construction activity to ensure access to traditional subsistence hunting and fishing areas [Section 8.4.6]; see recommended mitigation measures outlined in Table 7.2.2-4 Traditional Land and Resource Use. • See recommended mitigation measures outlined in Table 7.2.4-2 Human Occupancy and Resource Use.	• Disruption of areas relied upon for resource-based livelihoods during construction (refer to Section 7.2.4 HORU). • Reduced resource-based business income or livelihoods.

Notes: 1 RSA = Socio-economic RSA.

2 Some mitigation measures are outlined in the SEMP (Volume 6B).

7.2.7.5 Potential Residual Effects

The potential residual effects on employment and economy indicators associated with the construction and operations of the Project (Table 7.2.7-2) are:

- provincial and national economic benefits;
- opportunities for regional Project-related employment during construction and associated increases in labour income;
- reduced availability of labour for other regional industries due to workers taking Project-related opportunities during construction;
- opportunities for regional Project-related employment during operations and associated increases in labour income;
- increased municipal taxes in Footprint communities;
- increased personal spending by Project workers during construction and associated increased opportunities for businesses;
- increased regional contracting and procurement opportunities;
- enhancement of training opportunities for Aboriginal communities;
- increased skills due to Project-supported training for Aboriginal communities and Project-related employment or contract experience;
- reduced business or commercial income due to disruption of business; and
- reduced resource-based business income or livelihoods.

7.2.7.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method that is considered to be the appropriate method. Consequently, the evaluation of significance of each of the potential residual effects relies on economic modelling techniques as well as on the professional judgment of the assessment team.

Table 7.2.7-3 provides a summary of the significance evaluation of the potential residual socio-economic effects of the construction and operations of the Project on employment and economy. A discussion of the rationale used to evaluate the significance of each of the residual socio-economic effects is provided below.

TABLE 7.2.7-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON EMPLOYMENT AND ECONOMY

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Employment and Economy Indicator – National and Provincial Economies									
1(a) Provincial and national economic benefits.	Positive	Provincial National	Long-term	Continuous	Long-term	High	High	High	Significant
2. Employment and Economy Indicator – Regional Employment									
2(a) Opportunities for regional Project-related employment during construction and associated increases in labour income.	Positive	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
2(b) Reduced availability of labour for other regional industries due to workers taking Project-related opportunities during construction.	Neutral	RSA	Short term	Isolated	Short-term	Medium	High	High	Not significant
2(c) Opportunities for regional Project-related employment during operations and associated increases in labour income.	Positive	RSA	Long-term	Continuous	Long-term	Low	High	High	Not significant
2(d) Combined effects on regional employment indicator (2[a] to 2[c]).	Positive	RSA	Long-term	Continuous	Long-term	Medium	High	High	Not significant
3. Employment and Economy Indicator – Municipal Economies									
3(a) Increased municipal taxes in Footprint communities.	Positive	RSA	Long-term	Continuous	Long-term	High	High	High	Significant
3(b) Increased personal spending by Project workers during construction and associated increased opportunities for businesses.	Positive	RSA	Short-term	Isolated	Short-term	Medium	High	Moderate	Not significant
3(c) Combined effects on the municipal economies indicator (3[a] and 3[b]).	Positive	RSA	Long-term	Continuous	Long-term	High	High	High	Significant
4. Employment and Economy Indicator – Contracting and Procurement									
4(a) Increased contracting and procurement opportunities.	Positive	RSA	Long-term	Periodic	Long-term	Medium	High	High	Not significant
5. Employment and Economy Indicator – Training and Capacity Development									
5(a) Enhancement of training opportunities for Aboriginal communities.	Positive	RSA	Long-term	Occasional	Long-term	Low	High	High	Not significant
5(b) Increased skills due to Project-supported training for Aboriginal communities and Project-related employment or contract experience.	Positive	RSA	Long-term	Occasional	Permanent	Low	High	Moderate	Not significant
5(c) Combined effects on the training and capacity development indicator (5[a] and 5[b]).	Positive	RSA	Long-term	Occasional	Long-term to permanent	Low	High	Moderate	Not significant
6. Employment and Economy Indicator – Business and Livelihood Disruption									
6(a) Reduced business or commercial income due to disruption of business.	Negative	RSA	Short-term	Isolated	Short-term	Medium	Low	Moderate	Not significant

TABLE 7.2.7-3 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
6(b) Reduced resource-based business income or livelihoods.	Negative	RSA	Short-term	Isolated	Short to medium-term	Medium	Low	High	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Employment and Economy Indicator - National and Provincial Economies

The following provides the evaluation of significance of potential residual effects related to the national and provincial economies indicator.

Provincial and National Economic Benefits

The construction and operations of the Project is anticipated to create a range of economic benefits at the national and provincial level. A detailed quantitative economic effects analysis was conducted by the Conference Board of Canada on Project expenditures in Canada, including those related to the development and operations of the pipeline, pump stations and other facilities from Edmonton, Alberta to the Westridge Marine Terminal in Burnaby, BC. The full results and methodology of the economic modelling are presented in the Conference Board of Canada's report entitled Expansion of the Trans Mountain Pipeline: Understanding the Economic Benefits for Canada and its Regions (Volume 2), which should be referred to in conjunction with the summary discussion below.

As discussed in Volume 2, if approved, the capital cost of the Project is expected to be approximately $5.5 billion (2012 dollars), with the expenditures taking place over a seven-year period, from 2012 to 2018. If adjusted for price increases, that is equivalent to $4.9 billion in 2012 dollars. Parts of the Project, such as planning and regulatory fillings have already begun, and the bulk of the spending activity is expected to take place in 2016 and 2017, when the actual construction activity would take place. For the purposes of economic modelling, price adjusted figures were used and financing costs were excluded, and national and provincial economic impacts were assessed based on $4.6 billion of expenditures in 2012 dollars.

Based on modelling conducted by the Conference Board of Canada, spending in the development phase generates direct impacts in the construction sector, supply chain impacts associated with the inputs needed to complete the Project, and induced effects, which occur when the wages that employees earn from the direct and supply chain effects are spent. Combined, these three effects are expected to support 58,037 person-years of employment across Canada, with nearly half of those effects being direct, and the rest being indirect and induced. Most of the development phase employment effects will occur in BC (61.8%) and Alberta (25.2%), reflecting that this is where the Project will be built. However, Ontario (8%), Quebec (2.4%), and the Prairie provinces (1.9%) will also experience notable employment effects.

This development phase economic activity also generates fiscal effects at both the federal and provincial level. In total, the development of the Project is expected to support approximately $1.2 billion (in 2012 dollars) in federal (approximately $646 million) and provincial (approximately $568 million) government revenues. This is equivalent to $27 for every $100 of investment. The largest fiscal impacts are in personal income taxes ($559 million), indirect taxes such as sales taxes ($335 million), and corporate income taxes ($184 million).

A summary of estimated economic effects of Project development in Canada, including gross output, Gross Domestic Product (GDP), provincial and federal tax revenue, and employment effects, are presented in Table 7.2.7-4.

TABLE 7.2.7-4

ESTIMATED ECONOMIC EFFECTS OF THE PROJECT IN CANADA – DEVELOPMENT PHASE

	BC	Alberta	Ontario	Saskatchewan	Elsewhere in Canada	Total
Gross Output Generated ($2012 – thousands)						
Direct	3,206,359	1,367,895	0	0	0	4,574,254
Indirect	902,379	808,533	449,934	96,307	214,061	2,471,213
Induced	1,165,250	588,582	388,970	39,525	194,100	2,376,427
Total Direct, Indirect, Induced	5,273,988	2,765,010	838,904	135,832	408,161	9,421,894
GDP Generated ($2012 – thousands)						
Direct	1,518,005	650,088	0	0	0	2,168,092
Indirect	514,761	394,008	207,711	37,749	96,320	1,250,548
Induced	756,298	358,346	200,909	19,551	97,927	1,433,031
Total Direct, Indirect, Induced	2,789,063	1,402,442	408,620	57,300	194,247	4,851,672
Employment (Person-Years)						
Direct	20,675	7,527	0	0	0	28,202
Indirect	6,599	3,660	2,340	331	1,125	14,055
Induced	8,590	3,445	2,319	218	1,208	15,780
Total Direct, Indirect, Induced	35,864	14,632	4,659	549	2,334	58,037
Labour Income ($2012 – thousands)						
Direct	1,226,085	556,375	0	0	0	1,782,461
Indirect	358,745	259,490	141,468	18,583	57,219	835,505
Induced	323,496	158,295	112,377	7,627	50,374	652,169
Total Direct, Indirect, Induced	1,908,327	974,161	253,845	26,210	107,593	3,270,135
Federal Taxes ($2012 – millions)						
Total Direct, Indirect, Induced	85.6	71.6	250.1	20.0	218.5	645.8
Provincial Taxes ($2012 – millions)						
Total Direct, Indirect, Induced	308.7	167.5	56.5	8.8	26.8	568.3

Source: Conference Board of Canada 2013

Once operational, the Project is also expected to generate substantial economic and fiscal impacts. Operational impacts of the Project are assessed over its first 20 years of service under two scenarios. Economic modelling focused on a 20 year operating period given certainty of shipper contracts during this period, and thus should be considered conservative given that the operating life of the Project is anticipated to be over 50 years or more. The first scenario considers the impact of only the long-term contracts that have been signed and can be considered the minimum impact (minimum scenario). The second considers the scenario where the spot capacity in the pipeline is fully utilized and can be considered the maximum impact (maximum scenario).

At a minimum (Table 7.6.7-5), including the direct, supply chain, and induced effects, Project operations are anticipated to support 50,274 person-years of employment across Canada, and this figure rises to 65,184 person-years if the spot capacity is fully utilized (Table 7.6.7-6). Thus, the operational impacts may actually be larger than those associated with the development phase of the Project. BC (60.2%) and Alberta (20.5%) still experience the largest portion of the employment impacts during operations. However, other regions of the country, such as Ontario (12.6%), Quebec (3.9%), and the Prairies (2%) see a larger share of the employment impacts during the operational phase of the Project.

In terms of fiscal effects, Project operations are expected to support between $2.5 billion (minimum scenario) and $3.3 billion (maximum scenario) in combined federal and provincial revenues, considerably above those anticipated during the development phase. A key reason for this is that the oil pipeline industry has profitability that generates corporate income tax effects. In fact, corporate profits account for the largest share of the revenues (60.1%), followed by personal income taxes (19.7%) and indirect taxes (12.5%).

A summary of estimated economic effects of Project operations in Canada, including output, GDP, and provincial and federal tax revenue, and employment effects, are presented in Table 7.2.7-5 for the minimum scenario and Table 7.2.7-6 for the maximum scenario. Further details are discussed in the Conference Board of Canada's report entitled Expansion of the Trans Mountain Pipeline: Understanding the Economic Benefits for Canada and its Regions in Volume 2.

TABLE 7.2.7-5

ESTIMATED ECONOMIC EFFECTS OF THE PROJECT IN CANADA – OPERATIONS PHASE, MINIMUM SCENARIO

	BC	Alberta	Ontario	Saskatchewan	Elsewhere in Canada	Total
Gross Output Generated ($2012 – thousands)						
Direct	8,938,720	3,941,280	0	0	0	12,880,000
Indirect	2,637,387	1,215,888	632,130	52,257	281,671	4,819,333
Induced	936,178	490,708	399,994	32,392	193,467	2,052,739
Total Direct, Indirect, Induced	12,512,285	5,647,876	1,032,124	84,650	475,138	19,752,072
GDP Generated ($2012 – thousands)						
Direct	6,427,793	2,947,933	0	0	0	9,375,725
Indirect	1,505,554	711,654	330,412	25,968	139,808	2,713,396
Induced	606,810	298,465	212,452	15,829	99,853	1,233,408
Total Direct, Indirect, Induced	8,540,156	3,958,052	542,864	41,797	239,661	13,322,530
Employment (Person-Years)						
Direct	4,837	2,004	0	0	0	6,841
Indirect	18,558	5,426	3,895	242	1,724	29,845
Induced	6,868	2,853	2,450	175	1,242	13,588
Total Direct, Indirect, Induced	30,263	10,283	6,344	417	2,967	50,274
Labour Income ($2012 –thousands)						
Direct	400,036	306,810	0	0	0	706,846
Indirect	1,013,490	411,243	224,615	12,559	87,007	1,748,913
Induced	259,493	131,784	115,002	6,137	50,490	562,906
Total Direct, Indirect, Induced	1,673,019	849,836	339,617	18,696	137,497	3,018,666
Federal Taxes ($2012 – millions)						
Total Direct, Indirect, Induced	191.8	160.3	560.2	44.8	489.4	1,446.4
Provincial Taxes ($2012 – millions)						
Total Direct, Indirect, Induced	727.0	277.5	59.8	8.3	29.4	1,102.1

Source: Conference Board of Canada 2013

Note: Minimum scenario results based only on long-term contracts and a 20-year operating period.

TABLE 7.2.7-6

ESTIMATED ECONOMIC EFFECTS OF THE PROJECT IN CANADA – OPERATIONS PHASE, MAXIMUM SCENARIO

	BC	Alberta	Ontario	Saskatchewan	Elsewhere in Canada	Total
Gross Output Generated ($2012 –thousands)						
Direct	11,589,801	5,110,201	0	0	0	16,700,002
Indirect	3,419,594	1,576,500	819,609	67,756	365,210	6,248,670
Induced	1,213,833	636,244	518,625	41,999	250,846	2,661,548
Total Direct, Indirect, Induced	16,223,229	7,322,945	1,338,235	109,756	616,056	25,610,220
GDP Generated ($2012 – thousands)						
Direct	8,334,173	3,822,242	0	0	0	12,156,415
Indirect	1,952,077	922,720	428,407	33,670	181,273	3,518,146
Induced	786,780	386,984	275,462	20,524	129,467	1,599,218
Total Direct, Indirect, Induced	11,073,030	5,131,947	703,869	54,193	310,741	17,273,779

TABLE 7.2.7-6 Cont'd

	BC	Alberta	Ontario	Saskatchewan	Elsewhere in Canada	Total
Employment (Person-Years)						
Direct	6,271	2,599	0	0	0	8,870
Indirect	24,062	7,035	5,050	314	2,236	38,696
Induced	8,905	3,699	3,176	227	1,611	17,618
Total Direct, Indirect, Induced	39,238	13,332	8,226	541	3,847	65,184
Labour Income ($2012 – thousands)						
Direct	518,681	397,805	0	0	0	916,486
Indirect	1,314,075	533,210	291,232	16,283	112,812	2,267,613
Induced	336,454	170,869	149,110	7,957	65,465	729,855
Total Direct, Indirect, Induced	2,169,210	1,101,884	440,342	24,241	178,277	3,913,954
Federal Taxes ($2012 – millions)						
Total Direct, Indirect, Induced	248.7	207.9	726.3	58.0	634.5	1,875.4
Provincial Taxes ($2012 – millions)						
Total Direct, Indirect, Induced	942.6	359.9	77.6	10.8	38.1	1,429.0

Source: Conference Board of Canada 2013

Note: Maximum scenario results assume pipeline spot capacity is fully utilized and a 20-year operating period.

The impact balance of the Project-related effects on provincial and national economies is positive because the Project will contribute substantially in a beneficial manner to economic growth in all variables. The duration of the effect is long-term, since the economic effects are related to both construction and operations Project expenditures. The frequency of the effect is deemed continuous, as the expenditures that cause the economic benefits will occur over the operating life of the Project. The reversibility of the effect is considered long-term in that the economic benefits at the national and provincial levels will extend through the operations phase of the Project. The magnitude of the economic effects on provincial and national economies is considered to be high, as the Project will contribute substantially to overall national and provincial economic benefits during its construction and operational life (Table 7.2.7-3, point 1[a]). Given the above, the effect of the Project on provincial and national economies is considered to be a significant, positive residual socio-economic effect. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Provincial and National – the economic effects will extend through BC, Alberta and other provinces and territories in Canada.
- Duration: long-term – the economic effects are related to both construction and operations phase Project expenditures.
- Frequency: continuous – the expenditures that cause the effects will occur over the life of the Project.
- Reversibility: long-term – the economic benefits at the national and provincial level are anticipated to extend throughout the operations phase of the Project.
- Magnitude: high – the Project will contribute substantially to national and provincial economic benefits during its construction and operational life.
- Probability: high – Project-related contributions to output, GDP and tax revenues at the provincial and national level are very likely to occur.
- Confidence: high – based on a good understanding of cause-effect relationships, and based on the Conference Board of Canada economic modelling results in Volume 2.

Employment and Economy Indicator - Regional Employment

The following provides the evaluation of significance of potential residual effects related to the regional employment indicator.

Opportunities for Regional Project-Related Employment During Construction and Associated Increases In Labour Income

Construction of the Project will generate large demands for goods, services and workers, some of which are anticipated to be sourced from the Socio-economic RSA. Workers may be hired in the following ways: directly by pipeline or facilities contractors; contracted for specific activities such as site clearing (*i.e.,* right-of-way or pump station expansions); contracted for specific construction support services (*e.g.,* traffic management, environmental monitoring or operating construction camps); contracted for engineering or other professional services related to construction or project management; or they may be employed by companies that supply Trans Mountain or its contractors with goods or services. Project labour requirements that cannot be supplied regionally will be supplied from other regions or provinces.

In terms of direct regional employment opportunities associated with actual pipeline and facilities construction, the extent to which regional residents and businesses will participate in Project construction will depend on a number of factors. These factors include the size of the available regional workforce, the percentage of the labour force with relevant qualifications and experience, the range and capacity of regional businesses to provide goods and services, and the extent to which other projects will be competing for labour, goods and services. One of the challenges in constructing the Project will be to find workers with training and skills relevant to construction. In 2011, approximately 9.3% of the workforce in Alberta as a whole and 7.7% of the workforce in BC as a whole was employed in the construction industry (Statistics Canada 2013a). However, there are regional differences within the Socio-economic RSA (see Table 7.2.7-8). The percentage of the labour force experienced in the construction industry ranges from approximately 4.6% in the Jasper National Park Region, to approximately 8.5% in the Rural Alberta Region and approximately 7.7% in the Fraser-Fort George/Thompson-Nicola Region, to approximately 9.9% in the Fraser Valley Region (see Table 7.2.7-8).

Trans Mountain has prepared preliminary construction workforce estimates for the various Project components, including the pipeline, pump stations, tanks and the Westridge Marine Terminal. Overall, Trans Mountain anticipates that the construction workforce will result in approximately 1,324,035 worker days over a 2 year construction period (2016-2017), or approximately 60,183 full-time equivalent worker months. Worker days refers to the number of days of full-time work generated for an average worker; similarly, worker months refers to the number of months of full-time work generated. Construction spreads will require approximately 400-600 workers per spread; however, this will vary by region, spread and by month, with workforces starting smaller and ramping up over the construction period for each spread. Construction at terminals will require in the range of approximately 60 to 370 workers, depending on the number of new tanks to be installed and other activities. Construction activities at pump stations will require in the range of 55 to 80 workers, depending on the number of new pumps required and other activities. Construction at the Westridge Marine Terminal will require approximately 95 workers for much of the construction period. It is anticipated there will be workers associated with various Project components in certain areas at overlapping times. For example, the Metro Vancouver Region will have workers associated with pipeline spreads, terminals, and construction at the Westridge Marine Terminal throughout the construction period.

At the peak, it is estimated the Project will require over 4,475 direct construction workers in Alberta and BC combined (the peak month is anticipated to be July 2017). The Metro Vancouver Region will have the largest concentrated construction workforce requirements, with construction activities anticipated during the full construction period. The required workforce in the Metro Vancouver Region will average about 655 workers and will peak about 1,200 workers in October 2016.

Figure 7.2.7-1 below outlines the anticipated direct construction workforce (full-time worker equivalents) broken down month-by-month and by Project component over the 2016-2017 construction period.

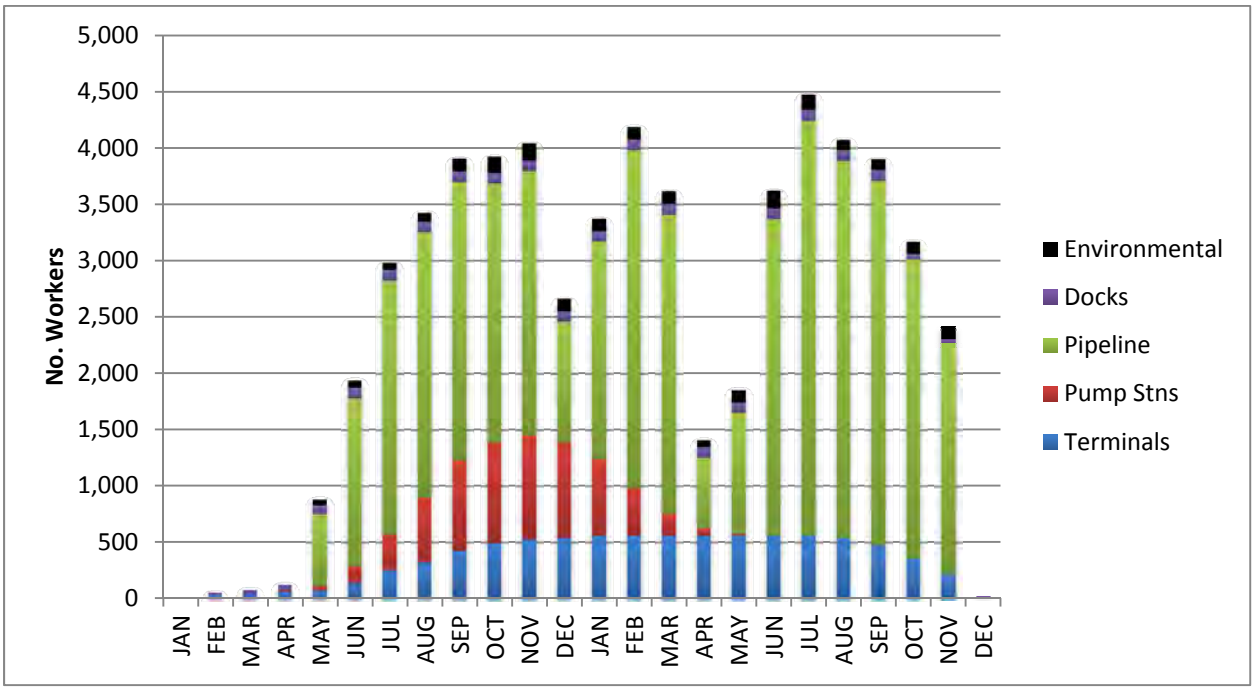

Figure 7.2.7-1 Estimated Direct Construction Workforce, 2016-2017 (Full-Time Equivalent Worker Months)

Source: KMC 2013a

The direct construction workforce and regional employment opportunities associated with construction activity are anticipated to vary by region and community within the Socio-economic RSA. Estimating the actual number of local and regional residents that may be employed on Project construction is challenging given the growing nature of the economies in BC and Alberta. The number of local and regional residents ultimately hired for Project construction will depend on the availability of qualified workers and the demands of other projects for skilled workers at the time of construction, as well as the implementation of Aboriginal training programs.

Based on early construction planning, Trans Mountain has estimated the direct construction workforce required in the Socio-economic RSA considering the anticipated timing of construction spreads, facilities and facilities expansion, and reactivation activities. It has also anticipated which communities in the Socio-economic RSA may serve as construction hubs along the proposed pipeline corridor considering the various Project components and their anticipated construction timing. Construction hubs are communities where regional material delivery and staging, construction offices, and worker accommodation may occur. Table 7.2.7-7 provides details on the anticipated Project construction workforce by potential construction hub over the course of the Project, aggregated for all Project components. While these construction workforce estimates are subject to change as detailed engineering and construction planning continues, they provide order-of-magnitude estimates for the purposes of evaluating the potential for the regional labour force to meet the Project's needs and related socio-economic issues. Details of which communities serve as construction hubs may change as construction planning advances, and will be influenced by economic conditions and logistical considerations of contractors closer to the construction period. Contractors are the contractors engaged directly by Trans Mountain to undertake large portions of the construction work; the scope of work for contractors will include all aspects of construction of one or more segments of the proposed pipeline corridor or at one or more of the pump stations or terminals.

TABLE 7.2.7-7

DIRECT CONSTRUCTION
WORKFORCE ESTIMATES, BY POTENTIAL CONSTRUCTION HUB (2016-2017)

Socio-economic Region	Community/ Construction Hub	Population (2011)	Full-time Worker Month Equivalents (Total)	Workers per Month (Low)	Workers per Month (High)	Workers per Month (Avg.)	No. of Construction Months	Estimated % of Regional Workers
Edmonton Region	Edmonton Area	1,188,968	7,154	136	734	377	19	30%
Rural Alberta Region	Edson	8,475	5,365	53	896	383	14	10%
	Hinton	9,640	1,522	4	336	101	15	10%
Fraser-Fort George/ Thompson-Nicola Region	Valemount	1,020	4,621	9	629	289	16	5%
	Blue River[1]	283	1,936	14	287	121	16	10% to a maximum of 5 workers
	Clearwater	2,331	4,906	41	570	327	15	10% to a maximum of 50 workers
	Kamloops	85,678	5,949	9	889	297	20	10%
	Merritt	7,113	5,496	9	820	323	17	10%
Fraser Valley Region	Hope	5,969	4,002	93	399	250	16	10%
	Chilliwack	77,936	1,635	61	202	149	11	10%
	Abbotsford	133,497	2,543	9	262	150	17	10%
Metro Vancouver Region	Metro Vancouver	2,313,328	15,054	14	1,204	655	23	30%
Project as a Whole[2]			60,183 (total)	14	4,477	2,616	23	--

Sources: KMC 2013c, Statistics Canada 2012

Notes: 1 Population of Electoral Area B, TNRD, in which the unincorporated Community of Blue River is located.

2 Project as a whole does not represent totals of the rows above, except in the case of column entitled full-time worker month equivalents (total).

The labour force in the Socio-economic RSA has capacity to meet some of the direct construction workforce needs of the Project. The level of regional participation in construction workforce opportunities is estimated to range from 5% in smaller communities with a small labour pool (such as Valemount) to 30% in larger communities that have a bigger labour pool (such as Edmonton and Metro Vancouver) (Table 7.2.7-8). The estimates for Edmonton and Metro Vancouver are conservative, given their large labour pool. However, estimates consider the regional unemployment rate, the size of the available construction industry, as well as the numerous other major projects likely to be drawing on regional labour in these metropolitan areas at the same time. Some non-local workers in smaller regions may come from the Edmonton and Metro Vancouver areas, thus still representing regional workers from an employment perspective but who would require accommodation and services in other regions during certain periods. Certain very small communities, such as Blue River, Vavenby, and Clearwater, have anticipated maximum capacity in terms of local employment (*i.e.*, these communities are anticipated to have a limited number of people available which may not meet the anticipated proportion of regional hires at times during construction; for example, in Blue River it is anticipated that 10% of the construction workforce will be regional, but to a maximum of five workers). These determinations considered the estimated availability of local workers based on labour force construction and resource-based industry experience and unemployment rates, as well as previous construction and maintenance experience of Trans Mountain. It again considered other major capital projects that may be occurring regionally during the construction phase of the Project, which will also be drawing from the regional labour pool.

Table 7.2.7-8 provides information on labour force characteristics in the six socio-economic regions in the context of construction workforce demand. The Socio-Economic Technical Report of Volume 5D provides further detail on labour force characteristics in the Socio-economic RSA at a community and regional level.

Based on the capacity of the regional labour force (Table 7.2.7-8) and the *average* work force requirements over the 2 year construction period, it is anticipated regional residents could fill approximately 113 construction positions in the Edmonton Region, approximately 48 construction

positions in the Rural Alberta Region, approximately 136 construction positions in the Fraser-Fort George/Thompson-Nicola Region, about 55 construction positions in the Fraser Valley Region, and approximately 197 construction positions in the Metro Vancouver Region.

Regional employment is anticipated to be higher during peak construction months. At peak, it is estimated that regional residents could fill approximately 220 construction positions in the Edmonton Region, approximately 123 construction positions in the Rural Alberta Region, approximately 320 construction positions in the Fraser-Fort George/Thompson-Nicola Region, approximately 86 construction positions in the Fraser Valley Region, and approximately 361 construction positions in the Metro Vancouver Region.

Further details on anticipated regional participation in the direct construction workforce, on a construction hub basis, is presented in the Socio-Economic Technical Report of Volume 5D. Workforce estimates will be refined as Project planning continues.

TABLE 7.2.7-8

SOCIO-ECONOMIC REGIONAL STUDY AREA LABOUR FORCE AND ESTIMATED REGIONAL AND NON-REGIONAL CONSTRUCTION WORKFORCE

Socio-economic Region	Estimated Construction Hubs	Regional Population (2011)	Regional Labour Force (2011)							Estimated Construction Workforce			Estimated Regional and Non-Regional (In-Migrating) Construction Workforce					
		Population[1] (No.)	Participation Rate (%)	Labour Force Size[1] (No.)	Unemployment Rate (%)	Estimated Total Available Labour (No.)	Construction Industry (%)	Construction Experience Labour (No.)	Experienced Labour Available Given other projects (No.)[2]	Low	Peak	Average	Regional Workers (%)[2]	Regional Workers – Peak (No.)	Regional Workers – Avg. (No.)	Non-Regional Workers (%)	Non-Regional Workers –Peak (No.)	Non-Regional Workers – Avg. (No.)
Edmonton Region	Edmonton (including Stony Plain)	1,188,968	73.2	696,610	5.6	39,010	9.8	3,823	104	136	734	377	30%	220	113	70%	514	264
Rural Alberta Region	Hinton, Edson	29,335	73.2	16,985	5.9	1,002	8.5	85	43	57	1,232	484	10%	123	48	90%	1,109	436
Jasper National Park Region[3]	Hinton	4,085	84.3	2,490	1.6	40	4.6	2	2	--	--	--	--	--	--	--	--	--
Fraser-Fort George/Thompson-Nicola Region	Valemount, Blue River, Vavenby/Clearwater, Kamloops, Merritt	128,978	63.7	63,175	9.4	5,938	7.7	457	349	82	3,195	1,357	10%[4]	320	136	90%	2,876	1,221
Fraser Valley Region	Hope, Chilliwack, Abbotsford	274,404	64.7	138,485	8.0	11,079	9.9	1,097	830	163	863	549	10%	86	55	90%	777	494
Metro Vancouver Region	Metro Vancouver	2,313,328	66.1	1,271,430	7.1	90,272	6.4	5,777	465	14	1,204	655	30%	361	197	70%	843	459

Sources: KMC 2013b, Statistics Canada 2012, 2013a

Notes: - Construction industry labour force is represented by % of labour force employed in the construction industry on census day, as per Statistics Canada's labour force by industrial classification data.

1 Population data are from the 2011 Census of Canada. Labour force data are from the 2011 NHS. Underlying population counts in the NHS may differ from those provided by the Census of Canada due to differing survey methods; however, labour force metrics based on the NHS are the best available at the community/municipality level.

2 Total available labour and estimated percentages of regional workers considered those unemployed plus the likelihood that employed workers may leave current positions for Project opportunities, some people not in the labour force may become available due to training opportunities, and that some may be employed by companies engaged in direct Project contracts. Project labour needs were also considered in the context of other reasonably foreseeable developments likely to be competing for regional labour during the 2016 to 2017 construction time frame.

3 Labour for Project work in areas within Jasper National Park Region (*i.e.*, Jasper Pump Station and Hinton to Hargreaves reactivation segment) are anticipated to be based in Hinton construction hub, due to small size of Jasper National Park Region labour force. Available labour from Jasper National Park Region is considered in Rural Alberta Region estimates.

4 10% is approximate estimate for Fraser-Fort George/Thompson-Nicola Region. There is variation anticipated between hub communities, upon which embedded calculations are based. In the Village of Valemount, the regional estimate is 5%; in the Community of Blue River, the regional estimate is 10% to a maximum of 5 workers; in the Community of Vavenby and the District of Clearwater, the regional estimate is 10% to a maximum of 50 workers; and in the cities of Kamloops and Merritt the regional estimate is 10% (see Table 10.2-3 in Socio-Economic Technical Report in Volume 5D for further detail on construction hub community basis).

The contractors and companies that supply goods and services needed for Project construction will also employ residents of the region. There is no direct method for assessing the current capability of regional businesses to provide the goods and services required directly for Project construction, or to supply Trans Mountain or its contractors with goods and services. The extent to which goods and services will be procured from local businesses ultimately depends on the qualifications of each business and its ability to provide the required goods and services in the specified time frame, at prices competitive with businesses outside the region and according to industry requirements. It also depends on the extent to which businesses with the potential to provide supporting goods and services prepare themselves for growth opportunities.

It is anticipated that regions where there is a higher ratio of people employed in industries that typically support primary sectors (supporting industries), in comparison to the number of people employed in basic industries such as construction and manufacturing, will have a greater likelihood of participating in Project opportunities. Higher supporting industry to basic industry ratios typically indicate a more diversified regional economy that can offer a wider range of services to the construction industry. Lower ratios infer a less developed economy that may have reduced ability to provide goods and services required to support the construction industry.

Of the socio-economic regions where Project construction will be focused (thus excluding Jasper National Park Region), the region with the highest ratio of supporting industries to basic industries is the Metro Vancouver Region (2.38:1). This means that for every worker in construction, manufacturing, agriculture/forestry, or mining/quarrying/oil and gas extraction in the Metro Vancouver Region, there are 2.38 workers in industries that could support primary industries (supporting industries include: wholesale trade, retail trade, transportation and warehousing, professional and technical services, accommodation and food services, and other services). As such, the Metro Vancouver Region is anticipated to have the greatest capacity to provide required goods and services during Project construction. The Edmonton Region has the second highest capacity, with a 1.91:1 ratio of supporting to primary industries, followed very closely by the Fraser-Fort George/Thompson-Nicola Region with a 1.90:1 ratio. The Fraser Valley Region has a ratio of supporting to primary industries of 1.52:1, while the Rural Alberta Region has the lowest ratio at 1.02:1 (all based on 2011 labour force data). It should be noted that Jasper National Park Region had the highest ratio of supporting to primary industries across the Socio-economic RSA (ratio of 13.13:1); this is due to its primarily tourist/recreational economic base and the fact that the accommodation and food services industry employs almost 30% of its small labour force. However, there will be limited construction activities in the Jasper National Park Region as only reactivation and pump station upgrades are proposed (*i.e.,* no new pipeline construction), and no work is anticipated to be staged from within the Jasper National Park Region.

Table 7.2.7-9 provides percentages of the workforce employed in businesses in basic and supporting industries in 2011 by socio-economic region.

TABLE 7.2.7-9

PERCENTAGE OF THE LABOUR FORCE IN SELECT INDUSTRIES, BY SOCIO-ECONOMIC REGION (2011)

Industrial Category	% of Labour Force in Industrial Category (2011)					
	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/ Thompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Basic Industries (%)						
Construction	9.8	8.5	4.6	7.7	9.9	6.5
Manufacturing	6.5	7.2	0.0	5.4	8.5	6.3
Agriculture, forestry, fishing and hunting	0.9	5.3	0.0	3.6	5.9	1.0
Mining, quarrying, oil and gas extraction	3.0	16.6	0.0	3.5	0.4	4.0
Total – Basic Industries	*20.2%*	*37.5*	*4.6*	*20.2*	*24.7*	*17.8*
Industries Supporting Basic Industry (%)						
Retail Trade	11.1	11.2	8.8	12.5	11.6	10.4
Transportation and Warehousing	4.7	7.9	13.2	5.5	6.1	5.4

TABLE 7.2.7-9 Cont'd

Industrial Category	% of Labour Force in Industrial Category (2011)					
	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/ Thompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Professional, scientific, technical services	6.9	4.4	2.4	4.8	4.4	9.1
Accommodation and food services	6.1	7.5	28.9	8.4	6.6	7.8
Wholesale Trade	4.8	2.5	0.0	3.3	3.8	4.8
Other Services	5.0	4.8	7.2	3.9	5.2	4.8
Total – Supporting Industries	*38.7*	*38.3*	*60.5*	*38.4*	*37.6*	*42.3*
Ratio of Supporting Industries to Basic Industries						
Ratio	1.91:1	1.02:1	13.13:1	1.90:1	1.52:1	2.38:1

Source: Statistics Canada 2013a

Note: Totals may not add due to rounding.

The Conference Board of Canada's economic modelling estimated the indirect or supply chain employment effects, as well as induced employment effects associated with Project construction at a provincial scale (see Table 7.2.7-4). Economic models and associated multipliers do not allow for employment predictions at the sub-provincial level. However, calculating the Socio-economic RSA labour force in Alberta and BC as a proportion of the total provincial labour force in each province, and using this to factor the extent to which indirect and induced employment may be experienced in the Socio-economic RSA, an order-of-magnitude estimate of regional indirect and induced employment can be made. Applying a factor of 34% for Alberta and 63% for BC (based on the size of the Socio-economic RSA labour force in Alberta and BC respectively compared to the Alberta labour force and BC labour force as whole), one can extrapolate that the Project may result in 1,239 person years of indirect employment and 1,166 person-years of induced employment within the Socio-economic RSA in Alberta. On this basis, it is estimated that the Project may create approximately 4,129 person-years of indirect employment and 5,375 person years of induced employment in the Socio-economic RSA in BC during the development phase (see Table 7.2.7-10).

TABLE 7.2.7-10

ESTIMATED REGIONAL EMPLOYMENT EFFECTS, DEVELOPMENT PHASE

Province	Development Phase Employment Effects (Person Years)				Provincial Labour Force (2011)	Socio-Economic RSA Labour Force (2011)	Regional Employment Factor	Development Phase Employment Effects in Socio-Economic RSA (Person Years)			
	Direct	Indirect	Induced	Total				Direct	Indirect	Induced	Total
Alberta	7,527	3,660	3,445	14,632	2,115,640	716,085	34%	2,548	1,239	1,166	4,953
BC	20,675	6,599	8,590	35,864	2,354,245	1,473,090	63%	12,937	4,129	5,375	22,441

Source: Conference Board of Canada 2013, Statistics Canada 2013a

Trans Mountain is committed to maximizing opportunities for regional participation in Project-related employment, most of which will be through contracting opportunities related to the Project construction. Where qualified local contractors are available, they will have the opportunity to participate in the contracting process established by Trans Mountain. It is anticipated that regional and Aboriginal businesses could participate by providing various goods, services and technical expertise. This means that these businesses and will realize economic benefits from the construction phase that will result in positive employment effects.

A number of enhancement measures will be implemented by Trans Mountain to support regional employment, including supporting qualified Aboriginal and regional businesses in obtaining contracts, which will further support the optimization of regional employment opportunities. Enhancement measures include: implementing a program to enhance enhance awareness of pipeline and facilities construction and operations jobs and career opportunities; creating an online employment communications tool and

maintaining an online procurement registry where interested parties can register to received updates about Project opportunities; including regional employment clauses in all Project contracts; continuing communications with Aboriginal communities about economic and employment opportunities; giving first consideration for employment opportunities to qualified regional and Aboriginal residents with appropriate skills and qualifications, where possible; and initiating an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project. A full list of measures to enhance local participation in Project opportunities is provided in the SEMP in Volume 6B.

Despite the Project's commitment to maximize regional participation in employment and contracting opportunities, it is anticipated that a notable proportion of the labour demand during construction will need to be met by non-regional workers because of the tight labour market in the Socio-economic RSA (Table 7.2.7-8). This may be a combination of temporary workers brought in by contractors to work on direct Project-related construction activities, as well as some permanent in-migration of workers to the region as services and other industries respond to the indirect and induced employment opportunities. Further discussion of Project-related population effects is provided in Section 7.2.3 Social and Cultural Well-being.

Regional employment opportunities are anticipated to have spin-off effects, such as increased labour income for those participating in Project-related opportunities. Based on the economic modelling, Project development is anticipated to generate almost $3.3 billion in labour income across Canada (direct, indirect, and induced effects combined). Of this, approximately 58% (or $1.9 billion of labour income) will be generated in BC and approximately 30% ($974 million of labour income) will be generated in Alberta. The total labour income associated with direct Project-related employment during construction is anticipated to be approximately $1.8 billion, of which approximately $1.2 billion will be in BC and approximately $556 million will be in Alberta (Conference Board of Canada 2013). Table 7.2.7-4 provides further detail on labour income anticipated in relation to Project construction. The model does not make labour income evaluations at the sub-provincial level. However, based the size of the Socio-economic RSA workforce in Alberta and BC related to the workforce as a whole in each province as discussed previously the Project-related labour income that could be generated regionally could be substantive. Using again the factor of 34% for Alberta and 63% for BC, approximately $1.2 billion of labour income could be generated in the Socio-economic RSA in BC and approximately $331 million of labour income could be generated in the Socio-economic RSA in BC (based on direct, indirect and induced effects combined). Discussion of typical wage income associated with key pipeline construction positions, compared to median regional incomes, is discussed in Section 7.2.3 Social and Cultural Well-being.

The impact balance of the effects on regional employment and associated labour income during construction is positive, due to the large work force demands of the Project and given the Project's commitment to maximize local and regional participation in Project opportunities. Contractors will be directed to maximize local workers on their crews and report to Trans Mountain on their levels of local content. The spatial boundary for the effect is regional; employment effects are anticipated to occur throughout the Socio-economic RSA because much of the regional labour force is in reasonable commuting distance of the proposed construction hubs. Indirect and induced employment related to businesses expanding to meeting the needs of contractors directly involved in the Project, as well as the needs of general spending of the temporary population residing in the region, is anticipated to occur throughout the Socio-economic RSA. The reversibility of the effect is short-term, since it is focused on the construction phase of the Project. The experience of the regional labour force in construction-related activities and the interest expressed in Project opportunities by many regional businesses and residents indicates that available local labour will likely seek to participate in opportunities that emerge related to the Project. An increase in employment opportunities will be readily detectable and result in a substantial change in the socio-economic environment in smaller communities; Project-related opportunities are anticipated to be less undetectable in larger communities such as those in the Edmonton and Metro Vancouver regions but nonetheless be considerable. Overall, the magnitude of the effect is considered to be medium. The probability of the effect occurring is considered high, given Trans Mountain's emphasis on, and commitment to, local and regional participation in Project opportunities. The level of confidence in the effects characterization is high, given the labour demands of the Project, experience of the regional labour force working on large capital Projects, Trans Mountain's local hiring experience during other pipeline construction projects, interest expressed by the regional business community and local government during consultation, and based on the professional experience of the assessment team (Table 7.2.7-3, point [2a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – residents from across the Socio-economic RSA could reasonably commute to various construction hubs for employment opportunities.
- Duration: short-term – the activity of providing construction-related employment opportunities will occur during construction.
- Frequency: isolated – the construction activities leading to regional employment opportunities would occur during specified months in given communities/areas during the overall construction phase.
- Reversibility: short-term – the potential residual effect is limited to the construction phase.
- Magnitude: medium – increases in employment opportunities will be readily detectable and result in a substantial change in the socio-economic environment in smaller communities, but largely undetectable in bigger communities.
- Probability: high – Trans Mountain plans to maximize local hiring and provide contract procurement opportunities to local businesses for the Project. Interest in Project-related employment was expressed consistently during Project consultation.
- Confidence: high – based on Project workforce needs, interest expressed by stakeholders, and the professional experience of the assessment team.

Reduced Availability of Labour for Other Regional Industries Due to Workers Taking Project-Related Opportunities During Construction

As discussed above, construction of the Project will generate a demand for goods, services and workers. The regional labour force, however, is anticipated to be constrained in terms of labour supply. As of 2011, average unemployment rates for the socio-economic regions ranged from a low of 1.9% in Jasper National Park to 5.6% and 5.9% in the Edmonton and the Rural Alberta regions, respectively. Unemployment rates are higher in BC, ranging from 7.2% in the Metro Vancouver Region to 9.3% in the Fraser-Fort George/Thompson-Nicola Region. While more recent data specific to Socio-economic RSA communities is not available, recent labour force information for the provincial Economic and Development Regions in which the socio-economic regions are located indicate further employment growth and tightening the labour market since 2011. In June 2013, the unemployment rates in relevant Alberta Economic regions were between 4% and 4.6%; unemployment rates in the relevant BC Economic regions were between 5% and 6.6% (Table 7.2.7-11). While the natural rate of unemployment in a region can vary based on a number of factors, the Alberta government notes that a 5% unemployment rate often indicates a balanced labour pool (Alberta Enterprise and Advanced Education 2009), with higher rates of unemployment suggesting a surplus labour market. Labour shortages tend to occur when the unemployment rate drops to 3% or less. However, workers can be induced to enter the labour market through training and other initiatives, thereby increasing available workers without altering the unemployment rate and improving access to labour in circumstances of high unemployment rates. The rule of thumb of 5% unemployment as a balanced labour market supports the understanding that some local labour will be available to participate in the Project, but that the Project should not anticipate an extensive regional supply of available workers. As noted previously, it is conservatively estimated that between 5%-30% of direct construction workers will be regional residents with the rest being filled by incoming temporary workers.

TABLE 7.2.7-11

UNEMPLOYMENT RATES (2013) AND LABOUR FORCE OUTLOOK, BY PROVINCIAL ECONOMIC REGION

Provincial Economic/ Development Region	Relevant Socio-economic Region	Unemployment Rate (June 2013)	Labour Force Outlook
Edmonton Region	Edmonton Region	4.6%	From 2010 to 2021, Alberta's labour demand is projected to grow by an annual average rate of 2.4%, while occupational supply is anticipated to increase at a rate of 1.9% annually. Alberta could experience a labour shortage of approximately 114,000 workers by 2021. The anticipated growth in labour demand is higher in the Edmonton Region than for the province as a whole, with approximately 2.9% growth in labour demand anticipated in the region annually from 2013 to 2017.
Banff-Jasper-Rocky Mountain House	Rural Alberta Region Jasper National Park Region	4.0%	From 2010 to 2021, Alberta's labour demand is projected to grow by an annual average rate of 2.4%, while occupational supply is anticipated to increase at a rate of 1.9% annually. Alberta could experience a labour shortage of approximately 114,000 workers by 2021. The anticipated growth in labour demand is lower in the Banff-Jasper-Rocky Mountain House Region than for the province as a whole, with approximately 1.9% growth in labour demand anticipated in the region annually from 2013 to 2017.
Caribou	Fraser-Fort George/Thompson-Nicola Region	5.0%	Employment demand expected to grow at an average rate of 0.5% annually between 2011 and 2020. Growth in demand is slightly outpacing supply (0.4% annually). Employment demand is anticipated to exceed labour supply starting in 2011 to 2017, peaking in 2014. Employment growth is mainly driven by the service-producing sector.
Thompson-Okanagan	Fraser-Fort George/Thompson-Nicola Region	6.5%	Employment demand expected to grow at an average rate of 1.1% annually between 2011 and 2020. Growth in demand is expected to outpace labour supply (0.8%) growth by 0.3 percentage points. Due to this, tightening in labour market is expected to occur. A shortage of workers is projected starting in 2014 and continuing toward 2020. Employment growth is mainly driven by the service-producing sector.
Mainland/Southwest	Fraser Valley Region Metro Vancouver Region	6.6%	Employment demand expected to grow at an average rate of 1.6% annually between 2011 and 2020. Growth in demand is outpacing supply (1.3% annually). Due to this, a tightening in labour market is expected to occur. The region is expected to see shortages in the supply of workers starting in 2017 through 2020. Employment growth is mainly driven by the service-producing sector.

Sources: Alberta Enterprise and Advanced Education 2013c,d,e, Work BC 2013a,b,c,d

The trend of tightening labour supply emerged during Project consultation, with several municipalities noting limited available workers and already seeing influxes of temporary foreign workers in order to meet demand or regular influxes of seasonal workers. The Town of Hinton and the Town of Edson noted a tight labour force capacity, along with an increased presence of temporary foreign workers (Kreiner, Lemieux pers. comm.). The Village of Valemount noted that it has limited labour availability and there are a limited number of people to draw on and train, but that employment opportunities, particularly long-term, would be considered a notable benefit to the community (McCracken pers. comm.). No issues with labour capacity were identified in larger centres in the Socio-economic RSA during consultation.

In the context of limited labour supply and tightening labour outlooks, other local and regional businesses and industries may experience reduced availability of labour to fill their needs, as workers may be drawn to participate in Project-related opportunities. This may be influenced by the income-differential between typical construction industry jobs compared to certain service sector jobs, whereby construction-related jobs are often substantially higher paid as shown in Section 7.2.3 Social and Cultural Well-being.

Overall, the impact balance of this residual effect is considered neutral. While there may be some undesirable consequences from the perspective of non-Project related businesses that may experience short-term labour pressures and/or upward pressure on wage expectations, on balance this should be offset by the effects of higher wages associated with a shift from lower to higher paying jobs. The spatial boundary for this effect is the Socio-economic RSA, since labour for the construction of the Project may be drawn from across the Socio-economic RSA and communities throughout the Socio-economic RSA could experience labour flight in services industries. The reversibility of the effect is short-term since the large labour demands will be limited to the construction phase of the Project. The relatively small number of additional direct permanent workers required during operations is not anticipated to affect business/industries on a regional scale. However, there may be implications in smaller communities such as Valemount or Blue River where the effect of even one or two new permanent operating positions may

be a detectable change that could draw workers from their existing employment. Feedback from consultation, however, has indicated that Project-related operations employment opportunities would be desirable in these communities.

The magnitude is characterized as medium since across the Socio-economic RSA the effect on labour supply for other businesses could range from negligible to high. It will depend on the size and labour force capacity of the various regions and communities crossed by the proposed pipeline corridor. For example, the effect is anticipated to be negligible in large urban areas such as the Edmonton and Metro Vancouver regions, since the workforce demands associated with the Project are small in the context of the total labour pool and unlikely to be detectable in the context of a large, industrial/commercial urban economy. In smaller communities, workforce demands of Project construction could fully outstrip local supply and the Project could present opportunities which may draw regional residents from their current employment. As a result labour effects on some other businesses could be detectable in smaller communities such as Edson, Hinton, Valemount, Blue River and Clearwater.

The probability of the effect is considered high, given Trans Mountain's emphasis on and commitment to local and regional participation in Project opportunities. The overall level of confidence in the effects characterization is high, given the labour demands of the Project and information on existing labour limitations, regional experience in large capital Projects, Trans Mountain's previous local hiring experience during the other pipeline construction projects, interest expressed by the regional business community and local government during consultation, and based on experience of the assessment team. Overall, at a regional scale, the residual effect is deemed not significant, though the effect will vary across different parts of the Socio-economic RSA. The goal of maximizing local content has the inevitable counter-effect of potentially reducing labour availability for other industries and sectors in the Socio-economic RSA. Such effects need to be carefully monitored and managed through active consultation and an issues-tracking process during the course of the construction period (Table 7.2.7-3, point 2[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – labour for the construction of the Project will be drawn from across the Socio-economic RSA.

- Duration: short-term – opportunities for Project-related employment that could reduce labour availability for other industries will occur during construction.

- Frequency: isolated – the event causing opportunities for Project-related employment that could reduce labour availability for other industries is confined to a specific period.

- Reversibility: short-term – the potential residual effect is limited to the construction phase.

- Magnitude: medium – the effect will be detectable in smaller communities but largely negligible in large urban centres.

- Probability: high – Trans Mountain plans to carry out local hiring and provide contract procurement opportunities to local businesses for the Project.

- Confidence: high – based on Project workforce needs, regional labour force capacity, interest expressed by stakeholders in Project opportunities, and the professional experience of the assessment team.

Opportunities for Regional Project-Related Employment during Operations and Associated Increases in Labour Income

Employment opportunities are anticipated related to operations though they will be notably smaller than during the construction phase. Based on Conference Board of Canada modelling, Project operating expenditures are anticipated to generate increased employment in the range of approximately 50,300 to 65,184 person-years of employment (depending on minimum or maximum scenario; including direct, indirect and induced employment in both scenarios) over a 20 year period. Of these person-years of employment (based on the minimum scenario), approximately 60% will be generated in BC, 20% in Alberta, 13% in Ontario and the remainder spread amongst the other provinces and territories. Direct

employment during operations is anticipated to be in the range of 6,800 to 8,900 person-years across Canada (see Tables 7.2.7-5 and 7.2.7-6). While the operations period will extend beyond 50 years, economic modelling is based on the 20 year shipper contracts; accordingly, these are conservative estimates.

The extent to which goods and services will be bought from regional businesses during the operations phase ultimately depends on the qualifications of each business and its ability to provide the required goods and services in the specified time frame, at prices competitive with businesses outside the region and according to industry requirements. It also depends on the extent to which businesses with the potential to provide supporting goods and services prepare themselves for growth opportunities.

Approximately 90 direct new full-time positions will be created during the operations phase of the Project. Of these positions, 40 are anticipated to be in Alberta and 50 are anticipated to be in BC. New operations positions may include: control centre operators; pipeline maintenance technicians; electrical/mechanical/instrumentation technicians, pipeline integrity/pipeline protection technicians; technical and line supervisors; tank operations technicians; marine operations technicians, terminal manager, and office/support staff. These positions will provide attractive sources of employment income for personnel that are hired. The hourly salary reported for an oil pipeline control centre operator and a pipeline maintenance technician in Alberta in 2011 was $28 to $44 per hour (between approximately $56,000 to $88,000 per year). For instrument technicians, the hourly wage ranged from $27 to $34 per hour (between approximately $54,000 to $74,000 per year) (Wageinfo 2013).

Employment effects during operations are anticipated to have spin-off effects in terms of increased labour income. Based on the economic modelling by the Conference Board of Canada, Project operating expenditures are estimated to generate increased labour income valued in the range of $3.0 billion to $3.9 billion in 2012 dollars over a 20 year period. Of this labour income (based on the minimum scenario), approximately 55% will be generated in BC, 28% in Alberta, 11% in Ontario and the remainder spread amongst the other provinces and territories (see Tables 7.2.7-5 and 7.2.7-6).

The impact balance of the effects on regional employment and associated labour income during operations is positive as new employment is desirable within overall economic development goals in Socio-economic RSA communities. The spatial boundary for the effect is the Socio-economic RSA since the new full-time positions related to the Project will be focused in communities along the proposed pipeline corridor, and people in those positions will be or will become permanent residents of communities in the Socio-economic RSA within commuting distance of the Project facility where the position is based (Project-related employment will occur outside the Socio-economic RSA, but the assessment is focused on regional employment effects). The reversibility is considered long-term since the employment opportunities and associated income will occur throughout Project operations. Given the relative small number of new operating positions associated with the Project, the magnitude of the effect is considered low; new positions may be detectable in smaller communities but will be largely in the normal range of variability in the context of the Socio-economic RSA as a whole. The probability of the effect is high, given Trans Mountain's statement that new positions will be required. The overall level of confidence in the effects characterization is high, given the operations phase employment projections provided by Trans Mountain, Trans Mountain's current operations workforce residing in the Socio-economic RSA, interest expressed by the regional business community and local government during consultation, and based on the professional experience of the assessment team (Table 7.2.7-3, point 2[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – workers in new positions could reside in any community within commuting distance.

- Duration: long-term – the activity of providing operations-related employment opportunities will occur during the operations phase.

- Frequency: continuous – the new positions and maintenance requirements of the Project will be required throughout Project operations.

- Reversibility: long-term – the employment opportunities and associated income will occur throughout Project operations.

- Magnitude: low – while new operating positions would be detectable in small communities, the number of new operating jobs is considered to be within normal range of variability across the Socio-economic RSA.

- Probability: high – Trans Mountain plans to carry out local hiring and provide contract procurement opportunities to local businesses during operations.

- Confidence: high – given the operations phase employment projections provided by Trans Mountain.

Combined Effect on Regional Employment

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects related to regional employment evaluated in Section 7.2.7.6 (Table 7.2.7-3, points 2[a] to 2[c]) are of high probability and, consequently, were considered in the evaluation of combined effects on the regional employment indicator.

The combined effect of the Project on regional employment considers the employment opportunities for residents within the Socio-economic RSA related to construction and operations, and the potential for non-construction/industry-related business to experience labour shortages if workers are drawn to Project opportunities. Construction of the Project will generate a large demand for goods, services and workers, some of which are anticipated to be sourced from the Socio-economic RSA. Workers may be hired directly by pipeline, pump stations or terminal contractors; contracted for specific construction support activities, or they may be employed by companies that directly supply Trans Mountain or its contractors with goods or services. Overall, Trans Mountain anticipates that the construction workforce will result in 1,324,035 worker days of employment over the 2016-2017 construction period, or 60,183 full-time equivalent worker months. At the peak, it is anticipated the Project will require over 4,475 direct construction workers in Alberta and BC combined. Further, approximately 90 new full-time positions related to Project operations will be created.

There is some capacity in the regional labour force to supply some workforce needs of the Project and interest has been expressed in employment and business opportunities during Project consultations. Regional employment is anticipated to vary across the various socio-economic regions. Considering labour force size, unemployment rates, the pace of economic growth in terms of other planned projects, it is conservatively anticipated that regional residents may fill from 5-30% of construction workforce jobs. Larger regional uptake on employment opportunities is anticipated in the larger regions such as Edmonton and Metro Vancouver Regions because there is a larger pool of labour but it is likely to be smaller in certain areas which have a much smaller population (such as Valemount, Blue River, and Clearwater). However, in smaller communities the employment opportunities are likely to be perceived as having a greater positive effect, given the fewer economic opportunities available compared to large urban economies. Trans Mountain will implement many enhancement measures to optimize regional employment both directly and via its contractors. This will include developing an on-line employment communication tool for interested workers and service providers, implementing communications initiatives to share required jobs skills, advertising work opportunities widely, and including regional employment clauses in all Project contracts. Trans Mountain will also initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project, which will further increase employment opportunities for Aboriginal communities.

It is acknowledged that the intense construction period of the Project may result in drawing labour from other sectors, particularly in smaller communities as this is a common counter-effect during boom periods in many economies. While this may affect service industries that experience implications related to labour scarcity and localized short-term wage inflation, it is anticipated that this potential effect will be counteracted by the economic benefits associated with increased spending in local economies due to the presence of temporary workers.

The overall Project effect on the regional employment indicator is anticipated to be positive, due to the large work force demands of the Project and given the Project's commitment to maximize local and regional participation in Project opportunities. Project-related employment opportunities will be highest during construction, but will extend throughout operations. The spatial boundary for the effect is regional, because employment effects are anticipated to occur throughout the Socio-economic RSA as much of the regional labour force is in reasonable commuting distance of the proposed construction hubs. Indirect and

induced employment related to businesses expanding to meeting the needs of contractors directly involved in the Project, and the needs of general spending of the temporary population residing in the region, is anticipated to occur throughout the Socio-economic RSA. The duration and frequency of the overall effect are considered to be long-term and continuous respectively, since the economic effect is related to the workforce needs of both the construction and operations phase activities and expenditures. The reversibility of the effect is long-term as regional employment opportunities will extend throughout operations. The experience of the regional labour force in construction-related activities and the interest expressed in Project opportunities by many regional businesses and residents indicates that available local labour will likely seek to participate in opportunities that emerge related to the Project, resulting in an overall medium effect on the regional employment situation. The probability of the effect occurring is considered high, given Trans Mountain's emphasis on, and commitment to, local and regional participation in Project opportunities and stakeholder interest (Table 7.2.7-3, point 2[d]). A summary of the rationale for all of the significance criteria of combined effects on regional employment is provided below.

- Spatial Boundary: Socio-economic RSA – training and capacity development opportunities will exist for community members throughout the RSA.
- Duration: long-term – while most regional employment effects will result from the construction phase, opportunities will continue throughout operations.
- Frequency: continuous – both construction and operations activities will generate employment opportunities.
- Reversibility: long-term – while most Project-related employment will occur during the construction phase, opportunities will continue throughout operations.
- Magnitude: medium – increases in employment opportunities will be readily detectable and result in a substantial change in the socio-economic environment in smaller communities, but are likely to be undetectable in larger communities.
- Probability: high – given Trans Mountain's emphasis on, and commitment to, local and regional participation in Project opportunities.
- Confidence: high – based on Project workforce needs, interest expressed by stakeholders, and the professional experience of the assessment team.

Employment and Economy Indicator - Municipal Economies

The following provides the evaluation of significance of potential residual effects related to the municipal economies indicator.

Increased Municipal Taxes in Footprint Communities

The Project will contribute to a substantial increase in the municipal tax base in the communities and regions it crosses. It is estimated that the municipalities, counties/regional districts, and IRs crossed by the Project will accrue aggregate property tax increases of approximately $3.4 million annually in Alberta (a 116% increase) and approximately $23.2 million annually in BC (a 101% increase) (Table 7.2.7-12). The total forecasted increase in Trans Mountain municipal taxes across Alberta and BC is over $26.5 million per year, which will result in Trans Mountain's total municipal taxes after Project construction being in the order of $52.3 million per year.

TABLE 7.2.7-12

TRANS MOUNTAIN MUNICIPAL TAXES PAID, 2013 AND PROJECTED INCREASE

Location	Current (2013) Taxes ($ Per Year)	TMEP Forecasted Tax Increase ($ Per Year)	Total Taxes After TMEP Construction ($ Per Year)
ALBERTA			
I.D. # 12 (Jasper National Park)	97,000	44,000	141,000
City of Edmonton	159,000	355,000	514,000
Town of Edson	63,000	110,000	173,000
Town of Hinton	69,000	34,000	103,000
Municipality of Jasper	368,000	135,000	503,000
Parkland County	353,000	559,000	912,000
City of Spruce Grove	19,000	33,000	52,000
Town of Stony Plain	18,000	31,000	49,000
Strathcona County	717,000	764,000	1,481,000
Village of Wabamun	16,000	7,000	23,000
Yellowhead County	1,004,000	1,280,000	2,284,000
Total Alberta	2,883,000	3,352,000	6,235,000
BC			
City of Abbotsford	2,065,000	1,304,000	3,369,000
City of Burnaby	7,022,000	6,221,000	13,243,000
City of Chilliwack	664,000	944,000	1,608,000
District of Clearwater	343,000	513,000	856,000
City of Coquitlam	200,000	243,000	443,000
District of Hope	680,000	594,000	1,274,000
City of Kamloops	1,578,000	1,278,000	2,856,000
Township of Langley	367,000	575,000	942,000
City of Merritt	99,000	151,000	250,000
City of Port Moody	16,000	0	16,000
City of Surrey	574,000	441,000	1,015,000
Kamloops IR 4	103,000	0	103,000
Whispering Pines IR 4	123,000	0	123,000
Lower Nicola IRs (Joeyaska 2, Zoht 4 and 5)	81,000	118,000	199,000
Coldwater IR 1	91,000	0	91,000
Shxw'owhamel IR 1	37,000	49,000	86,000
Peters IR 1 & 1A	11,000	40,000	51,000
Popkum IR 1 & IR 2	20,000	25,000	45,000
Grass IR 15	13,000	17,000	30,000
Tzeachten IR 13	19,000	19,000	38,000
Matsqui Main IR 2	4,000	7,000	11,000
Regional District of Fraser-Fort George	2,183,000	1,858,000	4,041,000
Thompson-Nicola Regional District	5,651,000	7,484,000	13,135,000
Fraser Valley Regional District	1,041,000	1,273,000	2,314,000
Total BC	22,985,000	23,154,000	46,139,000
Total Alberta and BC	25,868,000	26,506,000	52,374,000

Source: KMC 2013d

The impact balance of the effects on municipal taxes in communities along the proposed pipeline corridor is positive, as increased municipal tax revenues will support local government's ability to meet their respective social, economic, and community development goals. Increased municipal taxes associated with the Project have been identified as positive effect by many municipalities during the course of stakeholder engagement. The spatial boundary for the effect is the Socio-economic RSA, since the benefit will extend to all municipalities/regions crossed by the proposed pipeline corridor and residents living in all areas within Footprint communities and regions. The duration of the effect is long-term since the municipal taxes will be paid by Trans Mountain throughout the operations phase of the Project. The frequency of the effect is continuous since the new municipal tax revenue will be paid throughout Project

operations. The magnitude of the effect is considered high, as Trans Mountain will be increasing the municipal taxes paid by over 100% in both Alberta and BC which represents a substantial and detectable change in the tax base in most communities. The probability of the effect is high, since payment of municipal property taxes is a standard requirement of business for Trans Mountain and they have been paying municipal taxes in the Socio-economic RSA in good standing associated with their existing operations for many years. The overall level of confidence in the effects characterization is high (Table 7.2.7-3, point 3[a]). Given the above, the increase in municipal taxes resulting from the construction and operation of the Project is considered to be a significant positive residual socio-economic effect. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the increase in taxes and associated benefit will extend to all municipalities/regions crossed by the Project and residents living in all areas within nearby communities and regions.

- Duration: long-term – the municipal taxes will be paid by Trans Mountain throughout the operations phase of the Project.

- Frequency: continuous – the additional municipal tax revenue will be paid throughout Project operations.

- Reversibility: long-term – the tax revenues will be paid to Footprint municipalities/regions throughout Project operations.

- Magnitude: high – Trans Mountain will be increasing the municipal taxes paid by over 100% in both Alberta and BC which would be a substantial and detectable change in the tax base in most communities.

- Probability: high – payment of municipal property taxes is a standard requirement of business for Trans Mountain.

- Confidence: high – payment of municipal property taxes is a standard requirement of business.

Increased Personal Spending By Project Workers During Construction and Associated Increased Opportunities for Businesses

As discussed previously, the construction phase of the Project's demand for goods, services and workers is anticipated to result in substantial employment opportunities in the Socio-economic RSA. The non-regional workers that will come to the Socio-economic RSA during the construction period are anticipated to have an effect on the local economies in construction hubs and across the Socio-economic RSA. Non-regional workers will be residing in the Socio-economic RSA and spending personal income on goods and services, including accommodation, food, gasoline, entertainment and personal items.

Trans Mountain conducted a worker expenditure analysis to estimate direct Project worker spending for non-regional workers and increases in disposable income for regional workers in potential construction hubs. Factors that were considered include likely wage rates, the hiring of currently employed community members and the hiring of community members not presently employed and the number of other major projects in the area which may also attract workers. Using Statistics Canada data on personal expenditures, an estimate was also developed as to how much money might be spent while in the area and on which types of goods and services.

Overall, the economic effect of worker spending will vary across construction hubs due to the amount of construction in each hub and the availability of local workers. The value of expenditure of Project-related income by *regional workers* ranged from approximately $0.4 million in both the Town of Hinton and the Community of Blue River to over $80 million in the Metro Vancouver area. The value of *non-regional worker* spending would range from approximately $10.6 million based on spending of non-regional crews based in the Town of Hinton to over $78 million for non-regional workers based in the Metro Vancouver Region.

The estimate of non-regional worker spending would decrease in the event that temporary construction camps are established for Project workers in areas with limited housing/accommodation capacity, as

workers' spending on accommodations and food would be reduced. See Appendix A of the Worker Expenditures along the Pipeline Corridor Technical Report for a discussion of differentials in worker spending in the event construction camps are utilized in select locations such as Edson, Blue River and Clearwater. Also, the estimate of worker spending does not account for spending by new regional workers and associated population growth related to with indirect and induced employment. The estimates are independent from the construction phase labour income projections emerging the Conference Board of Canada's economic modelling (Tables 7.2.3-4).

Table 7.2.7-13 provides a summary of estimated direct construction workforce spending in potential construction hubs. Due to the high level nature of this assessment, no attempt was been made to calculate the share of spending and disposable income that would remain in the communities. In smaller hubs, local retail margins might comprise the totality of such impacts whereas in larger hubs a greater proportion of the spending would be locally produced and, therefore, remain in the community.

TABLE 7.2.7-13

ESTIMATED DIRECT CONSTRUCTION WORKFORCE SPENDING IN SOCIO-ECONOMIC REGIONAL STUDY AREA COMMUNITIES

Community/Construction Hub	Anticipated Spending by Non-Regional Workers[1] ($Million)	Anticipated Spending by Regional Workers (*i.e.*, current residents)[2] ($Million)	Total ($Million)
Edmonton Area	36.6	11.9	48.5
Edson	36.0	2.4	38.4
Hinton	10.6	0.4	11.0
Valemount	32.4	1.0	33.4
Blue River	13.6	0.4	14.0
Vavenby/Clearwater	32.5	2.5	35.0
Kamloops	39.1	3.3	42.4
Merritt	37.8	1.8	39.6
Hope	27.3	1.5	28.8
Chilliwack	10.8	0.9	11.7
Abbotsford	16.7	1.4	18.1
Metro Vancouver	78.1	80.6	158.7

Source: KMC 2013b

Notes: 1 Based on calculations and assumption that the average monthly disposable income of regional resident workers would be about $5,500.

2 As per the worker expenditure analysis, based on the estimation that non-regional workers would spend approximately $240 per day; this assumes spending of $100 per day on hotel or other commercial accommodation, $50 per day on meals, with the remainder spent on expenditure categories as per Statistics Canada Personal Expenditure Compositions likely to occur for temporary workers over the course of a year broken out into daily costs (*e.g.*, vehicle costs, clothing, personal hygiene, fuel, recreation products and services, alcohol and entertainment).

Further detail on the anticipated levels of worker spending and methodology is found in the Worker Expenditures Along the Pipeline Corridor Technical Report of Volume 5D.

Overall, it is anticipated that regional businesses will experience opportunities related to increased demand for personal use goods and services during the construction phase. The impact balance is positive, since increased opportunities for regional businesses will be desirable for the regional business community and support overall community development and regional economic growth. The spatial boundary for the effect is the Socio-economic RSA, as the benefit will extend across all construction hubs and potentially to regional communities where workers may choose to reside and/or spend their off-work time (most communities in the Socio-economic RSA are a reasonable commuting distance from the Project). The reversibility is considered short-term since the residual effect of increased opportunities for businesses is limited to the construction phase. The number of permanent additional workers during the operations phase (90 new permanent positions total across the Socio-economic RSA) would be negligible in the context of the regional population. The residual effect is considered of medium magnitude; it will be more pronounced in smaller communities, where the Project-related workforce is large in comparison to the local population. The probability of the effect is high given the large size of the construction workforce and the anticipated numbers of non-local workers who will be residing temporarily in the Socio-economic

RSA during the construction period. The overall level of confidence in the effect is moderate given information on the capacity of the regional labour market, the competing demands for labour from other capital projects, the subsequent need for non-regional workers to be brought in, and the results of the worker expenditure analysis, but also considering that the exact spending patterns of workers cannot be predicted (Table 7.2.7-3, point 3[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the opportunities for businesses due to worker spending will extend across all construction hubs and potentially to regional communities where workers may choose to reside and/or spend their off-work time.

- Duration: short-term – the effect is a result of the activities of workers during the construction phase only.

- Frequency: isolated – the presence of large numbers of workers who will make purchases from local/regional businesses is confined to the construction phase.

- Reversibility: short-term – the residual effect of increased opportunities for businesses due to worker spending is limited to the construction phase.

- Magnitude: medium – change would be readily detectable in smaller communities, but likely negligible in larger communities.

- Probability: high – based on Project work force demands and regional labour force capacity.

- Confidence: moderate – based on Project work force demands, regional labour force capacity, and the results of the worker expenditure analysis. However, precise worker spending habits cannot be accurately predicted.

Combined Effect on Municipal Economies

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects related to municipal economies evaluated in Section 7.2.7.6 (Table 7.2.7-3, points 3[a] and 3[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the municipal economies indicator.

The Project is anticipated to result in substantial economic benefits for many communities within the Socio-economic RSA, primarily those that are crossed by the proposed pipeline corridor. The Project will result in a substantial increase to the municipal tax base of each incorporated municipality, region and IRs it crosses. It is estimated that the municipalities, counties/regional districts, and IRs through which the Project passes will accrue combined property tax increases of approximately $23.2 million (a 101% increase) annually in BC and $3.4 million (a 116% increase) annually in Alberta. Benefits are also anticipated in construction hubs, due to workers spending Project-derived income on goods and services, including accommodation, food, gasoline, entertainment and personal items.

The impact balance of the overall Project effects on municipal economies is positive, due to increased spending in local businesses and substantial increases in municipal tax revenues that will support local government's ability to meet their respective social, economic, and community development goals. The spatial boundary for the effect is the Socio-economic RSA, since the benefit will extend to all municipalities/regions crossed by the proposed pipeline corridor and residents living in all areas within Footprint communities and regions. The duration of the effect is long-term; while the localized benefits of non-regional worker spending will be limited to the construction phase, the municipal taxes will be paid by Trans Mountain throughout the operations phase. The magnitude is considered high, as many non-regional workers are anticipated and Trans Mountain will be increasing the municipal taxes paid by over 100% in both Alberta and BC which represents a substantial and detectable change in the tax base in most communities. The probability of the effect is high because of the labour force analysis and the likely number of non-regional workers that will be residing in the Socio-economic RSA during construction, and that payment of municipal property taxes is a standard requirement of business for Trans Mountain (Table 7.2.7-3, point 3[c]). Given the above, the combined effect of the Project on the municipal

economies indicator is considered to be a significant positive residual socio-economic effect. A summary of the rationale for all of the significance criteria of combined effects on municipal economies is provided below.

- Spatial Boundary: Socio-economic RSA – the benefit will extend to all municipalities/regions crossed by the proposed pipeline corridor and residents living in all areas within Footprint communities and regions.

- Duration: long-term – while the localized benefits of non-regional worker spending will be limited to the construction phase, the municipal taxes will be paid by Trans Mountain throughout the operations phase.

- Frequency: continuous – though construction worker spending will be limited to the construction phase, increased municipal tax revenue will be paid throughout operations.

- Reversibility: long-term – as increased municipal tax revenues will be paid throughout operations.

- Magnitude: high – Trans Mountain will be increasing the municipal taxes paid by over 100% in both Alberta and BC which is a considerable and detectable change in the tax base in most communities.

- Probability: high – based on the required Project workforce, regional labour force capacity, and the projected increases in municipal taxes.

- Confidence: high – the Project will be paying increased taxing revenues and non-regional Project workers will be residing and, consequently, spending personal income, in many Socio-economic RSA communities.

Employment and Economy Indicator - Contracting and Procurement

The following provides the evaluation of significance of potential residual effects on the contracting and procurement indicator.

Increased Regional Contracting and Procurement Opportunities

The contracting and procurement requirements of the Project are anticipated to be substantial. They will be highest during the construction phase of the Project. As noted previously, approximately $4.6 billion (2012 dollars, financing costs excluded) is anticipated for capital expenditures over the 2012 to 2018 period. Of this, approximately 69.5% ($3.2 billion) will be spent to construct the BC portion and approximately 30.5% will be spent ($1.4 billion) to construct the Alberta portion (see Volume 2).

Procurement of goods and services for Project construction will be done through a combination of Trans Mountain direct procurement activities and procurement by the contractors engaged by Trans Mountain to construct the pipeline and facilities, including the Westridge Marine Terminal. Trans Mountain will procure some major goods and some services directly which may include:

- most goods and services required for the Project development phase;

- contracts for engineering, and for engineering, procurement and construction management;

- contracts for environmental and socio-economic studies and management plans;

- contracts for construction of the pipeline and associated facilities;

- contracts for construction camps (as required on the basis of the Worker Accommodation Strategy);

- major materials and equipment and long lead time materials and equipment such as pipe, large diameter valves and pumps and motors packages; and

- selected contracts with businesses in the Socio-economic RSA to support participation in the Project by Aboriginal communities and Socio-economic RSA residents and businesses; these contracts may in turn be managed by one of the Project General Contractors.

The contractors engaged directly by Trans Mountain to undertake large portions of the construction work are considered General Contractors. The scope of work for these General Contractors will include all aspects of construction of one or more segments of the proposed pipeline corridor or at one or more of the pump stations or terminals. Most Project-related contracts for goods and services will be awarded by these General Contractors through a sub-contracting process.

While it should not be considered exhaustive, the typical types of contracting and sub-contracting opportunities related to pipeline construction are listed below. Given the proposed location of the Project adjacent to existing pipeline routes, some of the following contracts may not be issued at all locations.

- right-of-way clearing;
- clearing and site preparation;
- road access clearing;
- hydrovac (crossings);
- pipe/equipment hauling;
- water hauling;
- fuel supply;
- reclamation (seeding, shrub planting);
- emergency medical services;
- HDD/boring;
- miscellaneous equipment supply (generators, lighting towers, pumps);
- security services;
- traffic management;
- trucking;
- janitorial services;
- quality control (non-destructive testing);
- environmental inspections;
- equipment rental and lease;
- maintenance;
- gravel supply and hauling; and
- pressure testing.

All contracts, service agreements and materials that are not deemed critical to sustain the Project will first be sought from regional resources. Some of the procurement opportunities that are more likely to be filled by regional suppliers include: water hauling; fuel supply; reclamation (*e.g.*, seeding, shrub planting);

emergency medical services; security services; flag personnel; equipment rental and lease; gravel supply and hauling; worker accommodation and temporary housing; catering; and miscellaneous equipment supply (*e.g.*, generators, lighting towers, pumps). This will vary by socio-economic region; the Edmonton Region and Metro Vancouver Region have large and diversified economies and have the potential to offer a greater ranged of needed services and materials to the Project.

There will be ongoing contracting and procurement opportunities during Project operations which will be smaller than during the construction phase, but increased over current-day operations. Of total additional annual operating costs ($118 million/year; see Volume 2), approximately 17% (or about $19.7 million) will be for operations and maintenance, much of which will involve additional contracting needs related to tank and pump station maintenance, right-of-way management, pipeline integrity, and ongoing environmental monitoring.

The guiding principles of the procurement approach for the Project are based on current practices of Trans Mountain and its parent company, KMC, and include the following key components.

- Trans Mountain will purchase goods and services on a fair basis and on a competitive basis, where practical, while meeting Project requirements regarding price, quality, safety, reliability, service and delivery.

- Trans Mountain will purchase Project-required goods and services from regional, Alberta and BC (Provincial) and Canadian suppliers, provided those suppliers meet the Project requirements on a best overall value basis, with added consideration for Aboriginal service providers.

- Suppliers who propose to provide benefits to Canada through their utilization of Canadian labour and subcontractors will be considered favourably during procurement evaluations.

- All procurement activities conducted by Trans Mountain and its contractors for the Project will be conducted in a transparent, legal and ethical manner. All fair trade practices, all Canadian laws, and terms of relevant international agreements will be observed.

The Project will take active steps to maximize regional, Aboriginal, provincial and Canadian contracting and procurement. Trans Mountain has developed a Project-specific *Procurement Policy*, which indicates that the Project is committed to maximize the use of local, regional, Aboriginal, provincial and Canadian businesses during the construction and operation of the Project. Trans Mountain may relay of existing relationships while providing opportunities to other local, regional, Aboriginal and provincial qualified businesses through a competitive bidding process.

Trans Mountain is also committed to maximizing Aboriginal contracting and procurement opportunities, as guided by their *Aboriginal Procurement Policy*. Trans Mountain promotes open and transparent consultation and communication, and strives to build lasting relationships, with Aboriginal communities and businesses. Trans Mountain is committed to ensuring these relationships are based on trust mutual respect and the achievement of common goals. The Project will work with Aboriginal communities to promote economic development through training and by identifying business opportunities that offer Aboriginal communities and business the ability to participate in procurement and sourcing activities related to all stages of Project operations, maintenance and other Project requirements.

Other steps Trans Mountain will take to enhance procurement and contracting opportunities related to the Project include: maintaining an online procurement registry where interested parties can register their capabilities and express interest in providing goods or services to the Project; requiring contractors to identify, track and report Aboriginal, regional, provincial and Canadian content in their regular reporting to Trans Mountain; giving first consideration to qualified regional suppliers of goods and services, where practical; and continuing to engage with Aboriginal communities regarding regional Aboriginal businesses/contractors, including available business services and capacity. Additional enhancement measures related to contracting and procurement are outlined in the SEMP in Volume 6B.

Trans Mountain has met with Aboriginal communities to begin discussions about economic opportunities related to the construction of the Project, including opportunities related to environmental field work. Discussions between Trans Mountain and Aboriginal communities will be ongoing during the regulatory

and Project planning phases to determine the subcontracting capacity of band-owned and member-owned businesses to provide services to the pre-construction and construction phases of the Project, as well as other benefit opportunities.

Overall, it is anticipated that the Project will result in substantially increased contracting and procurement opportunities, peaking during construction but extending through the life of the Project. The impact balance of this effect is positive; increased procurement opportunities for regional and provincial businesses has been identified as a key interest of many Aboriginal communities and stakeholders consulted during the assessment and application process. The spatial boundary for the effect is regional since ongoing procurement opportunities are anticipated throughout the Socio-economic RSA. Procurement opportunities will also extend provincially and nationally, but the ESA is focused on regional effects. The reversibility is considered long-term since the contracting and procurement opportunities will occur throughout Project operations. The magnitude of the effect is considered medium as change in opportunity will be highly detectable in smaller communities, but less so in larger communities with diverse economies and multiple other large capital developments. The probability of the effect and the confidence in the significance evaluation are both high, given Trans Mountain's projected materials and service needs throughout the life of the Project, their procurement experience to-date related to the construction and operation of the existing TMPL right-of-way and facilities, and their Project-specific procurement policies and objectives (Table 7.2.7-3, point 4[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – ongoing procurement and contracting opportunities will be available throughout the Socio-economic RSA.
- Duration: long-term – the goods and services needs of the Project are initiated and peak during construction, but will extend throughout the operations phase.
- Frequency: periodic – the need for extensive procurement will occur consistently during construction but then intermittently but repeatedly during operations due to periodic site-specific maintenance requirements.
- Reversibility: long-term – the residual effect of increased procurement and contracting opportunities peak during construction and will occur throughout Project operations.
- Magnitude: medium – change in opportunity will be detectable in smaller communities, but will be negligible in larger communities.
- Probability: high – based on Project information, interest expressed during stakeholder consultation and Project-specific procurement policies and objectives.
- Confidence: high – based on Project information, interest expressed during stakeholder consultation and Project-specific procurement policies and objectives.

Employment and Economy Indicator - Training and Capacity Development

The following provides the evaluation of significance of potential residual effects on the training and capacity development indicator.

Enhancement of Training Opportunities for Aboriginal Communities

Although a wide range of employment opportunities are anticipated in relation to the Project, particularly during construction, there may be challenges associated with certain Socio-economic RSA residents accessing them. For example, certain Aboriginal communities may face constraints related to seasonal harvesting commitments, levels of education and/or skills, or lack of services that support someone accepting a job away from his/her family and community (*e.g.,* transportation, day care, counselling). Results of socio-economic interviews and engagement with Aboriginal communities have indicated that the Project presents positive opportunities for Aboriginal communities including employment, training and other economic benefits. Equipment and materials could be staged on reserve/community land during construction, Aboriginal people seeking employment and training could be afforded opportunities for training and employment in association with construction of the pipeline and existing Aboriginal

businesses could be contracted to provide services. Trans Mountain is also working with interested Aboriginal communities regarding involvement in emergency preparedness and spill prevention. It was noted during studies conducted with Aboriginal communities for the ESA that Aboriginal-owned businesses (such as restaurants, gas stations, and recreational businesses) could also benefit from increased business during Project construction. As noted during socio-economic interviews, in some instances the Aboriginal workforce has a limited capacity to take skilled jobs and is seeking training opportunities to enhance transferrable skills. This may affect the ability of some to qualify and compete successfully for sub-contracted procurement opportunities. However, Trans Mountain is developing a Training and Employment Program that will support Aboriginal training opportunities related to skills needed for employment and with current high demand from other economic activity in the region, employers and communities may look to enhance the capacity of the Aboriginal workforce to take advantage of opportunities thereby enhancing the availability of local and regional labour.

Women as a demographic group may also face challenges in accessing employment opportunities, particularly with respect to direct construction. Women tend to be underrepresented in the construction industry. As previously mentioned, women account for only 14.2% and 12.1% of those employed in the Alberta and BC construction sector, respectively (Alberta Enterprise and Advanced Education 2013c, Statistics Canada 2012). The CSC reports that despite successful initiatives to increase the numbers of women in the construction industry, the rate of female participation, particularly in the trades and onsite construction management, has not grown significantly over time. Barriers faced by women on an aggregate level that were noted include: lack of information about career choices for young women, inappropriate (or lack of) physical facilities for women on work sites, lack of support or flexibility for women who are caregivers of their children, lack of support for women in labour unions, and on site harassment and lack of recourse (Canadian Construction Council 2010). In response, the Canadian construction industry is taking steps to expand the domestic labour pool by improving access to industry careers by older workers, Aboriginal peoples, immigrants and women (Canadian Construction Council 2010).

To ensure that Socio-economic RSA residents can maximize their opportunities for Project-related employment, the Project will work collaboratively with local educators and training institutions to support training opportunities for Aboriginal residents of the Socio-economic RSA. Training support will focus on local education and promoting pipeline industry workforce readiness for Aboriginal people in occupations that have skills transferrable to other industries. As noted above, Trans Mountain will initiate an Aboriginal Employment and Training Program to support increased access to Aboriginal employment opportunities on the Project. The Project will also work with contractors and labour organizations to encourage Project contractors to provide training and apprenticeship opportunities related to the work they perform, including opportunities for on-the-job training on the Project. This emphasis on training is anticipated to increase the likelihood of employing Aboriginal residents and those currently under-employed or not in the labour force. Trans Mountain will also support existing initiatives aimed at increasing female participation in the construction workforce, driven by government, labour organizations and education institutions. Enhancement measures related to training and capacity development are outlined in the SEMP in Volume 6B.

Overall, it is anticipated that the Project will contribute to enhanced training opportunities particularly for Aboriginal peoples. The impact balance is positive, since increased training has been identified as a key interest and desire of many Aboriginal communities. The spatial boundary for the effect is the Socio-economic RSA, since Project-related training initiatives will focus on the current residents of the Socio-economic RSA, namely the Aboriginal population in communities whose reserves and traditional territories are directly affected by the Project. The reversibility is considered long-term since training opportunities will occur throughout Project operations. The residual effect is considered low in magnitude as while new opportunities will be available they are considered in the normal range of variability at the community or regional level. The probability of the effect is high, given Trans Mountain's stated commitment to support the activities outlined in its training program and that direct discussions with training institutions and communities are underway. It is key to note, however, that uptake on training opportunities may be variable as a result of individual choice (Table 7.2.7-3, point 5[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – Project-related training initiatives will focus on the current residents of the RSA namely the Aboriginal population in communities whose reserves and traditional territories are located near the Project.

- Duration: long-term – Trans Mountain's planned training initiatives will extend beyond construction and into the operations phase of the Project.

- Frequency: occasional – training programs will be initiated at various times and for specific periods during the construction and operations phase of the Project.

- Reversibility: long-term – the new training opportunities will continue into the operations phase.

- Magnitude: low – while new opportunities will be available, they are considered to be in the normal range of variability at the community level.

- Probability: high – Trans Mountain has stated commitment to support training opportunities and direct discussions with training institutions and communities are underway.

- Confidence: high – based on training program information provided by Trans Mountain.

Increased Skills Due to Project-Supported Training for Aboriginal Communities and Project-Related Employment or Contract Experience

A notable number of workers will gain experience during their employment on the Project given the large construction workforce required. Further, assuming the successful implementation Trans Mountain's proposed Aboriginal Employment and Training Program, it is anticipated that members of the Aboriginal labour force in the Socio-economic RSA will increase their skill level in areas that are transferrable to other activities in the regional economy. For example, enhanced skills in environmental monitoring and emergency response, as well as general construction readiness skills, are transferrable over a wide range of future projects and economic activity in the Socio-economic RSA. Also steps taken by Trans Mountain to engage Aboriginal and non-Aboriginal businesses in contracting opportunities will enhance the experience and capacity of those businesses to be successful in future contracting opportunities.

Overall, an increase in skills due to Project-supported training for Aboriginal communities and Project-related employment or contract experience is anticipated. The impact balance is positive since it will contribute to the enhancement of the overall capacity of the regional labour force. The spatial boundary for the effect is the Socio-economic RSA since Project-related training initiatives will focus on the current residents of the Socio-economic RSA, namely the Aboriginal population in communities whose reserves and traditional territories are directly affected by the Project. Business skills and capacity development will extend to the Provincial and National level since Project-related procurement will extend to that spatial boundary, however, the assessment focuses on the regional spatial extent since the direct training efforts of the Project will be focused on members of Aboriginal communities in the Socio-economic RSA. The reversibility is considered permanent since experience and skills, once acquired, cannot be taken away. The effect is considered low in magnitude; increased skills will be detectable for some but given the large percentages of temporary workers anticipated increased skills are anticipate to be low across the Socio-economic RSA. The probability of the effect is high given Trans Mountain's stated commitment to support the activities outlined in its training program and the direct discussions with training institutions are already underway, and also given the strategies to maximize and support Aboriginal procurement/contracting opportunities related to the Project (Table 7.2.7-3, point 5[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – though business opportunities and experience will extend provincially and nationally, Project-related training initiatives will focus on the current residents of the Socio-economic RSA, namely the Aboriginal population in communities whose reserves and traditional territories are located near by the Project.

- Duration: long-term – Trans Mountain's planned training initiatives will extend beyond construction and into the operations phase of the Project and skills gained in the context of the Project will be transferable to future projects and other economic endeavours.

- Frequency: occasional – particular training programs and initiatives, and specific contracts leading to increases in skills and experience, will be initiated at various times and for specific durations during the construction and operations phase of the Project.

- Reversibility: permanent – once acquired, experience and skills cannot be taken away.

- Magnitude: low – increased skills will be detectable for some, but will be within normal range of opportunity variability across the Socio-economic RSA.

- Probability: high – given Trans Mountain's stated commitment to support the activities outlined in its training program and Aboriginal and regional procurement/contracting opportunities related to the Project.

- Confidence: moderate – outcomes will depend heavily on choices of individuals.

Combined Effect on Training and Capacity Development

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects related to training and capacity development evaluated in Section 7.2.7.6 (Table 7.2.7-3, points 5[a] and 5[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the training and capacity development indicator.

The combined effects on training and capacity development considers the training opportunities that will be supported by Trans Mountain, the skill development resulting from training and from the overall regional participation in the Project that will be transferrable to other projects and economic endeavours. The impact balance on the combined effects is positive. The duration of the combined effects is considered long-term since training opportunities will extend into operations and the skills people acquire will become long-term personal assets. While training opportunities will focus on Aboriginal community members, opportunities to participate in Project-related employment will exist for community members across the Socio-economic RSA. The Project has also consulted with educational institutions in an effort to raise awareness of skills required to support the Project. Job and business benefits were identified as a key interest by stakeholders during the consultation process (Table 7.2.7-3, point 5[c]). A summary of the rationale for all of the significance criteria of combined effects on training and capacity development is provided below.

- Spatial Boundary: Socio-economic RSA – training and capacity development opportunities will exist for community members at a regional level.

- Duration: long-term – opportunities will extend into the operations phase.

- Frequency: occasional – opportunities will occur intermittently and sporadically throughout the assessment period.

- Reversibility: long-term to permanent – training opportunities will extend into the operations phase; once acquired, experience and skills cannot be taken away.

- Magnitude: low – increased opportunities and skills will be detectable for some, but will be within normal range of opportunity variability across the Socio-economic RSA.

- Probability: high – given Trans Mountain's stated commitment to support the activities outlined in its training program and Aboriginal and regional procurement/contracting opportunities related to the Project.

- Confidence: moderate – while training opportunities will be provided, outcomes depend heavily on the choices of individuals.

Employment and Economy Indicator - Business and Livelihood Disruption

The following provides the evaluation of significance of potential residual effects on the business and livelihood disruption indicator.

Reduced Business or Commercial Income Due to Disruption of Business

There are several locations where the proposed pipeline corridor crosses areas of known commercial or industrial land use, which were listed previously under Physical Disturbance to Industrial and Commercial Areas during Construction in Section 7.2.4. In these areas and other areas (*e.g.,* golf courses), some business establishments may be physically disturbed. There is also potential that businesses may, despite best construction practices, experience disruptions due to residual sensory disturbance related to noise and dust from construction activities, including construction-related traffic. In places where certain municipal roads are being crossed or used for construction purposes, nearby businesses may experience disrupted access. These factors could result in changes in customer behaviour such that customers choose not to visit, or reduce their visits to these business locations during the construction phase. To the extent such nuisance factors result in reduced customers and business, they could contribute to temporary decline in business income in select locations during specific periods of construction.

This potential residual effect has a negative impact balance because any disruption of business income would be considered a detriment to the economic situation within a construction hub and for the particular business owners. The construction activities that may affect business areas, however, would be isolated to a specified period within the construction window and very specific locations. The reversibility of the residual effect is considered short-term since the potential disruption to businesses or commercial area is limited to the construction phase. The magnitude of the effect is considered medium since it would be detectable beyond a nuisance or inconvenience in that it could have livelihood implications for business owners but would be isolated to specific areas of a community and thus undetectable in many areas. The probability of a notable disruption in business income on a community scale is considered low; right-of-way finalization within the proposed pipeline corridor will seek to reduce proximity to business and commercial locations. Further, compensation will be negotiated in some form for any proven economic loss due to disturbance of property. Urban pipeline construction practices will also reduce nuisance noise and dust to the minimum levels practically achievable. In addition, alternate access routes for local businesses will be sought where practical during short periods of business or commercial property disruption. The confidence in the significance evaluation rating is moderate; while the implementation of standard urban construction mitigation measures to reduce noise, dust, and access disturbance, and the assumption of compensation agreements for direct economic loss due to property disturbance will reduce effects, it is not possible to predict business implications in disturbed areas (Table 7.2.7-3, point 6[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – nuisance dust and noise, and changes in access that could affect customer behaviour could extend beyond the Footprint.

- Duration: short-term – the activities causing noise, dust or changes in business access are confined to the construction phase. Compensation agreements will be established prior to construction to address any direct economic loss due to property disturbance.

- Frequency: isolated – the activities that could cause the disruption to businesses in urban areas (*e.g.,* property/land disturbance, noise, dust, changes in access) are confined to the construction phase and limited to a particular construction window.

- Reversibility: short-term – the potential disruption to businesses income is limited to the construction phase.

- Magnitude: medium – the effect is detectable beyond a nuisance or inconvenience in that it could have livelihood implications for business owners; effects are limited to certain areas of the community.

- Probability: low – given efforts to avoid business/commercial areas during right-of-way finalization, provision of alternate access routes, and agreements with any directly disturbed commercial establishment.

- Confidence: moderate – there are many factors contributing to business disruption and although outcomes are generally understood, they cannot be predicted with confidence.

Reduced Resource-Based Business Income or Livelihoods

As noted in the discussion of HORU effects (Section 7.2.4), there are a range of human land and resource uses that may be affected by the proposed pipeline corridor that have livelihood uses. This is pertinent to areas of agricultural use, forestry use, traditional Aboriginal land used for harvesting activities, trap line areas, guide/outfitting areas and commercial-recreation tenure holders.

To the extent that natural resources used for commercial or livelihood purposes are physically disturbed during the construction period, this may result in a period of reduced income and economic loss for certain individuals. Such businesses and/or livelihood activities could also be further disturbed by construction related noise and dust. For example, dust deposited on certain berry crops may reduce saleability or require crop washing before sale (certain berries can be washed, but other types such as raspberries and strawberries lose quality with exposure to moisture after harvest). Noise and vibration that can affect sensitive livestock such as poultry and dairy. Trappers, guide outfitters, traditional harvesters may have a period of disrupted income as they determine new areas of resource use to avoid Project-related construction activity or sensory disturbance during construction.

In order to address potential effects, upon right-of-way finalization, Trans Mountain will identify and contact all land/property owners, tenure holders and disposition holders directly affected by physically construction activities. This will allow certain resource users (*e.g.*, trappers, guide-outfitters, commercial recreation tenure holders) to identify alternate areas for their activities during specific construction windows that may affect their tenure areas. Trans Mountain will provide compensation, considering various forms, to private land and property owners and trapper according to established industry protocols where losses or damages are proven. Construction practices will also be used keep nuisance noise and dust to the minimum levels practically achievable.

The impact balance of this potential residual effect is negative since loss of resource-based business income would be considered a detriment to the economic situation within a community and for the personal livelihoods of the people or businesses affected. The reversibility is considered short-term to medium-term. Most effects may cease as construction finishes and, therefore, reversibility in most circumstances would be short-term. However, certain agricultural crops may take several years post-construction to be re-established (*e.g.*, blueberry plants can take up to eight years to reach full production) and, therefore, the residual effect may extend into the next 10 years of operations. The magnitude of the effect is considered medium since it would be detectable beyond a nuisance or inconvenience in that it could have implications for business/livelihood practices in certain instances. Compensation agreements will offset verified damages or economic loss, where identified and timely consultation will allow tenure holders to establish alternate plans for their activities. The probability of the residual effect is considered low as mitigation measures are in place (*i.e.*, compensation in some form) to off-set proven economic loss where physical disturbance may occur. The confidence in the significance evaluation rating is high, based on data available about land and resource use in the proposed pipeline corridor, Trans Mountain's commitment to fair and equitable compensation, for proven loss, Trans Mountain's experience in constructing other projects, proposed construction practices to reduce nuisance air and noise, and the professional experience of the assessment team (Table 7.2.7-3, point 6[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – livelihood implications could be the result of the land disturbance in the Footprint or of dust and noise that extends beyond the proposed pipeline corridor into the Socio-economic RSA.

- Duration: short-term – the activities causing the potential business/income disruption (*i.e.,* land or resource disturbance, noise, dust) are confined to the construction phase.

- Frequency: isolated – the activities that could cause the effect are limited to the construction phase. Construction activities that may affect a particular business would be isolated to specified periods of a single construction spread.

- Reversibility: short to medium-term – most effects will cease as construction finishes. However, certain agricultural crops may take several years (but less than 10 years) post-construction to be re-established.

- Magnitude: medium – the effect is detectable beyond a nuisance or inconvenience in that it could have implications for business/livelihood practices; however, compensation agreements will compensate for proven economic loss.

- Probability: low – compensation agreements will offset any proven economic loss for directly affected parties.

- Confidence: high – based on data available about land and resource use in the proposed pipeline corridor, Trans Mountain's commitment to compensation for direct economic loss, Trans Mountain's experience in constructing other projects and the professional experience of the assessment team.

7.2.7.7 Summary

As identified in Table 7.2.7-3, there are no situations for employment and economy indicators that would result in a significant adverse residual socio-economic effect. Consequently, it is concluded that the adverse residual socio-economic effects of Project construction and operation on employment and economy indicators will be not significant. However, significant positive residual socio-economic effects were identified related to provincial and national economic benefits, as well as the increase in municipal taxes and the combined effects on the municipal economies indicator.

7.2.8 Community Health

This subsection describes the potential Project effects on community health. The discussion of community health presents anticipated effects related to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the Westridge Marine Terminal), since the communities and regions in which the Project is located will experience Project-related activities in a combined manner. It is not meaningful from a community perspective to discuss the potential health effects of each Project component on a stand-alone basis.

The Community Health Technical Report of Volume 5D provides information pertaining to existing conditions, as well as issues and concerns identified by stakeholders related to community health.

7.2.8.1 Assessment Indicators and Measurement Endpoints

This assessment categorizes potential community health effects into six distinct areas, or indicators. These are: socio-economic health effects; infectious diseases; environmental health effects; public safety; health care service provision; and Aboriginal health. A description of each of the six community health indicators is provided in Table 7.2.8-1 along with selected key measurement endpoints. The key measurement endpoints represent specific data points that can be tied directly to community health changes but do not represent all relevant information about the indicator; additional, often qualitative, data is necessary to fully understand potential impacts.

These six indicators, in combination with specific assessments described in other technical reports for the Project, fulfill the requirements for health assessment described in the NEB *Filing Manual*.

The selection of these indicators was guided by a number of different sources mentioned below.

a) Guidance documents on categories of health effect commonly associated with development projects and best practices for Health Impact Assessment:

    - Canadian Handbook on Health Impact Assessment (Health Canada 2004);

    - Introduction to Health Impact Assessment (International Finance Corporation 2009);

    - Health Effects Assessment Tool (HEAT): an Innovative Guide for HIA in Resource Development Projects (Barron *et al*. 2010);

    - Managing the public health impacts of natural resource extraction activities: A framework for national and local health authorities (Pfeiffer *et al*. 2010);

- A Guide to Health Impact Assessments in the oil and gas industry (International Petroleum Industry Environmental Conservation Association and International Association of Oil and Gas Producers 2005a);
- Good Practice Guidance on Health Impact Assessment (International Council on Mining and Metals 2010); and
- Technical Guidance for Health Impact Assessment (HIA) in Alaska (State of Alaska HIA Program 2011).

b) A review of concerns raised in a recent large pipeline application in Alberta and BC.

c) A review of issues raised by the public during public information sessions, open houses and workshops about the ESA.

d) Discussions with key informed sources from the health sector, as described in Section 3.0.

TABLE 7.2.8-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR COMMUNITY HEALTH

Community Health Indicators	Measurement Endpoints	Rationale for Indicator Selection
Socio-economic health effects	• Mental well-being • Alcohol and drug misuse • Demand on and capacity of mental health and addictions services	Socio-economic health effects arise from the combination of demographic changes (induced by temporary or permanent workforces), changes in employment/income patterns, and resultant changes to culture, tradition and social cohesion. The relevance of socio-economic health effects in the context of the Project has been reinforced by Medical Officers of Health in both Alberta and BC. Alcohol and drug misuse and stress/anxiety are two of the most common health outcomes associated with socio-economic changes in a development context, and are well substantiated in the research literature. An increase in sexually transmitted infections (STI), also frequently a result of the same instigating factors, is examined as part of the infectious diseases indicator.
Infectious diseases	• Sexually transmitted infection rates • Infectious respiratory disease rates • Gastrointestinal infection rates	An increase in STIs is a common result of an influx of young mobile male workers with high amounts of disposable income. Crowded living or working conditions are associated with the potential for increased person-to-person transmission of respiratory and gastrointestinal (GI) illnesses.
Environmental health effects	• Stress and anxiety related to the perception of contamination	The three primary categories of environmental health effects: effects of exposure to chemical substances, noise and odours, are examined in the HHRA (Volume 5D), Air Quality and Greenhouse Gas Technical Report (Volume 5C) and Terrestrial Noise and Vibration Technical Report (Volume 5C). The potential for contaminant, noise and odour effects, both under normal construction/operations conditions and in the context of spills, have been raised repeatedly by health officials, local residents and other stakeholders. The perception of contamination has been shown to cause effects that include stress and anxiety. The perception of contamination is considered as a measurement endpoint under community health since it is not addressed elsewhere in this application.
Public safety	• Traffic-related injury and mortality	Traffic pattern changes associated with development activities have the potential to affect the risk of traffic-related injury or mortality. The potential effects of Project-related truck traffic has been raised as a concern by residents and municipal officials in several communities along the proposed pipeline corridor.

TABLE 7.2.8-1 Cont'd

Community Health Indicators	Measurement Endpoints	Rationale for Indicator Selection
Health care service provision	• Demand on and capacity of hospitals and health care facilities • Demand on and capacity of emergency medical response	The Project has the potential to affect health care service provision if there is an increase in the population that needs to be served, either as part of the Project workforce or via migration related to indirect or induced employment opportunities. Health care service provision may also be affected by a change in the types of services that are in high demand; mental health and addictions services and environmental health protection are two areas that are commonly drawn on during booms. Health outcomes may also be affected by the capacity and readiness of emergency health response providers to respond to public safety emergencies including traffic incidents and workplace accidents/malfunctions.
Aboriginal health	• Diet and nutritional outcomes	During consultation, numerous regulatory authorities and Aboriginal communities have brought forward concerns about the potential effects of the Project on Aboriginal communities. Development projects have the potential to change several aspects of Aboriginal culture and way of life. These changes are primarily examined in Section 7.2.3 Social and Cultural Well-being and Section 7.2.4 HORU. The Community Health Technical Report of Volume 5D examines effects on diet and nutrition that could result from Project-related changes in subsistence food access, availability or avoidance.

7.2.8.2 Spatial Boundaries

The spatial boundaries used in the effects assessment for community health considered is the Socio-economic RSA as described under Section 7.2.3.2 Social and Cultural Well-being. It is appropriate for the community health effects assessment to use the Socio-economic RSA since many of the factors influencing community health stem from changes in social, cultural and economic environments. It should be noted that no Footprint or LSA is being considered for community health.

Due to the large scale of the Project and the fact that it passes through distinct and different geographical and administrative regions, six study regions have been defined for the Socio-economic RSA. These regions are shown in Table 7.2.8-2. The table also shows how the regions line up with provincial Health Zones (in Alberta) and Health Service Delivery Areas (HSDAs) (in BC). This is relevant because the Health Zones and HSDAs are used to organize health care services and are the geographic units at which data are collated and reported. A further description of the study area boundaries for community health, including maps, can be found in the Community Health Technical Report of Volume 5D.

TABLE 7.2.8-2

BOUNDARIES OF THE SOCIO-ECONOMIC REGIONAL STUDY AREA REGIONS

Socio-economic RSA	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/ Thompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Description of area	Strathcona County to the western boundary of Parkland County	Eastern boundary of Yellowhead County to eastern boundary of Jasper National Park	Eastern and western boundaries of Jasper National Park	Western boundary of Jasper National Park (Alberta/BC) border to approximately half way between Merritt and Hope (the border of the TNRD and the FVRD)	Half way between Merritt and Hope to the western boundary of the FVRD)	Boundaries of Metro Vancouver or the Greater Vancouver Regional District

TABLE 7.2.8-2 Cont'd

Socio-economic RSA	Edmonton Region	Rural Alberta Region	Jasper National Park Region	Fraser-Fort George/ Thompson-Nicola Region	Fraser Valley Region	Metro Vancouver Region
Analogous health zone (Alberta) or health service delivery area (BC)	Edmonton Health Zone	North Health Zone	North Health Zone	Northern Interior HSDA Thompson Cariboo Shuswap HSDA	Fraser East HSDA	Fraser South HSDA Fraser North HSDA Richmond HSDA Vancouver HSDA

7.2.8.3 Community Health Context

Large development projects such as this Project have well-characterized effects on biophysical, social and economic environments. They may also exert an influence on health in nearby communities. Many, although not all, of these health effects are secondary to direct changes caused by a project (*e.g.*, changes in air quality, in wildlife availability or in the demographic makeup of communities). However, the health changes themselves are often a lens through which stakeholders and Aboriginal communities view the benefits or costs of a project. As such, appropriately framing project impacts from a community health perspective is important to enable all stakeholders and Aboriginal communities to fully understand the effects of the Project.

Project-related construction and operations activities have the potential to directly and indirectly affect community health through a number of different mechanisms. The specific components of this Project that have been identified as having the potential to directly interact with community health include:

- construction activities;
- transportation policies and practices;
- intentional and unintentional chemical releases;
- labour, hiring and contracting policies and practices;
- worker housing strategies;
- emergency medical response policies and practices; and
- Aboriginal community, regulatory authorities, landowners, other stakeholders and resident/public communication strategies.

In addition, community health may indirectly interact with Project attributes through changes to social, economic or biophysical attributes that are described in other discipline-specific technical reports (Volumes 5C and 5D). The technical reports that describe changes relevant to community health outcomes are the:

- Air Quality and Greenhouse Gas Technical Report;
- Groundwater Technical Report;
- Vegetation Technical Report;
- Wildlife Technical Report;
- Terrestrial Noise and Vibration Technical Report;
- Screening Level Human Health Risk Assessment of Pipeline and Facilities (HHRA); and
- Socio-Economic Technical Report.

It is important to note that most health outcomes are multi-factorial; that is, they are influenced by a wide variety of causes, and change in health outcomes can rarely be confidently ascribed to a single factor. As such, a future change in health outcomes from current conditions cannot likely be easily connected to Project activities or to any other single source. However, this difficulty in measuring change does not mean that the Project will not have an influence on health outcomes; rather, it implies that the focus of a community health assessment in a development context should not be on predicting a quantitative change from current conditions but rather on correctly identifying the pathways of influence and appropriate mitigation and enhancement strategies that align with predicted effects.

While many studies conducted on community health effects have focused on large- and medium-scale resource development projects, it should be noted that there is generally a lack of information available on pipeline construction projects similar to TMEP. Findings and conclusions from these resource development studies may or may not be correlated to a pipeline construction activity given possible differences in geography, timing, workforce size and approach to using construction spreads (e.g., using a combination of camps, local accommodations, and local housing), which may be more similar to highway construction or construction of other linear facilities. Based on the professional judgment of the community health assessment team, it is likely there would be some incremental increases experienced on a number of the community health indicators, due in large part to the use of mobile construction workforces. However, it should be recognized that the Project will be constructed along and within a corridor that currently experiences the movement of large populations both through tourism (*e.g.,* Jasper, Kamloops) and large population centres (*e.g.,* Edmonton and the Lower Mainland).

The TMX Anchor Loop Project was constructed in 2007 and 2008 in Jasper National Park and Mount Robson Provincial Park, a World Heritage Site. In the months leading up to construction, Trans Mountain had planned to construct a work camp outside of the Municipality of Jasper in response to concerns related to pressures on local businesses, resources, and health care facilities. The Mayor and council of Jasper called a meeting prior to the commencement of construction to reverse this plan and communicated the municipality's preference for Trans Mountain to use local facilities to house workers for the project. A combination of housing, hotels and campgrounds were occupied while still meeting the demands of a tourism industry that hosts close to one million park users per year. Following construction of the pipeline project, the businesses in the communities of Hinton, Jasper and Valemount, BC benefited from an injection of millions of dollars into the economy. Housing rent showed signs of an increase during the construction period that did not fully return to pre-construction levels. During the 5 year post-construction environmental monitoring program of the TMX Anchor Loop Project, there were no substantive findings from key informants communicated to Trans Mountain that would suggest there were increases in many of the community health indicators discussed herein. There were construction-related safety incidents that would have required resources from Parks Canada and the municipalities of Jasper and Valemount during this period; but overall, there was not a reported increase in demand or taxing of services and health care providers in these jurisdictions.

7.2.8.4 Potential Effects and Mitigation Measures

Identified Potential Effects

Potential effects associated with the construction and operations of the Project on community health indicators are listed in Table 7.2.8-3. These interactions were identified based on the results of the literature review, desktop analysis, consultation with regulatory authorities, municipal stakeholders, Aboriginal communities and the professional experience of the assessment team.

A summary of mitigation measures is provided in Table 7.2.8-3. These recommendations are intended to eliminate, reduce or minimize potential adverse effects on community health and to maximize health co-benefits where possible. The mitigation measures were developed in accordance with public health principles of harm avoidance: that emphasis should be placed on preventing or avoiding harm, rather than managing its consequences (Public Health Leadership Society 2002).

Mitigation measures have been developed based on input from a number of sources including industry best practice publications, government and other agency reports, suggestions made by key informed sources and a review of community health recommendations in other environmental impact assessments.

As presented in Table 7.2.8-3, the mitigation measures each fall under the heading of one of the six specific community health indicators; however, many of the measures will be relevant for mitigating multiple effects.

TABLE 7.2.8-3

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON COMMUNITY HEALTH

Potential Effect	Socio-economic Region/Facility	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
1. Community Health Indicator – Socio-economic Health Effects				
1.1 Mental well-being	All	RSA	• Establish a process by which community members can raise complaints or concerns related to Project activities or workers. Ensure this process includes protocols for timely follow-up by Trans Mountain and/or its contractors and transparent issue resolution, and communicate this process to communities [Section 8.4.11].	• Effects on mental well-being.
1.2 Alcohol and drug misuse	All	RSA	• Adhere to a policy of no tolerance of use or being under the influence of illicit drugs or alcohol during work hours [Section 8.4.11].	• Effects on alcohol and drug misuse.
1.3 Demand on and capacity of mental health and addictions services	All	RSA	• Provide recreational amenities in camps (*e.g.*, leisure/fitness areas) [Section 8.4.4].	• Increased demand on mental health and addictions services.
2. Community Health Indicator – Infectious Diseases				
2.1 Increase in rate of STIs	All	RSA	• Develop a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions [Section 8.4.11].	• Increase in number of STIs. • Increased demand on hospitals and health care facilities (refer to potential effect 5.1 of this table).
2.2 Transmission of infectious respiratory or GI disease	All	RSA	• Place hand-washing stations in communal areas of work camps, including cafeterias, washrooms and recreation areas [Section 8.4.5]. • Make hand sanitizer dispensers available in common areas, including any eating areas, where hand-washing stations are not feasible [Section 8.4.5]. • Ensure adequate strategies are put in place for cleaning up and/or disinfecting areas of potential human contamination at work sites. Where legislation and standards exist for other areas, such as food handling, these must be followed [Section 8.4.5]. • Prohibit workers from coming to or remaining in camp or at worksites while they show symptoms of highly contagious diseases [Section 8.4.5]. • Arrange for private transportation of workers exhibiting symptoms of highly contagious disease [Section 8.4.5]. • Report outbreaks of notifiable infectious disease in camps to local health authorities [Section 8.4.5]. • Ensure construction camps meet all provincial health and safety requirements [Section 8.4.4].	• Increase in number of respiratory or GI illnesses. • Increased demand on hospitals and health care facilities (refer to potential effect 5.1 of this table).
3. Community Health Indicator – Environmental Health Effects				
3.1 Stress and anxiety related to perceived contamination	All	RSA	• Employ all measures in the EPPs related to management of noise, air emissions, dust, odours, lighting, and litter/waste [Section 8.4.7]. • Continue communication and engagement with Aboriginal communities and various stakeholders as the Project progresses [Section 8.4.11].	• Increase in stress and anxiety related to perceived contamination. • Increased demand on mental health and addictions services (refer to potential effect 1.3 of this table).

TABLE 7.2.8-3 Cont'd

Potential Effect	Socio-economic Region/Facility	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
4. Community Health Indicator – Public Safety				
4.1 Traffic-related injury and mortality	All	RSA	• Develop estimates of Project-related traffic volumes associated with all Project components, related to both the movement of workers and the movement of equipment and materials [Section 8.4.3]. • Continue to consult with the BC Ministry of Transportation, the Alberta Ministry of Transportation and relevant municipalities regarding traffic volumes anticipated and traffic management protocols [Section 8.4.3]. • Develop a Traffic and Access Control Management Plan [Section 8.4.3]. • Develop Traffic Control Plans for site-specific sections of roads affected by the Project, and obtain approval for them from applicable provincial and municipal regulatory authorities as required [Section 8.4.3]. • Develop a communication plan for activities that impact normal traffic flow, such as road closures, detours [Section 8.4.3]. • Where possible, provide daily shuttle bus service from designated staging areas to work sites in order to reduce the volume of construction traffic on the road [Section 8.4.3]. • Actively encourage carpooling for times when shuttles/buses is not practical or available [Section 8.4.3]. • Follow acceptable heavy truck routes and approved access routes [Section 8.4.3]. • Communicate with local police and emergency services personnel to keep these organizations informed of traffic schedules and enlist their services as needed [Section 8.4.3]. • Develop mandatory minimum driving standards for contractors that include but are not limited to: submission of driver's abstract for any person driving a Project vehicle; the use of seat belts; the prohibition of drug and alcohol use while operating motor vehicles; no cell phone use; and driving to road conditions at all times while not exceeding posted speed limits. Driving standards will apply equally to Project employees and to contractors [Section 8.4.3]. • Develop and implement a driver safety awareness program as part of employee orientation [Section 8.4.3]. • Monitor all travel-related incidents involving Trans Mountain personnel or contractors; review this information regularly and take action to respond to incidents and to reduce risk [Section 8.4.3]. • Follow up all complaints raised by local organizations or residents related to driving behaviour or safety, and work with local organizations to address these concerns where practical [Section 8.4.3].	• Increase in traffic-related injury and mortality. • Increased demand on hospitals and health care facilities (refer to potential effect 5.1 of this table). • Increased demand on emergency medical response (refer to potential effect 5.2 of this table).

TABLE 7.2.8-3 Cont'd

Potential Effect	Socio-economic Region/Facility	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
5. Community Health Indicator – Health Care Service Provision				
5.1 Demand on and capacity of hospitals and health care facilities	All	RSA	• Ensure construction camps meet all provincial health and safety requirements [Section 8.4.4]. • Provide access to health services at all construction camps [Section 8.4.4]. • Ensure camp residents have access to information about worker assistance and social services support systems [Section 8.4.4]. • Communicate with local health authorities, emergency medical service authorities, social service authorities on the timing of the Project, duration of stay in the local community, expected number of people coming into the area and onsite health care plans [Section 8.4.9]. • Supply medical personnel and equipment to work sites, including camps, meeting applicable occupational health and safety legislation, as a minimum, including the use of Emergency Medical personnel, Emergency Transport Vehicles, and First Aid rooms [Section 8.4.8].	• Increased demand on hospitals and health care facilities.
5.2 Demand on and capacity of emergency medical response	All	RSA	• Provide appropriate levels of security at camps and worksites. This will minimize the potential for external events to impact Project personnel, at the same time reducing diversion of emergency services from regional residents [Section 8.4.8]. • Establish a point of contact in each camp for the local police, fire and ambulance detachments to contact in the event of incidents, investigations [Section 8.4.4]. • Contact appropriate regulatory authorities (*e.g.,* Alberta Environment and Sustainable Resource Development, BC Ministry of Forests, Lands and Natural Resource Operations, Alberta Tourism, Parks, and Recreation, BC Parks, Parks Canada) and municipal tourism offices prior to construction activities and provide maps and schedules of the proposed construction activities [Section 8.4.6]. • Establish contracts for the use of air evacuation in the event of serious injury in more remote locations [Section 8.4.8]. • Ensure fire protection and fire response is available, meeting applicable legislation [Section 8.4.8]. • Provide chemical information in the form of Material Safety Data sheets in the event of an exposure [Section 8.4.8]. • Prepare a Project ERP that covers the Project construction phase [Section 8.4.8]. • Develop site-specific ERPs [Section 8.4.8]. • Consult with emergency response agencies and municipal emergency planners regarding ERPs, as required, to ensure understanding of potential Project-related service needs [Section 8.4.8]. • Provide key Project contact numbers, pipeline route maps, the construction schedule and emergency response program information to local and regional police services, fire departments and medical/health services [Section 8.4.8].	• Increased demand on emergency medical response.
6. Community Health Indicator – Aboriginal Health				
6.1 Effects on diet and nutritional outcomes	All	RSA	• Coordinate pipeline construction activity to ensure access to traditional subsistence hunting and fishing areas [Section 8.4.6].	• Effects on diet and nutritional outcomes.

Notes: 1 RSA = Socio-economic RSA.

2 Detailed mitigation measures are outlined in the SEMP (Volume 6B).

7.2.8.5 Potential Residual Effects

While the proposed mitigation measures are intended to avoid or reduce potential adverse health consequences, in many cases it is not possible to state with certainty the extent to which adverse effects will be avoided. The anticipated potential residual effects on community health indicators associated with the construction and operations of the Project (Table 7.2.8-3) are:

- effects on mental well-being;
- effects on alcohol and drug misuse;
- increased demand on mental health and addictions services;
- increase in number of STIs;
- increase in number of respiratory or GI illnesses;
- increase in stress and anxiety related to perceived contamination;
- increase in traffic-related injury and mortality;
- increased demand on hospitals and health care facilities;
- increased demand on emergency medical response;
- effects on diet and nutritional outcomes; and
- effects on mental well-being in Aboriginal communities.

7.2.8.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method that is based on available research literature is considered to be the most appropriate method. Consequently, a qualitative assessment of community health was determined to be the most appropriate.

Table 7.2.8-4 provides a summary of the significance evaluation of the potential residual effects of the construction and operations of the Project on community health indicators. The rationale used to evaluate the significance of each of the residual effects is provided below.

TABLE 7.2.8-4

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT CONSTRUCTION AND OPERATIONS ON COMMUNITY HEALTH

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Community Health Indicator – Socio-economic Health Effects									
1(a) Effects on mental well-being.	Negative to positive	RSA	Short to long-term	Isolated	Short to long-term	Negligible to low	High	Moderate	Not significant
1(b) Effects on alcohol and drug misuse.	Negative to neutral	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	High	Not significant
1(c) Increased demand on mental health and addictions services.	Negative to neutral	RSA	Short-term	Isolated	Short-term	Negligible to medium	Low to high	Moderate	Not significant

TABLE 7.2.8-4 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1(d) Combined effect on socio-economic health indicator (1[a] to 1[c]).	Negative to positive	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	Moderate	Not significant
2. Community Health Indicator – Infectious Disease									
2(a) Increase in number of STIs.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	High	Not significant
2(b) Increase in number of respiratory or GI illnesses.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	Low	Moderate	Not significant
3. Community Health Indicator – Environmental Health Effects									
3(a) Increase in stress and anxiety related to perceived contamination.	Negative	RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
4. Community Health Indicator – Public Safety									
4(a) Increase in traffic-related injury and mortality.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	Low	High	Not significant
5. Community Health Indicator - Health Care Service Provision									
5(a) Increased demand on hospitals and health care facilities.	Negative	RSA	Short-term	Isolated	Short term	Negligible to medium	High	High	Not significant
5(b) Increased demand on emergency medical response.	Negative	RSA	Short-term	Isolated	Short term	Negligible to medium	High	High	Not significant
5(c) Combined effect on health care service provision indicator (5[a] and 5[b]).	Negative	RSA	Short-term	Isolated	Short term	Negligible to medium	High	High	Not significant
6. Community Health Indicator – Aboriginal Health									
6(a) Effects on diet and nutritional outcomes.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to low	Low	Moderate	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Community Health Indicator - Socio-economic Health Effects

The potential social and economic changes brought about by development projects influence a number of health effects that manifest at an individual and community level. In some instances, these health outcomes include both beneficial and adverse effects on overall health, mental well-being, and the incremental use of specific health services including emergency departments and mental health and addictions services.

These disparate outcomes are linked by common pathways: socio-economic health effects arise from a combination of demographic changes, changes in employment/income patterns (Orenstein *et al.* 2013), and resultant changes to culture, tradition and social cohesion (Barron *et al*. 2010, Pfeiffer *et al*. 2010).

This subsection describes several community health outcomes that are related to or that may stem from these social and economic changes. In particular, this subsection discusses potential residual effects of the Project on:

- mental well-being;
- alcohol and drug misuse; and
- mental health and addictions services.

These three areas comprise the measurement outcomes relevant for socio-economic health effects.

Other measurement outcomes related to socio-economic changes in the Socio-economic RSA are discussed elsewhere in this subsection:

- STI are discussed under the indicator Infectious Diseases; and
- emergency department and other health service provision is discussed under the indicator Health Care Service Provision.

Finally, the Community Health Technical Report of Volume 5D discusses the potential effect of the Project on several other issues that have been brought up as concerns by regulatory authorities and other stakeholders:

- the influence of unaffordable housing on health; and
- health equity.

Effects on Mental Well-Being

Large-scale development projects have been documented as having both beneficial and adverse effects on the mental well-being of community members.

Potential beneficial effects are primarily linked to provision of income. Increased income and employment opportunities have the potential to improve mental well-being through reducing stress, anxiety or depression, especially among those who were previously underemployed or at low income. Mental well-being can also be supported by programs or services in the community that may be enabled or made viable through Project-related revenue or donation.

Certain development activities have also been linked to a decrease in mental well-being among some segments of the population, particularly during economic “boom” periods. This issue has not been specifically raised in relation to pipeline construction activities but has been associated with other development projects elsewhere in BC, where stress, along with associated sleep deprivation and reduced quality of life were among the most commonly cited concerns about development (Fraser Basin Council 2012).

For mobile workers, effects may occur among those who are missing social supports such as family supports, social networks or community connections due to isolated living and working environments are more susceptible to mental wellness problems (Parkins and Angell 2011). Among community members, effects can occur due to changes in the social environment and social support networks associated with changes in the make-up of the community (Orenstein *et al*. 2013), and any decreases in social and community services for existing community members related to services being spread over a larger population base.

In summary, development projects have the potential to have both beneficial and adverse effects on mental well-being and the magnitude and extent of the effects would be correlated with the size of the project. In terms of positive benefits, income and employment, either direct or as an indirect or induced effect of the Project, can alleviate stress among local community members by supporting financial freedom and stability. In terms of adverse effects, sudden increases in community wealth and spending in a development context have been tied to increases in maladaptive behaviours such as alcohol and substance misuse, and these outcomes are often tied to depression, feelings of isolation and alienation from the community or family. The impact balance of this effect is considered neutral since both adverse and beneficial effects can be expected for different subsets of individuals.

Negative effects would extend throughout the Socio-economic RSA but would primarily manifest in those communities that act as construction hubs for construction workers or in those communities where the level of stress about the Project is high. Negative effects would have short-term reversibility as effects are anticipated to be limited to the construction phase. The magnitude of this residual effect is characterised as low since the size of the Project is relatively small compared to other development activities that have stimulated this effect as documented in published literature. The probability of occurrence is high and

level of confidence is moderate since these effects have been noted in other development projects inside and outside the Socio-economic RSA, but the effects have most often been noted for contexts where larger numbers of workers are brought into any one area, and generally for a longer duration.

Positive effects would also extend throughout the Socio-economic RSA and would be limited to areas where individuals secure employment with or as a result of the Project, and/or are provided with job training or mentoring. Positive effects on mental well-being are associated with the operations phase, and, consequently, are considered to be of long-term duration. Positive effects are considered to have long-term reversibility since they may be experienced for the duration of the operations phase but may be reversed if income or employment disappears. The magnitude of residual effect is considered to be negligible since there would be fewer new permanent full-time jobs associated the operations phase. The probability of occurrence is high and level of confidence is moderate since these effects have been noted in other development projects outside the Socio-economic RSA (Table 7.2.8-4, point 1[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effect could occur anywhere within the Socio-economic RSA, although effects would be felt most strongly in communities where Project employment occurs.

- Duration: short to long-term – the event causing adverse effects on mental well-being is likely to be restricted to the construction phase when a mobile work-force would be used (short-term); the event causing positive effects on mental well-being is related to training and employment (long-term).

- Frequency: isolated – the event causing adverse effects on mental well-being is limited to the construction phase while the event causing positive effects on mental well-being is limited to the operations phase.

- Reversibility: short to long-term – negative effects are likely limited to the construction phase and positive effects for the duration of the operations phase.

- Magnitude: negligible to low – positive effects from long-term local employment are negligible due to the small size of the operations workforce; negative effects associated with construction are low since the size of the Project workforce in any one location is relatively small and in the area for a relatively short period.

- Probability: high – the effect has been observed with development projects in BC, Alberta, elsewhere in Canada and internationally.

- Confidence: moderate – research evidence supports the association between development projects and mental well-being outcomes, but studies have generally focused on effects associated with a larger workforce.

Effects on Alcohol and Drug Misuse

A socially-related health impact of concern is a potential increase in the consumption of alcohol, illegal drugs and misused prescription drugs, and violence, crime, injury, chronic disease, and poor mental health outcomes that are associated with alcohol and substance misuse. These effects have been well documented in conjunction with development activities, especially in small communities, although many of the observations come from contexts where the work crews were larger than those anticipated for the Project, and where economic “boom” condition prevailed (International Petroleum Industry Environmental Conservation Association and International Association of Oil and Gas Producers 2010, Jacquet 2009, New Brunswick Department of Health 2012). They have also been seen during previous development periods in both Alberta and BC (Gosselin *et al.* 2010, Medd 2007, Ruddell 2011). These effects have manifested among both the mobile worker population and local community members.

While research evidence has established solid links between rapid development, an influx of mobile worker populations and increases in alcohol/drug misuse, there is little information that helps to model or quantify the size of the potential effect. However, the factors that contribute to the problem have been identified. These factors include: a temporary influx of. mobile project workers who have few community ties and few recreational opportunities; increased disposable income in the community; changing family

roles; and increased stress among local residents (Mucha 1978, Welch pers. comm.). The extent to which alcohol and drug misuse becomes a community problem is modified by previous experience of the community with booms, busts and mobile workforce populations; and also by the relative scale of the project, the mobile workforce and the sudden increase in income to the size of the local population (*i.e.,* in larger and more economically diversified communities, the effect is not as great).

Current levels of alcohol and drug misuse in the Socio-economic RSA are reported on in Section 5.8. The data indicates that drug and alcohol misuse are currently higher than average in both the Town of Edson and the Town of Hinton in Alberta, and also for the Northern Interior, Thompson Cariboo Shuswap and Vancouver HSDAs for BC.

The issue of alcohol and drug misuse has been discussed in key informant interviews and has also been raised by the public and stakeholders during open houses and other activities. There have been mixed reports on whether different communities anticipate problems in conjunction with the Project, based on past problems in each location.

In terms of whether alcohol and drug misuse is seen among workers, contributing factors may include:

- income and availability to purchase drugs and alcohol;
- a “work hard, play hard” work culture;
- feelings of isolation and loneliness; and
- limited social support and infrastructure.

Therefore, factors that could contribute to reducing drug and alcohol misuse amongst workers may include:

- having the ability to maintain connections with friends and family while on-rotation;
- having available other healthier modes of “unwinding” at the end of a work day;
- efforts to reduce alcohol and drug misuse through a Code of Conduct and Community Awareness orientation to all workers; and
- a zero-tolerance alcohol and drug policy included in the Project Safety Management Plan.

The extent to which alcohol and drug misuse occurs among the Project workforce can be, at least in part, modified by Trans Mountain. Specific recommendations to minimize adverse effects are included in the SEMP, including: a zero-tolerance alcohol and drug policy; and developing and enforcing a Code of Conduct for employees and contractors that provides guidance and policies on appropriate and inappropriate worker behaviour and community interactions.

In summary, the impact balance of this effect is characterized as negative to neutral. There is a well-documented observation that alcohol and drug misuse tend to increase during times when mobile workforces are in a community because of an influx of young, male mobile workers and an increase in disposable income among both workers and some local residents. With respect to the Project, workers will only be housed in communities for relatively short periods of time (months rather than years) and this will limit the duration of any potential effect. Improvements in economic circumstances that improve mental well-being could result in improved outcomes among some residents. The effects would extend throughout the Socio-economic RSA but would primarily manifest in those communities that act as construction hubs, and in particular those communities that have relatively small resident populations in relation to the size of the temporary Project workforce, including Valemount, Blue River, Vavenby, Clearwater, and Kamloops (only during the peak construction period). The duration is characterized as short-term and the frequency as isolated since the event causing the effect is linked to the construction phase, when the Project workforce will employ a substantial workforce of temporary and transient workers, although effects of an increase in alcohol and drug misuse may persist for individuals over a longer time period. An increase in alcohol and drug misuse is highly unlikely for the operations phase,

since the operations phase will rely primarily on a small number of workers drawn from the local population. The reversibility is similarly characterized as short-term, since any effect would mainly be observed during the construction phase. The magnitude of effect differs depending on the relative size of the community to the worker population and is estimated to range between negligible and medium. The probability is rated as high; this effect has been observed in conjunction with development projects both in BC and in Alberta as well as in other areas of Canada and internationally; however, the numbers of Project workers are relatively small compared to the numbers of workers with which this effect is observed in the literature. Research literature supports this relationship and stakeholders in open house meetings and key informant interviews have expressed concern about these effects based on past experience; therefore, the level of confidence in this evaluation is high (Table 7.2.8-4, point 1[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effect could occur anywhere within the Socio-economic RSA but would be limited primarily to communities that act as construction hubs and that have relatively small resident populations in relation to the size of the temporary Project workforce.

- Duration: short-term – the Project will draw on temporary and transient workers during the construction phase but will have fewer workers and a more stable workforce drawn from the local population during the operations phase.

- Frequency: isolated – the event causing the effect is the presence of the temporary workforce which, as described above, is limited to the construction phase.

- Reversibility: short-term – the effects on alcohol and drug use would be experienced primarily near the time period in which the workers were present in the construction hubs, and possibly extending for a short period beyond their presence.

- Magnitude: negligible to medium – the relative size of the community to worker population would determine the magnitude of effect observed in the community.

- Probability: high – the effect has been observed with development projects in BC, Alberta, elsewhere in Canada and internationally.

- Confidence: high – there is a good understanding of this relationship with supporting literature as well as from stakeholders in the Project area.

Increase in Demand on Mental Health and Addictions Services

Mental health and addictions services are run by the health authorities in both Alberta and BC. These authorities provide educational resources, prevention programs, early detection initiatives, needs assessment, referral services and treatment options to individuals dealing with mental health or addictions problems and to their families, friends and other affected individuals. Although uncertain at this time, the demand for mental health and addictions services, and the capacity of the health authorities to meet this demand, may be affected with the increase in workers.

Interviews indicated that an increase in the demand on mental health and addiction services can potentially be expected in conjunction with the Project, and in particular during the construction phase when large numbers of Project workers will be in the area, and local employment from the Project will be high relative to the operations phase. Although the effects on mental health and addictions services may be most readily observable in the smaller construction hubs where the Project workforce is large compared to the local population, key informant interviews indicated that an increase in demand will also strain the services of larger metropolitan areas, including Metro Vancouver (Welch pers. comm.). Not only is the Metro Vancouver addictions and mental health services working over capacity currently, but they are not reimbursed or funded for treating patients who do not have BC health insurance (although they will still offer treatment). Interviews also indicated that mental health and addictions services may be affected by employee drug testing.

In many towns along the proposed pipeline corridor, health services are limited and staff recruitment and retention is challenging. These services, including mental health and addictions services, are often not

able to expand in response to increase demand. Key informants provided a number of suggestions for how Trans Mountain could support both good mental well-being and support mental health and addictions services. Key supports include:

- providing workers with time off during business hours to use mental health and addictions services;
- if worker drug testing is required, using an Employee and Family Assistance Program or hire a practitioner on contract rather than local health services; and
- working proactively with mental health and addictions services to set up opportunities to support Project management and staff.

In summary, as described above, there is the potential for the Project to result in negative or adverse mental well-being and alcohol and drug misuse outcomes among some residents of the Socio-economic RSA and among some Project workers. Any impairment of mental well-being in the community and/or increase in alcohol or drug misuse would result in an additional demand for the mental well-being and addictions services provided by the provincial health authorities. The impact balance of this effect could be characterized as primarily negative since increased demand on mental health and addictions services would place a strain on capacity and may limit access for those people who currently use services. However, any improvements in mental well-being spurred by Project-related employment could partially offset this demand. The mitigation measures listed in the SEMP will help to further minimize any potential adverse effects.

Effects would extend throughout the Socio-economic RSA but would primarily manifest in communities that act as construction hubs, in communities that have limited mental health and addictions services, or in communities where the level of stress about the Project is high. The increased demand on mental health and addictions services is associated with the construction phase of the Project and, therefore, is considered to be of short-term duration and isolated frequency. An increase in demand on mental health and addictions services is much less likely for the operations phase, which will require much fewer workers and will likely result in positive mental well-being outcomes for those employees. The reversibility is similarly characterized as short-term, since any effect would mainly be observed during the construction phase, and possibly shortly afterwards as new cases continue to present for diagnosis and treatment. The magnitude of the effect varies depending on the size of the community in which it occurs. In a very large community such as Edmonton or the Greater Vancouver area, the residual effect is unlikely to be detectably different from existing conditions. In smaller communities such as Edson, Hinton and Clearwater, the magnitude of effect may be detectable and may strain the capacity and resources of mental well-being and addictions services. The probability is rated as low to high and varies by community. The level of confidence in this evaluation is moderate since there is a good understanding of the cause-effect relationship using data from outside the Socio-economic RSA (Table 7.2.8-4, point 1[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – effects are expected in the Socio-economic RSA but would primarily manifest in communities that act as construction hubs, in communities that have limited mental health and addictions services, or in communities where the level of stress about the Project is high.
- Duration: short-term – the event causing the increase in demand on mental health and addiction services is restricted to the construction phase.
- Frequency: isolated – the event causing the the increase in demand on mental health and addiction services is confined to the construction phase.
- Reversibility: short-term – the residual effect would mainly be observed during the construction phase, and possibly shortly afterwards as new cases continue to present for diagnosis and treatment.
- Magnitude: negligible to medium – varies depending on the size of the community in which it occurs and the capacity of mental well-being and addictions services.

- Probability: low to high – the probability varies by community and is lowest in large urban centres and highest in smaller communities that will experience a high ratio of workers compared with population size.

- Confidence: moderate – there is a good understanding of the cause-effect relationship using data from outside the Socio-economic RSA.

Combined Effects on the Socio-economic Health Effects Indicator

The effects of the Project on health outcomes related to socio-economic changes may be experienced in terms of effects on overall mental well-being; alcohol or drug misuse; or mental health and addictions services. The combined effects include all components of the Project; however, the main pathway from the Project to these outcomes comes from the use of temporary mobile workforces in relatively small communities. The impact balance of combined effects on the socio-economic effect indicator is negative to positive. The significance of the combined effects on the socio-economic health effects indicator from each of these components is summarized below and in Table 7.2.8-4, point 1(d).

- Spatial Boundary: Socio-economic RSA – the effect could occur anywhere within the Socio-economic RSA, although effects would be felt most strongly in communities where Project employment occurs.

- Duration: short-term – effects would primarily manifest during the construction phase when a workforce of temporary and transient workers would be brought into the region.

- Frequency: isolated – the effect would primarily be felt during the construction phase, in conjunction with the use of mobile workforces.

- Reversibility: short-term – adverse effects would likely be limited to the construction phase; positive effects will be reversed when income or employment disappears.

- Magnitude: negligible to medium – the relative size of the community to worker population will strongly influence the magnitude of effect observed in the community.

- Probability: high – the effect has been observed with development projects in BC, Alberta, elsewhere in Canada and internationally.

- Confidence: moderate – research evidence supports the association between development projects and mental well-being outcomes, but studies have generally focused on effects associated with a larger workforce.

Community Health Indicator - Infectious Disease

As noted under the community health setting (Section 5.8), there are three aspects of infectious disease that are relevant in the context of the Project:

- sexually transmitted infection rates;

- infectious respiratory disease rates; and

- gastrointestinal disease rates.

These three areas comprise the measurement outcomes relevant for infectious disease.

Increase in Number of Sexually Transmitted Infections

STIs are a serious and common concern in regions that are host to industries that experience influxes of temporary workers. STIs typically spike in development communities during periods of construction activity, and especially during “boom” times.

The increases are due to a number of factors, but in particular the combination of men, income, and mobility. When the mostly young men who stay in remote worksites and camps come off shift, their leisure time in adjacent towns may involves binges on alcohol, drugs and sex (Goldenberg 2008). The

phenomenon of an STI "spike" has been documented in BC and Alberta as well as in other Canadian jurisdictions and internationally (Goldenberg *et al.* 2008a,b; Government of Northwest Territories 2005, 2010; International Petroleum Industry Environmental Conservation Association and International Association of Oil and Gas Producers 2005b; Sharpe-Staples 2006). Research in northeastern BC found an increase of 21% in Chlamydia rates concomitant with the oil and gas boom that began in 2001. This increase exceeded the provincial average by 32% (Goldenberg 2008).

The issue of an increase in STIs being linked to temporary mobile workforces has been raised as a concern by senior health care officials in both Alberta and BC (Medd 2007, Richardson 2012). While the transmission of STIs is undesirable from a community health perspective, it also places strain on the health care services required to diagnose and treat STIs, and to initiate contact tracing of all sexual partners.

There is insufficient information in the literature or public health practice to allow for modelling or other quantitative estimation of the magnitude of increase in STI cases that could be expected as a result of Project activities; however, there are evidence-based predictions that can be made about the timing, the likely geographic location and the relative effect of any increase.

The potential for an increase in STIs linked to the Project is possible during the construction phase, when the Project workforce will comprise of large numbers of temporary and transient workers. An increase in STIs is highly unlikely for the operations phase, because there will be fewer workers and these workers tend to be more stable than mobile.

The geographic areas where STI increases have the greatest potential to occur are those communities that will act as construction hubs: Edmonton, Edson and Hinton in Alberta; and Valemount, Blue River, Vavenby, Clearwater, Kamloops, Merritt, Hope, Chilliwack, Abbotsford and the Greater Vancouver Area in BC.

The potential for an increase in STIs in these communities is contingent on several factors:

- the size of the mobile workforce being brought in;
- the size of the community in relation to the workforce. Generally speaking, the larger the community, the less likely it is that any increase will be noticeable or will adversely impact the health care systems required for disease diagnosis and treatment; and
- the degree of interaction between the workers and the community members. The degree of interaction depends on a number factors including: whether the workers are housed in remote camps or in hotels within the community; company policies on worker recreation; and the location of the community in relation to other, larger municipalities that could act as a draw for social activities and entertainment.

In summary, the potential for an increase in STIs stems from the well-documented observation that STIs tend to increase during construction periods, linked primarily to an influx of young, male mobile workers. The impact balance of this effect is characterized as negative, since it poses a detriment to community health. The effects would extend throughout the Socio-economic RSA but would primarily manifest in those communities that act as construction hubs, and in particular those communities that have relatively small resident populations in relation to the size of the temporary Project workforce.

The duration is characterized as short-term and the frequency as isolated, since the event causing the increase in STIs would be linked to the construction phase, when the Project workforce will employ a substantial workforce of temporary and transient workers. An increase in STIs is highly unlikely for the operations phase, which will require much fewer workers and will draw on a stable rather than a mobile workforce. The reversibility is similarly characterized as short-term, since any effect would mainly be observed during the construction phase, and possibly shortly afterwards as new cases continue to present for diagnosis and treatment. The magnitude of the effect varies depending on the size of the community in which it occurs; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is unlikely to be detectably different from existing conditions, whereas in smaller communities, the magnitude of effect may be detectable and may strain the capacity and resources of

local health care systems. The probability is rated as high, since this effect has been observed in conjunction with development projects both in BC and in Alberta as well as in other areas of Canada and internationally. The level of confidence in this evaluation is high, since the literature showing this cause-effect relationship relates directly to the Project area (Table 7.2.8-4, point 2[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effect could occur anywhere within the Socio-economic RSA but would be limited primarily to communities that act as construction hubs and that have relatively small resident populations in relation to the size of the temporary Project workforce.

- Duration: short-term – the Project will draw on temporary and transient workers during the construction phase but will have fewer workers and a more stable workforce drawn from the local population during the operations phase.

- Frequency: isolated – the event causing the potential increase in STIs is the presence of the temporary workforce which, as described above, will be limited to the construction phase.

- Reversibility: short-term – the residual effect of increased STIs will be experienced primarily near the time period in which the workers were present in the construction hubs, and possibly extending for a short period beyond their presence.

- Magnitude: negligible to medium – varies depending on the size of the community in which it occurs; in a very large community such as Edmonton or the Greater Vancouver area, the magnitude of effect is likely to be negligible, while in small communities the effect may be of medium magnitude, straining the capacity and resources of local health care systems.

- Probability: high – the effect has been observed with development projects in BC, Alberta, elsewhere in Canada and internationally.

- Confidence: high – there is a good understanding of this relationship with supporting literature from the Project area.

Increase in Number of Respiratory or Gastrointestinal Illnesses

Respiratory and GI illnesses are considered together in this discussion because they share similar causal pathways: the transmission of infection from one person to another, exacerbated by working or living conditions that bring people in close proximity to one another. Infectious respiratory or GI disease transmission among Project workers has the capacity to spread to the wider community, primarily through the employment of local workers who may contract an illness at the worksite and bring it back to the construction hub community. An increase in infectious respiratory or GI transmission can also affect health care services if there is an outbreak, even if the illness is limited just to Project workers.

Although no historical instances of an outbreak associated with resource development projects in Canada have been identified in the published literature, communal living or work environments are settings that can foster illness transmission. Communal settings such as children's camps, military camps, long-term care homes and cruise ships, and—most relevant for the Project—work camps provide close quarters that elevate the risk of person-to-person transmission (Colorado Department of Public Health and Environment 2006, Public Health Agency of Canada 2003). A 2012 report produced by the BC Northern Health Authority entitled *Understanding the State of Industrial Camps in Northern BC: A Background Paper* briefly discussed infectious diseases as a public health issue in the context of industrial camps in northeastern BC (Northern Health Authority 2012). Although it was not an initial focus of their research, a number of research sources (*i.e.,* interviews with Northern Health staff, published literature and studies conducted in northeastern BC) pointed out the potential for infectious disease transmission associated with camp conditions. Camp conditions that are of most relevance are the proximity of beds in sleeping quarters, the availability of water and waste treatment, and the cleanliness of facilities.

In terms of the Project, construction camps will be established in Edson, Blue River and Clearwater/Vavenby. The selection of camp operators whose camps meet provincial health and safety legislation, as described in the SEMP (Volume 6B), will help reduce the risk of adverse effects.

Crowding in housing, apartments or other non-camp residential settings can similarly increase human proximity and, therefore, the potential for infectious disease transmission. In communities that act as construction hubs, the cost of housing may increase and availability of housing may decrease, providing incentive for some local residents (especially those with low income) to increase the number of people inhabiting any one dwelling. This crowding increases the potential for infectious respiratory or gastrointestinal disease transmission (Jacquet 2009, Weber and Howell 1982). In terms of the Project, it is concluded in Section 7.2.5 Infrastructure and Services that there is likely to be upward pressure on rental and/or short-term accommodations during construction that may result in crowding in some segments of the population across the Socio-economic RSA. In order to minimize disease transmission, it will be important to ensure that the approach to worker housing minimizes the potential for overcrowding at a local level.

Workplace policies, procedures and conditions also influence the potential for infectious disease transmission. For example:

- safe food handling (*e.g.,* in cafeteria facilities) is strongly linked to the spread of GI illnesses;
- the provision of appropriate facilities for handwashing or hand sanitizing, maintaining clean restrooms, and planning for safe clean-up after someone has been ill at camp or work sites can affect disease transmission (Colorado Department of Public Health and Environment 2006); and
- sick time policies are also relevant; workers who fear missing work hours and pay might be reluctant to call in sick and therefore be more likely to come to work and infect others.

Finally, the ability to provide hygienic conditions is closely linked to water and sewer capacity of worksites and camps. Several key informants have indicated that in some areas, such as Clearwater, BC, water and sewer provision are currently near capacity and cannot handle an increase of even several hundred additional people (Groulx pers. comm.). Water and sewer capacity are discussed further in Section 7.2.5 Infrastructure and Services.

Specific mitigation measures are described in the SEMP that will help mitigate the potential risk of respiratory and GI illnesses. These include: ensuring construction camps meet all provincial health and safety requirements; providing access to health services at all construction camps; and developing prevention and control measures for sanitation and infectious disease transmission.

In summary, respiratory and GI illnesses are considered together because they share similar causal pathways: the transmission of infection from one person to another, exacerbated by working or living conditions (camps, housing or workplaces) that bring people in close proximity to one another. The impact balance of this effect is characterized as negative, since it poses a detriment to community health. An outbreak of infectious respiratory or GI illness could arise within a Project construction camp or worksite; or could originate within the local community, particularly if Project-related demand for housing causes an increase in crowding among some (especially low-income) community members. The effects will mainly be limited to those communities that act as construction hubs throughout the Socio-economic RSA. The duration and frequency are characterized as short-term and isolated respectively, since the potential for an outbreak is limited to the period in which large numbers of workers are housed together and/or working in close quarters (*i.e.,* the construction phase). The reversibility is characterized as short-term since the increased risk of respiratory or GI illness outbreaks is confined to the construction phase. The magnitude of the effect varies depending on the size of the community in which it occurs. In a very large community such as Edmonton or the Greater Vancouver area, the residual effect is unlikely to be detectably different from existing conditions, whereas in smaller communities, the magnitude of effect may be detectable and may strain the capacity and resources of local health care systems. The probability of this effect is characterized as low; while the potential for an increase in respiratory or GI illness transmission has been identified by key informed sources, no historical instances of an outbreak associated with resource development projects in Canada have been identified. For the same reasons, the confidence is considered to be moderate (Table 7.2.8-4, point 2[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effect could occur anywhere within the Socio-economic RSA but would be limited primarily to communities that act as construction hubs.

- Duration: short-term – limited to the construction period during which large numbers of workers are living and working together or when induced effects on crowding occur in the community.

- Frequency: isolated – the event causing the increase in the number of respiratory or GI illnesses is the close proximity of the larger workforce during the construction phase.

- Reversibility: short-term – the residual effect of increased respiratory or GI illnesses is likely to be experienced as a short-term effect with no lasting increase in risk.

- Magnitude: negligible to medium – the magnitude of the effect varies depending on the size of the community in which it occurs; in a very large community such as Edmonton or the Greater Vancouver area, the magnitude of effect is likely to be negligible, while in small communities the effect may be of medium magnitude, straining the capacity and resources of local health care systems.

- Probability: low – while the potential for the effect remains, no documented instances of an outbreak associated with resource development projects in Canada has been identified.

- Confidence: moderate – the cause-effect relationships are well-understood and have been characterized for other close living conditions (such as children's camps, long-term care facilities and cruise ships) but the application to Project circumstances is less certain.

Community Health Indicator - Environmental Health Effects

As noted under Section 5.8, environmental health effects refer to potential health changes that could arise as a result of exposure to Project-related hazards through environmental media, including air, water and soil and biota such as animals, fish, and vegetation.

Environmental health concerns are often among the most prominent issues raised by residents and stakeholders in relation to development activity. The potential for contaminant, noise and odour effects, both under normal construction/operations conditions and in the context of spills, have also been raised repeatedly by health officials, local residents and other stakeholders in the context of the Project.

The effects of the Project on a number of environmental health endpoints are discussed elsewhere in the ESA:

- the HHRA of Volume 5D discusses human exposure to chemical substances via all environmental media;

- Acoustic Environment describes exposure to and effects of noise (Section 7.2.6 of Volume 5A);

- Air Emissions (Section 7.2.4 of Volume 5A) discusses experience of nuisance odours; and

- Section 7.2.4 discusses effects of changes to the visual environment.

This subsection examines the potential for stress and anxiety related to perceived contamination and environmental change.

Increase in Stress and Anxiety Related to Perceived Contamination

Regardless of the actual level of environmental contamination, people's perception of exposure to contamination can itself have adverse impacts on health (Health Canada 2005, Luria *et al.* 2009, Marques and Lima 2011). Perception of contamination can cause stress and anxiety. Among populations reliant on subsistence foods, the perception of contamination may result in the avoidance of subsistence food sources.

While no data is available to show what proportion of the population of the Socio-economic RSA believe that the Project will have a deleterious effect on health through environmental media, there are several sources that document the fact that this perception exists among some residents and other stakeholders in relation to oil and gas development activities and that it may be causing stress or anxiety for a portion of the population.

Interviews with key informants at the Vancouver and Fraser Health authorities indicated that some local residents were worried about future oil and gas transport because of the potential for exposure to hazardous contaminants if there were to be a spill such as the one that happened in Burnaby in 2007 (Daly, Van Buynder pers. comm.).

The concerns around the potential for human exposure to contamination have been raised in a number of Project workshops and open houses. As documented throughout Volume 5A, questions have been raised around Project-related effects on air quality, water quality, dust and soils.

In summary, both a review of relevant literature and stakeholder engagement activities have shown that there is a potential for the Project to cause stress and anxiety specifically related to the possibility of human exposure to environmental contamination. This effect is distinct from potential toxicologic or other biophysical effects that could occur in the presence of contamination and relates instead to psycho-social strain experienced as a result of anxiety or the perception of contamination. While the main source of stress appears to be related to the possibility of a spill or other malfunction that causes exposure to petroleum products, the presence of the pipeline itself has the potential to cause this effect. A number of the mitigation measures listed in the EPPs and the SEMP will help to minimize any potential effect, in particular measures in the EPPs around air, water, vegetation, wildlife and fish quality; and measures in the SEMP around ongoing communication and engagement with stakeholders.

The impact balance of this effect is characterized as negative, since it poses a detriment to community health. The effects could extend throughout the Socio-economic RSA; however, the communities in the Fraser-Fort George/Thompson-Nicola, Fraser Valley and Metro Vancouver regions have to date voiced concern most strongly. The duration is characterized as long-term and the frequency as continuous, since the event causing the residual effect is in place for as long as the pipeline is in place and in active use, unless attitudes about the pipeline change. The reversibility of the residual effect is characterized as long-term since any effect would likely be able to mitigated with the decommissioning and remediation of the pipeline. In terms of magnitude, no regulatory, environmental or social standards exist that describe acceptable threshold levels of stress and anxiety. The residual effects on stress and anxiety are likely be detectable since some segments of the population will likely continue to be vocal about their concern, but the extent to which this stress and anxiety are experienced in the population cannot be predicted. Therefore, the magnitude is characterized as low to medium. The probability is rated as high, since this effect has been observed in conjunction with development projects both in BC and in Alberta as well as in other areas of Canada and internationally. Research literature supports this relationship as do stakeholder concerns in open house meetings and key informant interviews; and therefore, the level of confidence in this evaluation is high (Table 7.2.8-4, point 3[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effect could occur anywhere within the Socio-economic RSA.

- Duration: long-term – the event causing the increase in stress and anxiety related to perceived contamination is the operations of the pipeline.

- Frequency: continuous – the event causing the increase in stress and anxiety related to perceived contamination is the operations of the pipeline.

- Reversibility: long-term – the residual effect will extend over the lifetime of the pipeline.

- Magnitude: low to medium – no regulatory standards exist; concerns will likely continue to be voiced by affected residents but the extent to which the stress and anxiety will be experienced by the population at large is not known.

- Probability: high – the residual effect has been observed with development projects in BC, Alberta, elsewhere in Canada and internationally.

- Confidence: high – there is a good understanding of this relationship with supporting literature as well as from stakeholders in the Project area.

Community Health Indicator - Public Safety

As noted under the community health setting (Section 5.8), public safety has the potential to be influenced by the Project in several ways. The potential for injury or mortality related to traffic collisions during Project construction and operations is described in this subsection. Aspects of public safety related to potential accidents and malfunctions are discussed in Section 7.9.

Increase in Traffic-Related Injury and Mortality

Since the number of traffic collisions in a given area is associated with traffic volumes, an increase in Project-related traffic could be expected to result in a higher number of collisions, and with it an increase in the risk of traffic-related injuries or fatalities. It is not possible to quantify the extent of a potential increase or whether there would be a measureable, increase, because the numbers of proposed Project-related vehicles in each area are not currently known. However, there are several factors that may modify the frequency or severity of those collisions and injuries and that suggest approaches for Trans Mountain to use in minimizing the potential impacts on public safety. These factors are: numbers of vehicles; location of vehicles; and driver behaviour.

Number of Vehicles

Safety performance functions that have been developed for different roadway types confirm that the number of collisions expected in a given area relates directly to the volume of traffic on that roadway segment. In other words, more traffic equates with more collisions (Parisien 2012). By limiting or minimizing the additional traffic put onto a road, the risk of collisions and traffic injuries is also reduced.

Project traffic will comprise both vehicles used to transport equipment and supplies, and also vehicles used to transport workers. Of these, worker transport is more amenable to being reduced, through the use of buses or vans to transport workers rather than private vehicles where practical. Specific recommendations to minimize the number of worker vehicles are discussed in the SEMP (Volume 6B).

Location of Vehicles

The risk of traffic-related injury can also be limited by avoiding areas that have a high potential for collision due to high traffic volumes, poor visibility, a large volume of pedestrian traffic or poor road conditions, or by altering how Project-related vehicles behave in these areas. Within the Socio-economic RSA, there have been several locations identified by key stakeholders as being of concern. These include:

- Highways 16, 779, 627 and 93 in Alberta;
- Highway 5 near the Village of Valemount, near the Community of Blue River (specifically around RK 622) and near the District of Barriere in BC;
- Othello Road, a former logging road, in the District of Hope;
- between Hope and Burnaby, where there are approximately 23 schools within 200 m of the proposed pipeline corridor;
- United Road in the City of Coquitlam, BC; and
- South Fraser Perimeter Road in the City of Surrey, BC.

In addition, areas with children and the elderly comprise locations of high risk for traffic-related injuries or fatalities. Examples include schools (especially during morning and afternoon drop-off/pick up times) and long-term care residences. Once Project traffic routes have been identified, Trans Mountain will work with municipalities to identify these locations and identify appropriate routes for Project-related vehicles to the extent feasible.

Finally, intersections are particularly hazardous with respect to collisions, as approximately 60% of all crashes in BC occur at intersections (Insurance Corporation of BC 2012a-k, Lord and Mannering 2010). Road safety snapshots produced by the Insurance Corporation of BC identify the high-crash intersections

for select BC communities. These are noted in the Traffic and Access Control Management Plan in Appendix C of the Pipeline EPP (Volume 6B) for communities for which this information is available. No similar information is available for Alberta. These intersections should be taken into account when planning Project traffic routes; but if they cannot be avoided, then drivers should be instructed to take particular caution should be taken around these intersections.

Driver Behaviour

A number of driver behaviours can contribute to the risk and severity of collisions. Driver inattention was the number one contributing factor to collisions in BC in 2007 according to the BC Motor Vehicle Branch (Motor Vehicle Branch 2007); excessive speed was the second most frequent contributing factor.

The development and strict enforcement of policies on driver behaviour, among both employees and contractors, is essential for minimizing potential effects on traffic safety. These policies will include screening of driver abstracts, provisions on observance of posted speed limits, a ban on cell-phone or tablet use, mandatory seatbelt use, fatigue management, no driving while impaired and other behaviours that can influence safety.

Concerns around traffic volume, congestion and safety have been raised as an issue in the context of the Project by a number of key informants (Hanlan, Hannah, Humphreys, Kreiner pers. comm., as well as in the Wabamun Community Workshop). The Project will increase the amount of traffic on public roads because of the need for transportation of equipment, supplies and workers to various locations along the proposed pipeline corridor. As described in Section 7.2.5 Infrastructure and Services, to address these concerns, Trans Mountain will develop detailed traffic estimates as construction and project planning continues; these detailed traffic estimates are not currently available. Also as described in Section 7.2.5, the increase in traffic is projected to occur mainly during the construction phase; little Project-related traffic is anticipated for the operations phase.

Specific mitigation measures are described in the SEMP that will help mitigate the potential risk of traffic-related injuries and fatalities. These include the development of site-specifc Traffic Access and Control Plans; the use of shuttle buses, where feasible, to reduce the volume of traffic on the road; communication with local police and emergency services; the development and enforcement of mandatory minimum driving standards; and development of a driving complaint mechanism.

In summary, the Project will increase the number of vehicles in the Socio-economic RSA, both in terms of Project-related construction vehicles and vehicles used to transport workers. Evidence from the literature shows that an increase in traffic volumes results in an increased risk of traffic collisions. This in turn increases the risk of collision-related injuries and fatalities. The impact balance of this effect is characterized as negative since vehicle collisions pose a detriment to community health. The effects would extend throughout the Socio-economic RSA, and would manifest in those locations in which the Project uses vehicles on public roadways. Risk will be particularly high in collision “hot-spots” – locations (usually intersections) which have pre-existing high rates of traffic collisions. The duration is characterized as short-term and the frequency as isolated since the effect is primarily linked to the construction phase when the Project workforce will be large and when the movement of heavy machinery and vehicles is required. An increase in traffic-related injury and mortality is unlikely for the operations phase since there will be fewer workers and equipment requiring transport. The reversibility is similarly characterized as short-term since any effect would mainly be observed during the construction phase. The increase in risk of traffic-related injury and mortality is highly dependent upon the number and types of additional vehicles, the current road conditions and capacity of the roadways, driver behaviour, and the characteristics of the areas through which traffic will travel. While the addition of Project-related traffic creates an increase in collision risk, traffic-related collisions, injuries and fatalities are rare events; therefore, even though the risk increases, there is no certainty that any traffic-related injuries or fatalities will result from the increase in traffic. In addition, no regulatory standards exist for this area. The magnitude of effect is characterized as negligible to medium. The probability of occurrence is rated as low since, as noted above, traffic accidents are rare. The level of confidence in this evaluation is high, since the literature showing this cause-effect relationship relates to other areas in BC and internationally (Table 7.2.8-4, point 4[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – effects extend throughout the Socio-economic RSA wherever worker and Project-related traffic exists and would be a primary concern in current traffic accident hot-spots.

- Duration: short-term – the event causing the potential increase in traffic-related injury and mortality is the construction phase, when the Project workforce will be large and when heavy machinery and vehicles are required.

- Frequency: isolated – the event causing the potential increase in traffic-related injury and mortality is confined to the construction phase.

- Reversibility: short-term – residual increases in traffic related injury and mortality are considered to be limited to the construction phase.

- Magnitude: negligible to medium – no regulatory standards exist for this area. While the addition of Project-related traffic creates an increase in risk, traffic-related collisions, injuries and fatalities are rare events.

- Probability: low – the probability of occurrence is rated as low since traffic collisions, injuries and fatalities are rare events.

- Confidence: high – the literature showing this cause-effect relationship relates to other areas in BC and internationally, and some stakeholders are concerned about traffic accidents.

Community Health Indicator - Health Care Service Provision

Health care services are a critical support for population health as they enable the prevention, detection, treatment and management of health care problems. If health care services are inadequate – through problems in access, capacity or quality – then population health is adversely affected as a result.

As noted in the community health setting (Section 5.8), there are two aspects of health care service provision that are most relevant in the context of the Project:

- demand on and capacity of hospitals and health care centres; and

- demand on and capacity of emergency medical response.

These two areas comprise the measurement outcomes relevant for health care service provision. It should be noted that potential effects of the Project on mental health and addictions services are discussed in Section 7.2.8 under the socio-economic health effects indicator.

Increased Demand on Hospitals and Health Care Facilities

Health care services have the potential to be affected by Project construction and operations in two ways. The first is through an increase in the number of people in a particular health service area and the second is through a change in the pattern of conditions requiring treatment.

Health care service levels are determined by the provincial health care authorities and, therefore, are not able to be directly responsive to any increased demand that may result from this Project. Consequently, the discussion below assumes that service levels will remain constant and/or increase with the predicted growth rate (unrelated to the Project) for the Socio-economic RSA.

An increase in an area's population often means an increase in demand for health care services due simply to additional numbers of people requiring services. In the case of the Project, population increase can arise in one of two ways: an increase in Project workers; or an increase in people moving to the area because of indirect or induced employment opportunities. As discussed below, construction-phase Project workers will comprise most of this increase.

Table 7.2.7-7 under Section 7.2.7 Economy and Employment lists the number of Project workers expected to be housed in the communities along the proposed pipeline corridor that are currently considered as Project construction hubs during the construction phase.

Edmonton will receive an average of 377 workers per month over a 19-month construction period, with a peak of 734 workers per month. There is a low likelihood that Project workers housed in the Edmonton Region will have a noticeable effect on health care service provision in that region since the Edmonton area is highly populated (close to one million people in the metropolitan area) and acts as a centre for health care services.

In the Rural Alberta Region, the Town of Edson will receive most of the construction workers with an average of 383 workers per month over a 14-month period, peaking at 896 per month, whereas the Town of Hinton will receive approximately 136 workers per month over 11 months. There are health care centres with 24-hour emergency departments in both Edson and Hinton. The facilities work closely together to accommodate any inpatient needs and to transfer patients when required. Key informants have indicated that Hinton health care services can likely meet the incoming needs of the Project construction labour force given the systems in place for cross-facility transfers. Past development projects of a similar size have not greatly impacted health care services in the community (Lodder pers. comm.). The Town of Edson is in the planning stages for development of a new healthcare centre that will further increase health care capacity in town. In summary, due to the short time frame that workers will be in the Rural Alberta Region and given the current capabilities of the health care centres, construction labour is unlikely to have a noticeable effect on health care services.

The Jasper National Park Region has one health care centre with a 24-hour emergency department. The remote location of this health care centre makes recruitment and retention of employees particularly challenging. Due to lack of accommodation options in Jasper, workers tend to stay in Hinton. As a result, effects on health care service provision in Jasper are likely to be minimal (see also emergency medical response below).

Within the Fraser-Fort George/Thompson-Nicola Region, the smaller communities of Valemount, Blue River, Vavenby and Clearwater are more susceptible to the effects of temporary workforces on health care services since fewer services are available in these communities and staffing levels are lower, as described by participants in the Clearwater Community Workshop. Stakeholder interviews and media reports have indicated that Clearwater and Blue River have experienced or are currently experiencing staff shortages that has led to the temporary facility closures and the transfer of patients to other health care locations (see Section 5.8). The average numbers of workers per month are expected to be 289 in Valemount, 121 in Blue River and 327 in Vavenby/Clearwater with maximum worker levels approximately 629, 287 and 591, respectively. The maximum worker numbers are very high compared to the populations of these communities and represent an increase of 62%, 110%, and 25% over current population levels. Given these figures and the current strain on healthcare services, increased demand caused by the Project workforce could overwhelm existing services in these areas. It is important to note, however, that past projects in the Valemount area did not result in increased demand for health care services (Strang pers. comm.) and that Valemount, with three physicians, is currently overstaffed relative to its existing population. Demand for health care services from the worker population will be modified by Trans Mountain plans and policies around worker health strategies.

Health care centres in the Cities of Kamloops and Merritt are currently running over capacity. Kamloops in particular is extremely short of physicians and had to close its North Shore walk-in clinic in June 2013 as a result. Maximum workforce numbers will be equivalent to a 1% and 12% increase in population, respectively. Due to a lack of interviews in the Interior Health Region (see note in Section 3.0), it is difficult to determine how health care services would be affected in Kamloops and Merritt.

The Fraser Valley Region is projected to have some of the smallest workforce numbers of all the regions in the Socio-economic RSA. Maximum workforce numbers will represent an increase of 7% for the population in the District of Hope, and the workforce numbers in comparison with the existing population sizes for the Cities of Chilliwack and Abbotsford are negligible. However, key informants have expressed concern that the population growth and resulting socio-economic health effects in Hope would quickly overwhelm the Fraser Canyon Hospital (Wiebe pers. comm.). Hospitals in the Fraser Valley Region are expecting to be faced with staffing challenges in the next 5 to 10 years due to population growth and

mass retirement of health care professionals. The Project workforce will add to these population growth challenges for a period of one to one-and-a-half years. Adherence to mitigation measures proposed for health care services will help to minimize effects on services.

The Metro Vancouver Region will receive an average of 655 workers per month over a 23-month construction period, with a peak of 1,204 workers per month. Because the Metro Vancouver Region is highly populated (several million people) and acts as a centre for health care services, there is a low likelihood that Project workers housed in the Metro Vancouver Region will have a noticeable effect on health care service provision in that region.

The number of workers on the Project during the operations phase will be far lower and it is expected that operations workers will primarily be drawn from the local population. As a result, the Project is not anticipated to cause adverse effects on health care service demand, capacity or quality during the operation period in any of the Socio-economic RSA communities.

Indirect or induced employment opportunities also have the potential to increase the size of the population for the communities discussed above, and this growth would similarly affect the demand on health care services. Section 7.2.3 Social and Cultural Well-being discusses projected indirect/induced population growth at the regional level; however, these projections are not community-specific.

As mentioned at the start of this subsection, the Project also has the potential to affect health care services if it causes a change in the pattern of conditions requiring treatment or a change in specific health care services that are in high demand. In the context of the Project, this could result from an increase in specific health outcomes that require treatment such as occupational injuries, traffic-related injuries or increased rates of illnesses. The potential for changes in the prevalence of these health outcomes is discussed elsewhere in this subsection, under the indicators socio-economic health effects, infectious disease, public safety and environmental health effects, as well as in the HHRA of Volume 5D.

There is insufficient information in the literature or public health practice to allow for modelling or quantitative estimation of the magnitude of effect on health care service capacity that could be expected as a result of Project activities; however, there are evidence-based predictions that can be made about the timing and the likely geographic location of any effect as well as the specific services that would be affected.

The health services that are most likely to experience increased demand are hospital emergency departments and mental health and addictions services. Effects on mental health and addiction services are described under the indicator for mental well-being and effects on emergency departments are described below.

Temporary workers tend to disproportionately increase demand on hospital emergency departments for several reasons: emergency departments are generally open 24 hours a day and can be accessed following shift work; as mobile Project workers are only in the region temporarily, many prefer to use emergency departments rather than establishing a relationship with primary caregivers in the work area. In addition, some of the community health effects described in other subsections, such as traffic-related injury, tend to present first in the emergency department.

In BC, an increase in health care facility utilization has been observed during past development periods. An assessment of health facility use between 2000 and 2005 for Dawson Creek, Chetwynd, Fort Nelson, Fort St. John and Hudson's Hope found an increase in unscheduled emergency room visits in each of the communities, particularly for the October-to-March time period which corresponds with highest construction crew activities in the region (Medd 2007). An earlier report pegged the increase in patient visits due to oil and gas activity at 50% higher than normal volumes (P. Eby and Associates Limited and Cornerstone Planning Group Limited 1979). A more recent study in Chetwynd and Tumbler Ridge identified a 12% increase (L. Tolarchuk in Medd 2007). These increases were tied to a much larger volume of development activity that stimulated "boom" conditions in the local communities; however, this reinforces the pattern in which emergency departments take on most of the Project worker medical care and shows that in certain circumstances the effect can be substantial.

Given the Project workforce numbers, any increase in emergency department visits from these employees is less likely to be noticed in the major urban centres such as Edmonton, Kamloops, Chilliwack, Abbotsford and Vancouver. However, the increase will be more apparent in rural areas where there are fewer facilities and more severe staffing shortages, including Valemount, Blue River and Hope. Some of these communities have had to alter emergency department services in the past due to staffing shortages. Key informant interviews revealed mixed experiences with temporary worker populations in the past. In Hope, there was fear that increases in alcohol and drug use and vehicle collisions would overwhelm existing resources, while in other communities such as Hinton and Valemount, industrial projects have resulted in very small increases in health care service demands. Despite the various experiences, all health care personnel interviewed indicated that they would like or need advanced warning of the exact number of workers coming into the community, the length of the construction period, and housing arrangements for the workers.

Although health care worker shortages were noted in most areas of the Socio-economic RSA, the geographic areas where effects on health care services have the greatest potential to occur are those communities that will act as construction hubs and that have limited health care service capacity. This includes Valemount, Blue River, Vavenby, Clearwater and Hope which are located in the Fraser-Fort George/Thompson-Nicola and the Fraser Valley regions.

The potential for an effect on health care services linked to the Project is highest during the construction phase, when the Project workforce will be large and when there is increased Project-related traffic on the roads. An increase in utilization of health care services is unlikely under normal conditions for the operations phase, which will involve far fewer workers traveling to the Project site every day and will draw on a locally-based rather than a mobile workforce.

It is also worth noting the potential for effects on recruitment and retention of health care personnel. It has been documented in BC and Alberta that periods of high development activity have been associated with increasing difficulty in recruiting and retaining health care service personnel, because of stressful working conditions, low housing availability and high housing and clinic costs during high economic periods. However, these issues are unlikely to result from the Project because the projected number of Project workers in any given area is relatively small and the duration that they will remain is relatively short-term (generally 12-14 months). Recruitment and retention difficulties have been more closely associated with locations experiencing a more extended boom period. However, these issues may become more prominent in the context of cumulative effects of development, particularly in more rural regions.

Finally, environmental health protection services are also commonly strained during construction activity periods. Environmental health protection comprises those services that protect individuals' health from environmental exposures such as food-borne infection, unsafe drinking water or sanitation practices and unsafe housing conditions. Because environmental health protection officers are involved in inspecting work camps and ensuring compliance with the *Public Health Acts* of Alberta and BC, demand for their services will increase when construction camps and working areas are being established and monitored.

In summary, the potential for an increase in utilization of health care services is supported by literature documenting increases in alcohol and drug misuse and related cases of injury and violence (see socio-economic health effects indicator), increases in STIs and respiratory or gastro-intestinal disease (see infectious disease indicator), and increases in traffic-related injury and mortality (see public safety indicator) that occur during "boom" periods. All of these conditions require treatment at a health care facility. Since workers generally use emergency departments for health care while away from home, these impacts will mainly be observed at hospitals and health care centres. If the capacity of health care centres to serve community members is impacted because of the increase in usage then this can lead to reduced health outcomes for the community at large. As such, the impact balance of this effect is characterized as negative, since it poses a potential detriment to community health. The mitigation measures listed in the SEMP that will work to minimize any potential effect include: supplying medical personnel and equipment to work sites, including camps, meeting applicable occupational health and safety legislation, as a minimum, including the use of Emergency Medical personnel, Emergency Transport Vehicles, and First Aid rooms; and communicating with local health authorities, on the timing of the Project, duration of stay in the local community, expected number of people coming into the area and on-site health care plans.

The residual effects extend throughout the Socio-economic RSA but are most likely to occur in those communities that act as construction hubs and have limited health care access, namely Valemount, Blue River, Vavenby, and Clearwater. Health care facilities in the Fraser Valley are also at or over capacity and, therefore, those construction hubs may also be affected. The residual effects will last throughout the construction phase since effects assessed in other indicators will manifest during that time period, meaning that the duration is short-term and the frequency is isolated. The operations phase is not likely to result in an increase in demand on hospitals or health care centres under normal operations since the workforce and Project-related traffic would be greatly reduced. The reversibility would also be short-term since effects are expected to occur during the construction phase. The magnitude of effect varies depending on the size of the workforce and the capabilities of the particular health care facilities; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is unlikely to be detectably different from existing conditions, whereas in smaller communities such as Valemount and Clearwater, the capacity and resources of local health care systems may become strained. The probability is rated as high since this effect has been noted in other development projects in BC and Alberta. The level of confidence in this evaluation is high, since stakeholder interviews and open house meetings have expressed concern, and research literature has demonstrated that projects of this size and nature can influence health care service capacity (Table 7.2.8-4, point 5[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effects extend throughout the Socio-economic RSA but are most likely to manifest in those communities that act as construction hubs and have limited health care access.

- Duration: short-term – the effects would be expected to last throughout the construction phase since impacts assessed in other sections (see public safety and socio-economic health effects indicators) would manifest during that time period.

- Frequency: isolated – the event causing the increased demand on hospitals and healthcare facilities is related to construction activity.

- Reversibility: short-term – the residual effects of increased demand on health care services is limited to the construction phase or to less than one year into operations.

- Magnitude: negligible to medium – the magnitude varies depending on the size of the workforce and the capabilities of the particular health care facilities; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is likely to be negligible, whereas in smaller communities such as Valemount and Clearwater, the effect may be of medium magnitude, straining the capacity and resources of local health care systems.

- Probability: high – research literature has clearly documented these types of impacts with development projects and temporary workforces.

- Confidence: high – stakeholder interviews and open house meetings have expressed concern, and research literature has demonstrated that projects of this size and nature can influence health care service capacity.

Increased Demand on Emergency Medical Response

Emergency medical response refers to the ability for ambulance and other first responders to respond to emergency medical situations. Excess demand placed on emergency medical response results not only in a burden on these services but also in poorer health outcomes for the population being served; as such it constitutes a critical community health issue.

There are several pathways through which the Project has the potential to affect emergency medical response.

- Worksite Accidents: If severe accidents or incidents occur on Project worksites, emergency medical services may be called in to respond and provide transfer to local or regional emergency departments.

- Population Increase: An increase in the population of a local area, either as part of the Project workforce or as part of an indirect or induced population increase, will increase the number of people requiring emergency medical services, even if the rate of emergencies remains fixed.

- Increase in Community-Based Injuries: As discussed under the indicators for socio-economic health effects, infectious disease and public safety, the Project has the potential to cause increases in a number of conditions that require emergency medical transfer or treatment, most notably injuries or trauma related to traffic or altercations.

Any of these three scenarios could be expected under normal operating conditions. Both anecdotal evidence and data analysis conducted on other development projects in similar contexts have pointed to an increase in the number of ambulance runs correlated with increases in development activity (Carrington and Pereira 2011, Haefele and Morton 2009, Jacquet 2009).

- Accidents or malfunctions. Although they have a very low likelihood, accidents or malfunctions such as a pipeline rupture draw heavily on the resources of emergency medical response structures and personnel.

Accidents or malfunctions represent an unexpected circumstance and, while not anticipated as a part of the Project, must be considered and planned for since they remain a possibility, although unlikely. The potential effect of an accident or malfunction relating to a large pipeline spill on emergency medical response is discussed within Volume 7.

In both Alberta and BC, situations that call for emergency medical response are coordinated and managed at either a local or a regional level, depending on the size and scale of the event or the number of people who require medical attention.

Small-scale incidents involve only a small number of people at one time (*e.g.,* one to three people), such as a vehicle collision involving two or three people or a worksite injury in which one or two people are injured. These small-scale incidents are managed by local emergency health management teams, comprising the local ambulance station and the closest hospital, with back-up for especially severe injuries provided by regional air ambulance and the closest tertiary care hospital. The health care service provision indicator provides a list of those communities across the Socio-economic RSA that house ambulance stations, emergency departments, tertiary care centres and air ambulance bases.

In key informant interviews, emergency management and municipal officials indicated that across the Socio-economic RSA, responding to a small-scale patient incident would be manageable by the local ambulance services (Kreiner, Lodder, Ramme, Vallely, Wiebe pers. comm.). However, these key informants reiterated that smaller hospitals and health centres, as discussed above, would quickly reach capacity treating even a small caseload and would have to transfer patients to alternate facilities.

Larger-scale incidents that are beyond the capacity of local responders would draw on the resources of regional or provincial-level coordination systems. Although a large-scale emergency event associated with the Project is unlikely, it remains a remote possibility under normal construction or operating conditions (*e.g.,* a traffic-related collision involving dozens of people), as well as in conjunction with a spill or other accident or malfunction.

In situations that may overwhelm local capacity for containment, treatment and management, regional or provincial-level regulatory authority will step in to coordinate response and allocate resources. A large-scale incident (*e.g.,* a 20-30 person mass casualty incident) would be followed by the initiation of "Code Orange", or a mass casualty plan (Lodder, Strang, Wiebe pers. comm.). Key informants indicated that planning would be coordinated between emergency medical responders (fire, ambulance) and hospitals in adjacent regions. Ambulance services would recruit both ground and air ambulance in order to transfer patients to care centres that could handle the particular needs of the patients. This type of scenario would overwhelm both ambulance services and local health care facilities, but the effect would be temporary. During the incident and follow-up, any regions that have allocated resources to help with the incident would be considered vulnerable, because their capacity to respond to other incidents would be diminished (Vallely pers. comm.).

A number of stakeholders and key informants have emphasized that the way in which Trans Mountain is internally prepared to handle emergencies will strongly influence the effects felt at the local or regional level (Lodder, Strang, Vallely, Wiebe pers. comm.). Key informants expressed that Trans Mountain should be prepared to handle their own emergency medical situations independent of the public health care system to the greatest extent possible. Having an emergency preparedness program would include having an emergency management plan in place that is well-communicated to the various health care facilities and government bodies; having adequate numbers of trained medical first responders on site to treat minor incidents; ensuring that medical first responders are trained to handle remote medical cases as response is sometimes far away; and to have developed good communications protocols for emergency situations. The goal of Trans Mountain's emergency management program would be to avoid using the public health system to the greatest extent possible. It was also emphasized by key informants that Trans Mountain's emergency management protocols should be reviewed with municipal and health care agencies and coordinated with their own plans.

Finally, concerns were raised by participants in the Abbotsford Community Workshop and the Valemount Community Workshop about the potential for Project-related construction activities to impede the movement of emergency response vehicles. This could cause a delay in response time either in terms of ambulances reaching people who need help or the time that it takes to transfer a patient in critical condition to a hospital, potentially compromising health. This situation would also apply to other emergency responders such as fire or police. In terms of the Project, this problem could arise if traffic was delayed or diverted to accommodate construction or the movement of Project vehicles. Mitigating this effect will require planning prior to the construction phase and ongoing communication with the RCMP, the city or town, and the Project contractors. Trans Mountain's commitments on relevant mitigation measures are listed in the SEMP.

In summary, the potential for an increase in demand on emergency medical response is supported by literature documenting increases in alcohol and drug misuse and related cases of injury and violence (see socio-economic health effects indicator) and increases in traffic-related injury and mortality (see public safety indicator) that occur during construction periods. Responding to traffic-related injuries, serious workplace injuries and some cases of domestic or other violence triggers the emergency medical response system. If the addition of emergency medical response required for Project construction and operation exceeds local capacity then this results in increased risk of reduced health outcomes for community members. The impact balance of this effect is characterized as negative since it poses a potential detriment to community health as well as a burden on the emergency medical response infrastructure. The measures in the SEMP that will help minimize any adverse effect on emergency medical response include: communicating with emergency medical service authorities on the timing of the Project, duration of stay in the local community, expected number of people coming into the area and on-site health care plans; developing site-specific Emergency Response Plans; supplying medical personnel and equipment to work sites, including camps; establishing contracts for the use of air evacuation in the event of serious injury in more remote locations; and providing chemical information in the form of Material Safety Data sheets in the event of an exposure.

The residual effects could extend throughout the Socio-economic RSA but would primarily manifest in the areas that provide ground ambulance dispatch proximate to the proposed pipeline corridor: Fort Saskatchewan, Edmonton, Spruce Grove, Stony Plain, Wabamun, Mayerthorpe, Onoway, Alberta Beach, Morinville, Gibbons, Legal, Redwater, St. Albert, Drayton Valley, Breton, Leduc, Beaumont, Calmar, Devon and Warburg in the Edmonton Region; Edson and Hinton in the Rural Alberta Region; Jasper in the Jasper National Park Region; Valemount, McBride, Clearwater, Kamloops, Merritt, Barriere, Chase, Logan Lake and Princeton in the Fraser-Fort George/Thompson-Nicola Region; Hope, Chilliwack, Abbotsford and Mission in the Fraser Valley Region; and Langley, Surrey, Coquitlam, Burnaby, Maple Ridge, White Rock, New Westminster, Delta, Port Coquitlam, Richmond, Port Moody, North Vancouver and West Vancouver in the Metro Vancouver Region.

The residual effects of increased demand on emergency medical response are expected to manifest primarily during the construction phase since this is when the Project workforce and activities would be highest. Therefore, the duration is considered to be short-term and the frequency is isolated. The operations phase is not likely to result in an increase in demand for emergency medical services under normal operation since the workforce and Project-related traffic would be greatly reduced and the potential for workplace injuries would also be greatly reduced. The reversibility is short-term since effects

are expected to occur during the construction phase. The magnitude of effect varies depending on the incident and the capabilities of the particular emergency medical response unit; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is unlikely to be detectably different from existing conditions, whereas in smaller communities such as Valemount and Clearwater, the capacity of emergency medical responders may become strained. The probability is rated as high since this effect has been noted in other development projects in BC and Alberta. The level of confidence in this evaluation is high, as stakeholder interviews and open house meetings have expressed concern, and research literature has demonstrated that projects of this size and nature can influence emergency medical response capacity (Table 7.2.8-4, point 5[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effects could extend throughout the Socio-economic RSA but would primarily manifest in those communities that act as construction hubs and have limited emergency response capacity.

- Duration: short-term – limited to the construction phase since impacts assessed in other sections (see socio-economic health effects and public safety indicators) would manifest during that time period.

- Frequency: isolated – the events causing increased demand on emergency medical response occur mostly during the construction phase.

- Reversibility: short-term – the residual effects of increased demand on emergency medical response is limited to the construction phase or to less than one year into operations.

- Magnitude: negligible to medium – the magnitude of the effect varies depending on the incident and the capabilities of the particular emergency medical response unit; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is unlikely to be negligible, whereas in smaller communities such as Valemount and Clearwater, the magnitude may be medium where the capacity of emergency medical responders become strained.

- Probability: high – research literature has clearly documented these types of impacts with development project construction phases.

- Confidence: high – stakeholder interviews and open house meetings have expressed concern, and research literature has demonstrated that projects of this size and nature can influence health care service capacity.

Combined Effects on the Health Care Service Provision Indicator

The evaluation of the combined effects of the Project on health care service provision reflects the assessment of the combined effects on this indicator from the construction and operations of the proposed pipeline including all associated activities and facilities. The Project has the potential to negatively affect various facets of health care service provision, most notably health care delivered through hospitals and health centres; capacity of emergency medical response; and capacity of mental health and addictions services (discussed under socio-economic health effects indicator) (Table 7.2.8-4, point 5[c]). The residual effects would primarily be experienced during the construction phase when the effects on indicators such as socio-economic health effects, infectious disease and public safety would occur. A summary of the rationale for all of the significance criteria of combined effects on health care service provision is provided below.

- Spatial Boundary: Socio-economic RSA – the effects would extend throughout the Socio-economic RSA but would primarily manifest in those communities that act as construction hubs and have limited health care access.

- Duration: short-term – the event causing the potential increase in demand on health care service provision is primarily associated with is the construction phase, when the Project workforce will be large and when heavy machinery and vehicles are required.

- Frequency: isolated – the event causing the increased demand on health care service provision is related primarily to construction activity.

- Reversibility: short-term – the residual effects of increased demand on health care services would be limited to the construction phase or to less than any one year during operations.

- Magnitude: negligible to medium – the magnitude of the effect varies depending on the size of the workforce and the capabilities of the particular health care services; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is likely to be negligible, whereas in smaller communities such as Valemount and Clearwater, the effect may be of medium magnitude, straining the capacity and resources of local health care systems.

- Probability: high – research literature has clearly documented these types of impacts with development projects.

- Confidence: high – stakeholder interviews and open house meetings have expressed concern, and research literature has demonstrated that projects of this size and nature can influence health care service capacity.

Community Health Indicator - Aboriginal Health

Development projects can have substantial effects on Aboriginal peoples if projects cross or are located proximate to Aboriginal traditional lands and if the projects affect ecosystem components that are highly valued by Aboriginal communities. This subsection examines an important aspect of Aboriginal health that are relevant in the context of the Project and that is not discussed in other sections of the ESA: diet and nutritional outcomes.

In addition, Project-related effects on overall health status for the Aboriginal communities in the Socio-economic RSA is discussed in the Community Health Technical Report of Volume 5D.

Effects on Diet and Nutritional Outcomes

The potential for Aboriginal communities in the Socio-economic RSA to be exposed to contaminants through food and other media is examined in the HHRA of Volume 5D. The discussion below focuses instead on the potential for the Project to contribute to dietary change within the Aboriginal population.

As described in the community health environmental setting (Section 5.8), traditional subsistence diets are relatively healthful; high in animal protein, nutrient-rich, and low in fat or high in marine sources of fat, whereas Western diets tend to be higher in fat and sugar and lower in nutritional density (Earle 2011). As Aboriginal populations in Canada and elsewhere have transitioned away from a subsistence diet to a more Western diet and lifestyle, there have been marked changes in disease patterns, including a drastic increase in obesity, diabetes and other chronic diseases (Kuhnlein and Receveur 1996). Traditional diets are also associated with higher physical activity levels that help to prevent metabolic disorders, and have important linkages to the continuity of cultural practices and traditional activities and livelihoods, which is supportive of mental well-being (Chandler and Lalonde 1998). For these reasons, the maintenance of the traditional subsistence diets, where possible, supports optimal health.

The Project has the potential to contribute to dietary change away from a traditional subsistence diet by either altering the landscape in such a way that subsistence foods are less readily available; or by influencing people to believe that foods are contaminated and should be avoided.

In terms of the Project's potential to reduce the availability of traditional foods, concerns have been raised by Aboriginal communities about destruction of wildlife habitat; migration disruption from Project-related noise pollution and developments; and overharvesting of animals due to increased access via construction of project roads. These concerns are especially prevalent in the more rural locations from Edmonton through to the Fraser Valley regions.

In the wildlife and wildlife habitat assessment (Section 7.2.10 of Volume 5A), it was predicted that there would be residual effects to animal habitat, animal movements, and increased mortality risk for wildlife

along the corridor. This means that despite mitigation measures, some subsistence food sources will be affected by Project activities.

In terms of the potential for avoidance certain subsistence foods due to fears of contamination, concerns have been raised around this issue by various Aboriginal communities. Specific concerns raised include the potential for contamination of animals from oil spills, sewage or waste treatment facilities; and the potential for people to consume contaminated wildlife. Concerns have also been raised about the condition of traditional plants used for harvesting and medicinal purposes including use of pesticides on traditional plants, alteration or loss of traditional plants due to construction activities, and contamination of plants from spills (Vegetation Technical Report). These concerns are congruent with concerns that have been raised in relation to development activities elsewhere in BC (Fraser Basin Council 2012). Given these concerns, some community members may avoid eating subsistence foods; however, the degree to which this would occur is unknown.

In summary, traditional hunting and gathering activities can be impacted by development projects through land use, disruption of migratory pathways, and disturbance to habitat and plant life. Traditional diet has many well-documented beneficial health outcomes for Aboriginal populations in Canada. The impact balance of this pathway is negative since movement away from traditional subsistence diets has potentially adverse effects on nutrition. The effects could extend throughout the Socio-economic RSA but would primarily manifest among communities/bands whose hunting and gathering areas are impacted by the Project. The duration is characterized as short-term and the frequency as isolated since the disturbance events will be limited to the construction period. In terms of reversibility, residual effects will be short-term if the disturbance of plants and wildlife is temporary and quickly reverts to pre-construction levels as described in Volume 5A. The magnitude of the effect varies; however, the effects would likely range from negligible to low since most of the proposed pipeline corridor parallels the existing TMPL right-of-way that was built in the 1950s. The probability is rated as low; although this effect has been observed in conjunction with development projects elsewhere, the Project will use an existing well-established transportation corridor. The level of confidence in this evaluation is moderate, since stakeholder input on the expected extent of this effect in the Socio-economic RSA is lacking; however, these changes have been noted in other land use project and concerns have been noted at open house meetings (Table 7.2.8-4, point 6[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – the effects could extend throughout the Socio-economic RSA but would primarily manifest in those communities/bands whose hunting and gathering lands are impacted by the Project.
- Duration: short-term – the disturbance events will be limited to the construction period.
- Frequency: isolated – the disturbance events will be limited to the construction period.
- Reversibility: short-term – residual effects on diet and nutritional outcomes will be short-term if the disturbance of plants and wildlife is temporary and quickly reverts to pre-construction levels, as predicted in Volume 5A.
- Magnitude: negligible to low – most of the proposed pipeline corridor parallels the existing TMPL right-of-way that has been in operations since the 1950s.
- Probability: low – the probability is rated as low as the Project is using an existing well-established transportation corridor.
- Confidence: moderate – stakeholder input on the expected extent of this impact in the Socio-economic RSA is lacking; however, these changes have been noted in other land use projects and concerns have been noted at open house meetings.

7.2.8.7 Summary

As identified in Table 7.2.8-4, there are no situations for community health indicators that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of Project construction and operations on community health indicators will be not significant.

7.2.9 Facilities Located Within Pipeline Right-of-Way

The elements interacting with pipeline facilities (*e.g.*, automated MLBVs) within the pipeline right-of-way and the associated potential residual effects on the socio-economic indicators are provided in Table 7.2.9-1. The evaluation of significance of the potential residual effects is as described in the applicable subsection of Section 7.2 for the construction and operations of the pipeline.

TABLE 7.2.9-1

POTENTIAL RESIDUAL EFFECTS ASSOCIATED WITH FACILITIES LOCATED WITHIN THE PIPELINE RIGHT-OF-WAY

Element	Indicator	Potential Residual Effect(s)
Heritage Resources	Archaeological Sites, Historic Sites and Palaeontological Sites	No residual effects anticipated.
Traditional Land and Resource Use	The assessment of potential residual effects on TLRU associated with permanent pipeline facilities located within the pipeline right-of-way is considered within the assessment of TLRU for the Project in Section 7.2.2.	
Social and Cultural Well-being	The assessment of effects on social and cultural well-being, HORU, infrastructure and services, employment and economy, and community health have been conducted considering all the Project components in an integrated manner, including facilities located within the pipeline right-of-way. Many potential effects are related to the presence of Project workers, employment and contracting opportunities, and overall community perspectives which cannot be meaningfully disaggregated by Project component. The assessment of effects on these socio-economic elements is presented as a whole in Section 7.2.3 to 7.2.5 and Sections 7.2.7 and 7.2.8.	
Human Occupancy and Resource Use		
Infrastructure and Services		
Employment and Economy		
Community Health		
Navigation and Navigation Safety	Not applicable	Not applicable
Human Health Risk Assessment	Not applicable	Not applicable

7.3 Effects Assessment - Temporary Facilities Construction and Operations

The following temporary facilities that are located beyond the pipeline construction right-of-way are required during the construction of the Project:

- temporary access roads and shoo-flies;
- staging and stockpile sites;
- equipment storage sites;
- construction office sites;
- construction camps, if needed;
- trenchless crossing work areas;
- borrow pits; and
- log decks.

This subsection considers the preparation of the temporary sites and installation of temporary facilities (*i.e.*, construction) as well as the use of the temporary facilities (*i.e.*, operations). Although the need for and the respective general location of some of these sites are the responsibility of the pipeline construction contractor, all temporary facility site locations will require the approval of Trans Mountain's Inspector(s). Temporary facilities will be located within previously disturbed areas within the proposed pipeline corridor, where possible. In the event that specific mitigation measures are warranted for site(s), the measures developed will be documented in the Pipeline EPP prior to construction. The level of mitigation applied will ensure that any adverse residual socio-economic effects associated with the temporary facilities are reduced to a level that is not significant.

Using the assessment methodology described in Section 7.1, the following subsections evaluate the potential socio-economic effects associated with the construction and operations of the temporary facilities located beyond the pipeline construction right-of-way. Temporary facilities such as stockpile and staging areas that are located within the construction right-of-way are evaluated in the applicable

subsection of Section 7.2. Spatial boundaries for the assessment of temporary facilities are the same as in the applicable subsection of Section 7.2 unless otherwise noted.

Socio-economic elements potentially interacting with the construction and operations of the temporary construction camps and other temporary facilities include: heritage resources, TLRU, social and cultural well-being, HORU, infrastructure and services, employment and economy, and community health.

Navigation and navigation safety is not considered to interact with the construction and operations of the temporary facilities since the proposed temporary facilities will not be located in, on, over, under, through or across a navigable waterway.

7.3.1 Heritage Resources

The assessment of effects on heritage resources has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of heritage resources is the same for all components.

The assessment of effects on heritage resources for the Project as a whole is presented in Section 7.2.1. Section 7.2.1.5 provides the evaluation of potential residual effects of temporary facilities on heritage resource indicators.

7.3.2 Traditional Land and Resource Use

The assessment of effects on TLRU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of TLRU is the same for all of these components.

The assessment of effects on TLRU for the Project as a whole is presented in Section 7.2.2. Section 7.2.2.5 provides the evaluation of potential residual effects of temporary facilities on TLRU indicators.

7.3.3 Social and Cultural Well-being

The assessment of effects on social and cultural well-being has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). Many potential effects are related to presence of Project workers, employment and contracting opportunities, and overall community perspectives which cannot be meaningfully disaggregated by Project component.

The assessment of effects on social and cultural well-being for the Project as a whole is presented in Section 7.2.3. Table 7.2.2-3 and accompanying discussion in Section 7.2.3.6 provide the evaluation of potential residual effects of temporary facilities on social and cultural well-being indicators.

7.3.4 Human Occupancy and Resource Use

The assessment of effects on HORU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, ancillary facilities and terrestrial portion of the Westridge Marine Terminal), as many potential human use effects are experienced in a combined manner by host communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on HORU for the Project as a whole is presented in Section 7.2.4. Table 7.2.4-3 and accompanying discussion in Section 7.2.4.6 provide the evaluation of potential residual effects of temporary facilities on HORU indicators.

7.3.5 Infrastructure and Services

The assessment of effects on infrastructure and services has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to presence of temporary

construction workforce, the transportation of workers and materials during construction, overall Project power needs, and general construction practices for pipeline crossing of linear infrastructure. Infrastructure and service effects are experienced in a combined manner by construction hub communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on infrastructure and services for the Project as a whole is presented in Section 7.2.5. Table 7.2.5-3 and accompanying discussion in Section 7.2.5.6 provide the evaluation of potential residual effects of temporary facilities on infrastructure and services indicators.

7.3.6 Employment and Economy

The assessment of effects on employment and economy has been conducted considering all the Project components in an integrated manner (*e.g.*, pipeline, pump stations, tanks, other ancillary facilities, and the Westridge Marine Terminal), since many potential effects are related to capital and operational expenditures, regional employment opportunities and contracting/procurement approaches, which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on employment and economy for the Project as a whole is presented in Section 7.2.7. Table 7.2.7-3 and accompanying discussion in Section 7.2.7.6 provide the evaluation of potential residual effects of temporary facilities on employment and economy indicators.

7.3.7 Community Health

The assessment of effects on community health has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to factors such as population movement, employment and community change which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of potential effects on community health indicators for the Project as a whole is presented in Section 7.2.8. Table 7.2.8-4 and accompanying discussion in Section 7.2.8.6 provide the evaluation of potential residual effects of temporary facilities on community health indicators.

7.4 Effects Assessment – Pump Stations

To accommodate the expansion, the Project will include construction and operations of new pump stations serving the new pipeline at 10 of the existing pump station sites at Edmonton, Gainford, Wolf, Edson and Hinton in Alberta, and at Rearguard, Blue River, Blackpool, Kamloops and Kingsvale, BC. Two new pump stations will also be constructed and operated at a new greenfield site at Black Pines, BC. In addition, the Project also involves expansion, replacement, reactivation and deactivation of pump stations as well as other associated components such as access roads and power lines. Table 7.4-1 describes the activities to be conducted at each pump station facility and whether new lands outside of the existing facility are required.

TABLE 7.4-1

PROJECT ACTIVITIES TO BE CONDUCTED AT PUMP STATION FACILITIES

Pump Station Facility	New Pump Units	Deactivation/ Reactivation	Disturbance of Previously Undisturbed Areas within Existing Fenceline	New Lands Outside of Existing Fenceline	Other Activities
Edmonton, AB	4 x 5,000 HP 1 spare 5,000 HP	No	No	No	• New scraper facilities (sending) on TMEP • New substation • New power line (to be determined by provincial regulatory authority) • Fencing
Gainford, AB	3 x 5,000 HP	No	Yes (forested lands outside existing fenceline but within existing property boundary)	No	• Upgrades to existing substation • Fencing
Niton, AB	No	Reactivation of 2 x 5,000 HP pump units	No	No	• None
Wolf, AB	2 X 5,000 HP	Deactivation	No	No	• Existing pump building will be deactivated • Fencing
Edson, AB	3 x 5,000 HP	No	No	No	• New scraper facilities (sending and receiving) on TMEP • Replace existing substation • New power line (to be determined by provincial regulatory authority) • Fencing and on-site gravel road
Hinton, AB	3 x 5,000 HP	No	No	Yes (0.3 ha of forested lands)	• New scraper facilities (sending) on TMPL • Fencing
Jasper, AB	No	No	No	No	• Relocate two existing 2,500 HP pumps from the TMX Anchor Loop pipeline to TMPL (currently deactivated) • Drag resistant agent injection facility requiring a small storage tank (with secondary containment) and high pressure injection pump
Rearguard, BC	2 x 5,000 HP	No	No	Yes (0.7 ha of disturbed lands)	• Remove scraper facilities (sending and receiving) from Hargreaves • New scraper facilities (sending and receiving) on TMPL and TMEP • Fencing and on-site gravel road
Blue River, BC	3 x 5,000 HP	Deactivation	No	No	• Existing pump building will be deactivated
Blackpool, BC	3 x 5,000 HP	No	No	No	• Upgrade existing transformer • Fencing and on-site gravel road
Darfield, BC	No	No	No	Yes (0.07 ha of agricultural land)	• New scraper facilities (receiving) on TMEP • Fencing
Black Pines, BC	2 x 2,500 HP 2 x 5,000 HP	No	No	Yes – new facility site on forested lands (2.3 ha)	• New substation to serve both lines • New scraper facilities (sending and receiving) on TMPL and TMEP • New access road approximately 5 m x 25 m • New 138 kV power line approximately 50 m x 2.2 km • Fencing and on-site gravel road
Kamloops, BC	3 x 5,000 HP 1 spare 5,000 HP	No	No	No	• New substation to serve TMEP • New scraper facilities (sending and receiving) on TMEP
Kingsvale, BC	2 x 5,000 HP	No	Yes (forested)	No	• Replace existing substation • New 138 kV power line approximately 50 m x 23.5 km • Fencing

TABLE 7.4-1 Cont'd

Pump Station Facility	New Pump Units	Deactivation/ Reactivation	Disturbance of Previously Undisturbed Areas within Existing Fenceline	New Lands Outside of Existing Fenceline	Other Activities
Sumas, BC	1 x 2,500 HP serving the Puget Sound line	No	No	No	• Upgrade existing substation
Total Number of New Pump Units: 35					

A detailed description of the Project activities at pump station facilities is provided in Section 2.0 of this volume and in Volume 2.

Using the assessment methodology described in Section 7.1, the following subsections evaluate the potential socio-economic effects arising from the Project activities at pump stations (including construction and operations of new pump units and a new pump station facility, associated power lines and reactivation and deactivation of existing pump stations).

Socio-economic elements potentially interacting with the Project activities at pump station facilities are identified in Table 7.4-2. The table also describes the rationale for those socio-economic elements which are not considered to interact with the Project activities at pump station facilities. Spatial boundaries for the assessment of pump station facilities are the same as in the applicable subsection of Section 7.2 unless otherwise noted.

TABLE 7.4-2

ELEMENT INTERACTION WITH PROJECT ACTIVITIES AT PUMP STATION FACILITIES

Element	Interaction with Pump Station Component		
	Construction	Operations[1]	Reactivation
Heritage Resources	Yes	No – surface or buried heritage resources sites, if present, would have been disturbed as a result of construction activities. Therefore, no interaction is anticipated during operations, reactivation or deactivation at pump station facilities.	
Traditional Land and Resource Use	Yes	Yes	Yes
Social and Cultural Well-being	Yes	Yes	Yes
Human Occupancy and Resource Use	Yes	Yes	Yes
Infrastructure and Services	Yes	Yes	Yes
Navigation and Navigation Safety	Yes	Yes	No – reactivation activities will not be located in, on, over, under, through or across a navigable waterway
Employment and Economy	Yes	Yes	Yes
Community Health	Yes	Yes	Yes
Human Health Risk Assessment	No – emissions from pump station construction, operations, reactivation and deactivation are not expected to affect human health.		

Note: 1 Activities during operations include maintenance activities and vegetation management (*e.g.,* weed control).

7.4.1 Heritage Resources

The assessment of effects on heritage resources has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of heritage resources is the same for all components.

The assessment of effects on heritage resources for the Project as a whole is presented in Section 7.2.1. Section 7.2.1.5 provides the evaluation of potential residual effects of pump station activities on heritage resource indicators.

7.4.2 Traditional Land and Resource Use

The assessment of effects on TLRU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of TLRU is the same for all components.

There are no instances identified through desktop analysis, TLU studies and ongoing engagement for the Project not already considered in the assessment of effects on TLRU in Section 7.2.2 whereby the potential for TLRU indicators may be uniquely affected by the construction and operations of new and expanded pump stations.

The assessment of effects on TLRU for the Project as a whole is presented in Section 7.2.2. Section 7.2.2.5 provides the evaluation of potential residual effects of pump station activities on TLRU indicators. These potential residual effects, associated mitigation measures, and significance evaluation are discussed in Section 7.2.2. Table 7.2.2-5 and accompanying discussion in Section 7.2.2.6 provide the evaluation of potential residual effects of pump station activities on TLRU indicators.

7.4.3 Social and Cultural Well-Being

The assessment of effects on social and cultural well-being has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). Many potential effects are related to presence of Project workers, employment and contracting opportunities and overall community perspectives which cannot be meaningfully disaggregated by Project component.

The assessment of effects on social and cultural well-being for the Project as a whole is presented in Section 7.2.3. Table 7.2.3-3 and accompanying discussion in Section 7.2.3.6 provide the evaluation of potential residual effects of pump station activities on social and cultural well-being indicators.

7.4.4 Human Occupancy and Resource Use

The assessment of effects on HORU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, ancillary facilities and terrestrial portion of the Westridge Marine Terminal), since many potential human use effects are experienced in a combined manner by construction hub communities, and cannot be meaningfully disaggregated by Project component from a community perspective. The assessment of effects on HORU for the Project as a whole is presented in Section 7.2.4.

This subsection highlights the potential for HORU indicators to be uniquely affected by the construction and operations new and expanded pump stations.

Effects Considerations

All but four pump station expansions will occur within the boundaries of the existing pump station property on lands already owned by Trans Mountain, thus will not extend into other potential use areas. As such, no incremental effects are anticipated on land use and, therefore, land users, associated with these facilities. The exceptions are as follows.

The expansion of Hinton Pump Station will require acquisition of new land outside existing Trans Mountain lands to the west. A total of approximately 0.3 ha of additional land will be required adjacent to the western boundary of the existing property. This is Crown land and has some level of existing disturbance due to the existing TMPL right-of-way. There is one registered trap line tenure crossed by the pump station (IHS Inc. 2012). The nearest residence is located approximately 820 m southwest of the property boundaries.

The expansion of the Rearguard Pump Station will require the acquisition of new land outside and adjacent to existing Trans Mountain lands to the east. A total of approximately 0.4 ha of additional land will be required adjacent to the eastern boundary of the existing property. The new land required is on Crown land. The Rearguard Pump Station is partially located within a placer tenure and entirely within a guide-outfitter area. The pump station is located in an Aggregate Resource area, designated by the

RDFFG Robson Valley Canoe Upstream OCP (RDFFG 2006). The Rearguard Pump Station is approximately 200 m from two commercial recreation tenures for guided freshwater recreation (Mount Robson White Water Rafting Co. Ltd. and Maligne Rafting Adventures Ltd.). There is one registered trap line tenure crossed by the pump station (IHS Inc. 2012). It is also adjacent to lands used for agricultural purposes. The VQO for the Rearguard Pump Station area are partial retention and retention. There are no residences located within 2 km of the Rearguard Pump Station.

The expansion of the Darfield Pump Station will require a small amount of land that extends beyond the existing facility site. A total of approximately 0.05 ha of additional land will be required adjacent to the northern boundary of the existing property, within the existing TMPL right-of-way. The Darfield Pump Station is located on lands in the ALR. The VQO for the Darfield Pump Station area is modification. There is one registered trap line tenure crossed by the pump station (IHS Inc. 2012). The closest residence is located 150 m south of the Darfield Pump Station.

The new Black Pines Pump Station will require a new land base of approximately 150 m x 150 m (approximately 2.3 ha) to construct the pump station and substation. Land in this area is treed (*i.e.*, previously undisturbed) and is within the ALR. The new land is privately owned, with no viewable or known structures or regular use. The VQO for the Black Pines Pump Station is partial retention. A new electrical substation rated at 15/20/25 MVA will be required, as well as a 138 kV power line (approximately 2.2 km in length) to bring power to the pump station. It is anticipated that the new line will tie into an existing power line on the east side of Highway 5, which is to the east of the Black Pines Pump Station site. The new power line route crosses the North Thompson River and then turns to the south on the west side of Westsyde Road where it intersects with the north boundary of the proposed Black Pines Pump Station site. The power line crosses approximately 1.8 km of ALR lands. The power line crosses partial retention and modification VQOs. The Black Pines Pump Station and associated power line cross two known trap line tenures (IHS Inc. 2012). The nearest residence is located 600 m south of the Black Pines Pump Station.

The Project will also require the development of additional new transmission and/or distribution infrastructure in certain areas of the Socio-economic RSA, related to the power supply needs of various pump stations and tank terminals. As discussed in Section 2.0, the other facilities that will require new power lines are: the Edmonton Terminal, the Edson Pump Station, the Kingsvale Pump Station. The details of these power lines are still under discussion with provincial electrical system operators. However, the Kingsvale Pump Station will require a new 138 kV power line, approximately 23.5 km in length. The nearest residence is located 300 m southwest of the Kingsvale Pump Station. Various land uses occur in the area. The power line crosses:

- approximately 11 km of ALR lands;
- two OGMAs for approximately 0.8 km;
- five mineral tenures for approximately 10.5 km;
- Kane Valley Road, which provides recreational access to Harrison Lake Recreation Reserve, Harmon Lake Forest Interpretive Trail and Forest, Harmon Lake West and East Recreation Sites and Kane Lake Recreation Site;
- retention, partial retention and modification VQOs;
- Highway 5A (Princeton-Kamloops Highway) near the Highway 5A-Highway 97C (Okanagan Connector) junction; and
- three known trap line tenures (IHS Inc. 2012).

Potential Residual Effects

Due to the potential for other human uses on the new lands required, the construction and operations of these select pump stations and associated power lines could contribute to overall Project effects associated with select HORU indicators discussed in Section 7.2.4.

The particular potential residual socio-economic effects on HORU indicators that could be associated with the construction and operations of pump stations and associated power lines (Table 7.2.4-2) are:

- decrease in quality of the outdoor recreational experience of Aboriginal and non-Aboriginal resource users during construction and site-specific maintenance;
- change in land use patterns during construction and operations;
- disruption of outfitting and non-traditional non-recreational trapping, hunting and fishing activities of Aboriginal and non-Aboriginal land users during construction;
- loss of forestry resources and reduction of land base for timber harvest during construction and operations (related to OGMAs);
- reduction of land base for subsurface activities during construction and operations; and
- sensory disturbance for Aboriginal and non-Aboriginal local residents and land users (from nuisance air emissions and noise) during construction and site-specific maintenance activities.

These potential residual effects, associated mitigation measures, and significance evaluation are discussed in Section 7.2.4. Table 7.2.4-3 and accompanying discussion in Section 7.2.4.6 provide the evaluation of potential residual effects of pump station activities on HORU indicators.

7.4.5 Infrastructure and Services

The assessment of effects on infrastructure and services has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities, and the Westridge Marine Terminal), since many potential effects are related to presence of temporary construction workforce, the transportation of workers and materials during construction, overall Project power needs, and general construction practices for pipeline crossing of linear infrastructure. Infrastructure and service effects are experienced in a combined manner by construction hub communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on infrastructure and services for the Project as a whole is presented in Section 7.2.5. Table 7.2.5-3 and accompanying discussion in Section 7.2.5.6 provide the evaluation of potential residual effects of pump station activities on infrastructure and services indicators.

The Project-related effects on power supply are driven largely by the incremental power needs of the new and expanded pump stations in Alberta and BC. As noted in Section 7.2.5.6, Trans Mountain has identified that the Project will require an additional 37.5 MW of power in Alberta, an additional 16.9 MW of power in the BC North Thompson Region, 10.8 MW of additional power in the BC Kamloops Nicola Valley Region, and a reduction of 26.3 MW of power in the BC Lower Mainland Region related to pump stations operations.

The particular potential residual socio-economic effect on infrastructure and services indicators that could be associated with the construction and operations of pump stations and associated power lines (Table 7.2.5-2) are:

- upward pressure on power supply/capacity in localized areas.

This potential residual effect, associated mitigation measures, and significance evaluation are discussed in Section 7.2.5. Table 7.2.5-3 and accompanying discussion in Section 7.2.5.6 provide the evaluation of potential residual effects of pump station activities on infrastructure and services indicators.

7.4.6 Employment and Economy

The assessment of effects on employment and economy has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities, and the Westridge Marine Terminal), since many potential effects are related to capital and operational

expenditures, regional employment opportunities and contracting/procurement approaches, which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on employment and economy for the Project as a whole is presented in Section 7.2.7. Table 7.2.7-3 and accompanying discussion in Section 7.2.7.6 provide the evaluation of potential residual effects of pump station activities on employment and economy indicators.

7.4.7 Community Health

The assessment of effects on community health has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to factors such as population movement, employment and community change which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of potential effects on community health indicators for the Project as a whole is presented in Section 7.2.8. Table 7.2.8-4 and accompanying discussion in Section 7.2.8.6 provide the evaluation of potential residual effects of pump station activities on community health indicators.

7.5 Effects Assessment – Tank Installation and Operations

Preliminary assessment indicates that to accommodate the expanded pipeline operation, the Project will require a total of 20 additional tanks ranging in shell capacities from 75,000 bbl to 400,000 bbl to accommodate the expanded pipeline operation. Further study is underway to verify the number and capacities of the new tanks that are optimal to support the expanded system. The location, number and capacity of the new tanks are identified in Table 7.5-1.

TABLE 7.5-1

PROJECT TANKS AND ASSOCIATED TERMINAL WORK

Terminal	Number of New Tanks	Disturbance of Previously Undisturbed Areas	Activities
Edmonton, Alberta	5	No	• Four new tanks will be installed (2 x 34,980 m^3 [220,000 bbl] and 2 x 63,600 m^3 [400,000 bbl]) • An existing 12,720 m^3 (80,000 bbl) tank will be dismantled and a new 11,920 m^3 (75,000 bbl) tank will be installed • Onsite access roads to each new tank • Power requirements/upgrades
Sumas, BC	1	Yes	• One new 27,820 m^3 (175,000 bbl) tank will be installed • Onsite access road to the new tank • Relocate existing power line • Clearing of treed area and grading
Burnaby, BC	14	Yes (disturbance to natural watercourse within existing fenceline)	• 14 new tanks will be installed (2 x 39,750 m^3 [250,000 bbl], 10 x 45,310 m^3 [285,000 bbl] and 2 x 53,260 m^3 [335,000 bbl]) • One 12,720 m^3 (80,000 bbl) existing tank will be dismantled and replaced by one of the 43,310 m^3 (285,000 bbl) tanks • New scraper facilities for new pipeline (receiving) and Westridge delivery lines (sending) • Power requirements/upgrades will be determined by BC Hydro • Onsite access roads to each new tank and other associated facilities

A detailed description of the proposed tank activities is provided in Section 2.0 of this volume and in Volume 2.

Using the assessment methodology described in Section 7.1, the following subsections evaluate the potential socio-economic effects arising from the construction and operations of the proposed tanks and associated terminal work.

Socio-economic elements potentially interacting with the construction and operations of the proposed tanks are identified in Table 7.5-2. The table also describes the rationale for those socio-economic

elements which are not considered to interact with proposed tank activities and associated terminal work. Spatial boundaries for the assessment of terminal facilities are the same as in the applicable subsection of Section 7.2 unless otherwise noted.

TABLE 7.5-2

ELEMENT INTERACTION WITH THE PROPOSED TANKS AND ASSOCIATED TERMINAL WORK

Element	Interaction with Proposed Tanks	
	Construction	Operations[1]
Heritage Resources	Yes	No – surface or buried heritage resources sites, if present, would have been disturbed as a result of construction activities. Therefore, no interaction is anticipated during operations of the tanks and associated terminal work.
Traditional Land and Resource Use	Yes	Yes
Social and Cultural Well-Being	Yes	Yes
Human Occupancy and Resource Use	Yes	Yes
Infrastructure and Services	Yes	Yes
Navigation and Navigation Safety	No – the proposed tanks and associated terminal work will not be located in, on, over, under, through or across a navigable waterway.	
Employment and Economy	Yes	Yes
Human Health Risk Assessment	No – construction was not included in the overall scope of the HHRA owing, in part, to the absence of supporting air quality data and the short-term nature of the emissions associated with construction. Instead, the HHRA focused on emissions that will be continuous in nature, thereby presenting the opportunity for long-term exposures.	Yes
Community Health	Yes	Yes

Note: 1 Activities during operations include maintenance activities and vegetation management (weed control).

7.5.1 Heritage Resources

The assessment of effects on heritage resources has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of heritage resources is the same for all components.

The assessment of effects on heritage resources for the Project as a whole is presented in Section 7.2.1. Section 7.2.1.5 provides the evaluation of potential residual effects of tank installation and operations on heritage resource indicators.

7.5.2 Traditional Land and Resource Use

The assessment of effects on TLRU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of TLRU is the same for all components.

The assessment of effects on TLRU for the Project as a whole is presented in Section 7.2.2. Table 7.2.2-5 and accompanying discussion in Section 7.2.2.6 provide the evaluation of potential residual effects of tank installation and operations on TLRU indicators.

7.5.3 Social and Cultural Well-Being

The assessment of effects on social and cultural well-being has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). Many potential effects are related to presence of Project workers, employment and contracting opportunities, and overall community perspectives which cannot be meaningfully disaggregated by Project component.

The assessment of effects on social and cultural well-being for the Project as a whole is presented in Section 7.2.3. Table 7.2.3-3 and accompanying discussion in Section 7.2.3.6 provide the evaluation of potential residual effects of tank installation and operations on social and cultural well-being indicators.

7.5.4 Human Occupancy and Resource Use

The assessment of effects on HORU has been conducted considering all the Project components in an integrated manner (*e.g.*, pipeline, pump stations, tanks, ancillary facilities and terrestrial portion of the Westridge Marine Terminal), as many potential human use effects are experienced in a combined manner by construction hub communities and cannot be meaningfully disaggregated by Project component from a community perspective. The assessment of effects on HORU for the Project as a whole is presented in Section 7.2.4. Table 7.2.4-3 and accompanying discussion in Section 7.2.4.6 provide the evaluation of potential residual effects of tank installation and operations on HORU indicators.

The proposed terminal expansions will take place on lands owned by Trans Mountain and will require no additional land. As such, unique land and resource use effects associated with terminal expansions are not anticipated.

7.5.5 Infrastructure and Services

The assessment of effects on infrastructure and services has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities, and the Westridge Marine Terminal), since many potential effects are related to presence of temporary construction workforce, the transportation of workers and materials during construction, overall Project power needs, and general construction practices for pipeline crossing of linear infrastructure. Infrastructure and service effects are experienced in a combined manner by construction hub communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on infrastructure and services for the Project as a whole is presented in Section 7.2.5. Table 7.2.5-3 and accompanying discussion in Section 7.2.5.6 provide the evaluation of potential residual effects of tank installation and operations on infrastructure and services indicators.

7.5.6 Employment and Economy

The assessment of effects on employment and economy has been conducted considering all the Project components in an integrated manner (*e.g.*, pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to capital and operational expenditures, regional employment opportunities and contracting/procurement approaches, which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on employment and economy for the Project as a whole is presented in Section 7.2.7. Table 7.2.7-3 and accompanying discussion in Section 7.2.7.6 provide the evaluation of potential residual effects of tank installation and operations on employment and economy indicators.

7.5.7 Community Health

The assessment of effects on community health has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to factors such as population movement, employment and community change which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of potential effects on community health indicators for the Project as a whole is presented in Section 7.2.8. Table 7.2.8-4 and accompanying discussion in Section 7.2.8.6 provide the evaluation of potential residual effects of tank installation and operations on community health indicators.

7.5.8 Human Health Risk Assessment

This subsection outlines the nature of the potential health risks to people associated with short-term and long-term exposures to the chemical emissions from the additional tanks to be installed at the existing Edmonton, Sumas and Burnaby terminals. The Screening Level Human Health Risk Assessment (HHRA) was performed step-wise following a conventional risk assessment paradigm. The paradigm is recognized world-wide, and has been accepted by a number of leading federal and provincial regulatory health authorities, including Health Canada, Environment Canada, the Canadian Council of Ministers of the Environment (CCME), Alberta Health, Alberta Environment and Sustainable Resource Development (AESRD), the Alberta Energy Regulator (AER), BC Ministry of Environment (MOE), and a number of the regional health authorities. The paradigm consists of several steps, highlights of which are outlined below.

- Problem Formulation – This step is concerned with defining the scope and nature of the assessment, and setting practical boundaries on the work such that it is directed at the principal areas of concern. The step focuses on five major areas.

    1. Identification of the Project components that potentially could release chemicals into the environment in a manner that provides some opportunity for exposure of people to the chemicals.
    2. Identification of the area potentially affected by the chemical releases from the Project components or sources of interest.
    3. Identification of the specific chemicals of potential concern (COPC) released from the Project that might contribute to potential health risks.
    4. Characterization of the people who might be exposed to the COPC, with special attention directed at sensitive or susceptible individuals (*e.g.*, young children, the elderly and individuals with compromised health).
    5. Identification of all potential exposure pathways by which the people might be exposed to the COPC.

- Exposure Assessment – This step is concerned with estimating the level of exposure to the COPC that might be received via the various exposure pathways. The step often relies on one or more forms of predictive modeling to arrive at the exposure estimates, with specific reliance on air dispersion modeling in the case of chemical emissions to air. Distinction is made between exposures of a short-term (or “acute”) nature extending over a few minutes to several hours and long-term (or “chronic”) exposures lasting for several months or years, possibly up to a lifetime. (Note that the definitions of short-term and long-term for the purposes of the HHRA are different than those used for significance evaluation [Table 7.1-2]).

- Toxicity Assessment – This step is concerned with identifying and understanding the potential health effects that can be caused by each of the COPC (acting either singly or in combination), and the conditions under which the effects can occur. A principal outcome of this step is the determination of exposure limits for the COPC, which refer to the levels of exposure that would not be expected to cause health effects. The limits are typically based on guidelines, objectives or standards established by reputable government authorities responsible for the protection of public health, and incorporate a high degree of protection to accommodate vulnerable members of the population.

- Risk Characterization – This step is concerned with quantifying the potential health risks that could be presented to the local residents or general public by comparing the exposure estimates determined as part of the exposure assessment to the corresponding exposure limits identified as part of the toxicity assessment.

Details on HHRA methods, results and conclusions can be found in the Screening Level Human Health Risk Assessment of Pipeline and Facilities Technical Report of Volume 5D.

7.5.8.1 Assessment Indicators and Measurement Endpoints

For the purposes of the HHRA, the assessment indicators were people whose health might be adversely affected as a result of exposure to the chemical emissions originating from the tanks associated with the Project. The choice of assessment indicators was based on the following:

- the need to assess the potential effects of the chemical emissions on the health of people either living in the area (hereafter referred to as "residents"), or who might frequent the area for recreation or other purposes (hereafter referred to as "area users");

- the need to consider the influence of the residents' lifestyle characteristics, such as dietary patterns, on the potential chemical exposures caused by the Project, and the corresponding health risks that could be presented; and

- the need to acknowledge that the manner and degree to which people may respond to chemical exposures can vary from one individual to another due to factors like age, gender and/or health status.

The assessment indicators used for the HHRA are described below.

- Residents:

  - Aboriginal peoples – specific consideration was given to Aboriginal peoples living in the area to accommodate the unique opportunities for chemical exposures that might occur among these individuals, some of whom may practice a subsistence lifestyle, including the consumption of traditional foods such as game meat, fish and wild plants.

  - Non-Aboriginal people:

    - Urban dwellers – people living in an urban environment, with allowance for potential chemical exposures through the consumption of home-garden produce and fish.

    - Non-urban dwellers – people living in a rural environment, practicing an agricultural lifestyle with reliance on home-grown foodstuffs, including beef, chicken, dairy, eggs and home-garden produce.

- Area users – people who might frequent the area periodically for recreation or other purposes. Unlike the residents, it is unlikely that these individuals would remain in the area for extended periods of time, thereby precluding any reasonable opportunity for these people to be exposed to the chemical emissions on a long-term basis and/or through the consumption of locally grown or harvested foodstuffs.

The measurement endpoints for the HHRA refer to the potential adverse health effects that could result from exposure of residents and area users to the COPC originating from the tank terminals. The assessment required consideration of the toxic properties of the chemicals and the amount, frequency and duration of the exposure to the chemicals that people in the area might experience.

Distinction was made between the potential health risks to the indicators (residents and area users) on the basis of:

- the length of exposure (*i.e.,* short-term exposures lasting several hours to a few days versus long-term exposures lasting for several months or years, possibly up to a lifetime). The emissions associated with the tanks will be continuous in nature and will extend over the more than 50-year life of the Project, thereby presenting opportunity for both short-term and long-term exposure. For the purposes of the HHRA, the potential health risks associated with short-term and long-term exposure were referred to as acute and chronic health risks, respectively;

- the pathway of exposure (*i.e.,* the avenue(s) by which the residents and/or area users might be exposed to the chemical emissions from the tanks). Since the chemicals will be emitted directly into the air, the primary pathway by which people could be exposed is via inhalation (*i.e.,* breathing in

chemicals). Exposure through secondary pathways also could occur and needs to be evaluated as part of the HHRA. For example, the chemicals might fall-out or deposit from the air onto the ground and enter the so-called food chain (*i.e.,* deposition of the chemicals directly onto the leafy surfaces of vegetables or other home-garden produce and/or deposition onto soils, with subsequent uptake by plants through the root system). The affected foods could then be consumed by people (*i.e.,* a secondary pathway). As a further example, children might inadvertently ingest soil affected from the deposition of the chemicals from the air through normal hand-to-mouth behaviour (*i.e.,* another secondary pathway). More than one secondary pathway of exposure may be involved; and

- the assessment indicator (*i.e.,* residents versus area users). Both indicators could theoretically be exposed to the emissions from the tanks via inhalation on a short-term basis. However, opportunity also exists for the residents to be exposed to the emissions on a longer-term basis through multiple pathways, including inhalation and/or secondary pathways (*e.g.,* consumption of home-grown produce, consumption of game meat).

The assessment indicators and measurement endpoints evaluated as part of the HHRA are specified in Table 7.5.8-1 below.

TABLE 7.5.8-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR THE HUMAN HEALTH RISK ASSESSMENT

HHRA Indicator		Measurement Endpoint	Rationale
Residents	Aboriginal Peoples	• Adverse health effects associated with short-term and long-term inhalation of the COPC, as well as long-term exposures to the COPC through multiple pathways.	The selection of indicators and measurement endpoints was guided by information contained in the NEB *Filing Manual* as well as guidance provided by Alberta Health, BC MOE, Health Canada and CCME. Specific consideration was given to the human health-related concerns identified through the various Aboriginal engagement and stakeholder consultation activities.
	Urban Dwellers		
	Non-Urban Dwellers		
Area Users		• Adverse health effects associated with short-term inhalation of the COPC.	

7.5.8.2 Spatial Boundaries

The spatial boundaries for the HHRA took into account:

- the predicted spatial extent of the chemical emissions from the tank terminals; and
- the locations of communities, including Aboriginal communities, surrounding the existing tank terminals.

The spatial boundaries were defined in terms of a HHRA LSA and an Air Quality RSA, as described below.

- HHRA LSA: the area in the immediate vicinity of the existing tank terminals where exposure to the chemical emissions from the tanks might be expected to occur. The HHRA LSA represents the predicted spatial extent of the chemical emissions from the additional tanks to which people might be exposed. Separate HHRA LSAs applied to each of the existing tank terminals, extending over a 5 km radius centred on each terminal.
- Air Quality RSA: the area specified in the air quality assessment (see the Air Quality and Greenhouse Gas Technical Report of Volume 5C) extending beyond the HHRA LSA where other activities could directly or indirectly influence air quality within the HHRA LSA on a cumulative basis, and potentially

contribute to cumulative effects on human health. Separate Air Quality RSAs apply to each of the existing tank terminals, comprising of a 24 km x 24 km area centred on each terminal. The exception is the combined Air Quality RSA for the Burnaby Terminal and the Westridge Marine Terminal because of their close proximity to one another (*i.e.*, less than 3 km apart).

Figures 7.5.8-1 through 7.5.8-3 show the spatial boundaries of the HHRA in relation to the three existing tank terminals (*i.e.*, Edmonton, Sumas and Burnaby).

TRANS MOUNTAIN

FIGURE 7.5.8-1

HUMAN HEALTH STUDY AREA BOUNDARIES FOR EDMONTON TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal Property Boundary
- Air Quality RSA
- Edmonton Terminal HHRA Local Study Area (5 km Buffer)
- Highway
- Paved Road
- Railway
- Village / Hamlet / Community
- City / Town
- Indian Reserve / Métis Settlement
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 12N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; B/W & Colour Imagery: 2005-2011 provided by KMC, 2012, NASA, 2005, ESRI, 2013; Existing Infrastructure: IHS Inc., 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010, IHS Inc., 2011; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012.

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DATE: December 2013	TERA REF.: 7894	REVISION: 0
SCALE: 1:100,000	PAGE SIZE: 11x17	DISCIPLINE: HEA
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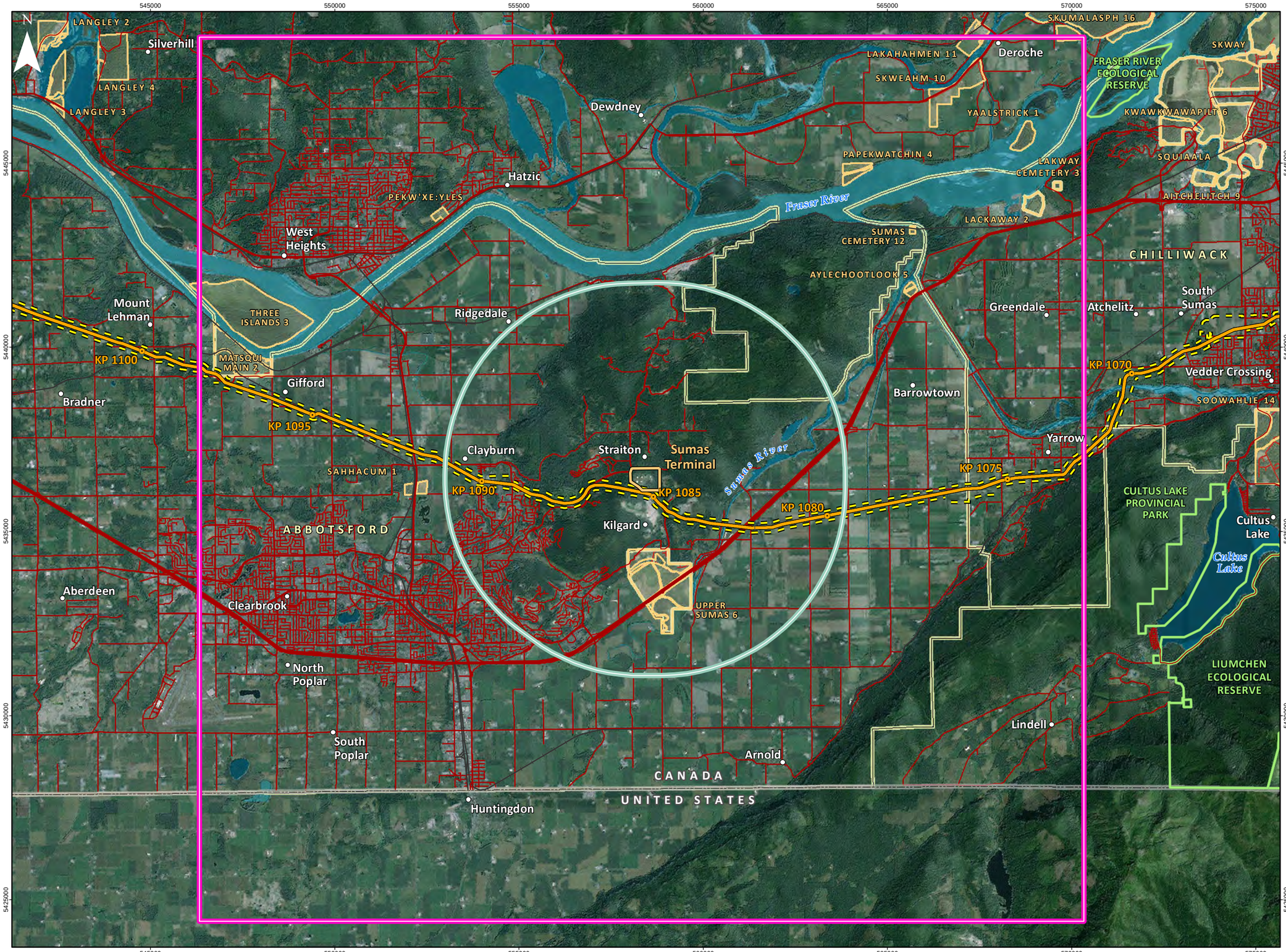

TRANS MOUNTAIN

FIGURE 7.5.8-2

HUMAN HEALTH STUDY AREA BOUNDARIES FOR SUMAS TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal Property Boundary
- Air Quality RSA
- Sumas Terminal HHRA Local Study Area (5 km Buffer)
- Village / Hamlet / Community
- Highway
- Paved Road
- Railway
- International Boundary
- City / Town
- Indian Reserve / Métis Settlement
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; B/W & Colour Imagery: 2005-2011 provided by KMC, 2012, NASA, 2005, ESRI, 2013 - Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community; Existing Infrastructure: IHS Inc., 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010, IHS Inc., 2011; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012.

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0 1 2 3 4 km

ALL LOCATIONS APPROXIMATE

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TRANS MOUNTAIN

FIGURE 7.5.8-3

HUMAN HEALTH STUDY AREA BOUNDARIES FOR BURNABY TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal Property Boundary
- Air Quality RSA
- Burnaby Terminal HHRA Local Study Area (5 km Buffer)
- Village / Hamlet / Community
- Highway
- Paved Road
- Railway
- City / Town
- Indian Reserve / Métis Settlement
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; B/W & Colour Imagery: 2005-2011 provided by KMC, 2012, NASA, 2005,Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community; Existing Infrastructure: IHS Inc., 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010, IHS Inc., 2011; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012.

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DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

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ALL LOCATIONS APPROXIMATE

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7.5.8.3 HHRA Context

This subsection outlines the current health status of people residing in each of the three Air Quality RSAs (*i.e.,* Edmonton, Sumas and Burnaby), with the information consisting of population-based health statistics compiled by several Canadian health agencies from comprehensive health care data collected by health authorities in Alberta and BC. The information served as a benchmark for assessing the potential health effects that might occur among people in these regions from exposure to the chemical emissions from tank terminals. It represents one of several benchmarks that were examined as part of the HHRA. The baseline health status is described principally in terms of two endpoints, namely cancer and respiratory health, since these indices have been identified as two of the more commonly-cited health concerns and they are among the most relevant endpoints for assessing the potential effects of exposures to COPC emissions. The information presents an overall picture of the general health of the population residing in the Air Quality RSAs in relation to the two endpoints of interest.

The Air Quality RSA for the Edmonton Terminal is located in the Edmonton Health Zone of Alberta Health Services (AHS). The Edmonton Health Zone serves the City of Edmonton and the surrounding capital region. It extends north from Edmonton to the municipality of Redwater, east to Fort Saskatchewan, west to the municipality of Kapasiwin, and south to the municipalities of Thorsby and Leduc.

The Air Quality RSAs within BC are located within two health authorities that operate under the auspices of the BC Ministry of Health (BC MOH). These include the Fraser Health Authority (FHA) and the Vancouver Coastal Health Authority (VCHA). A limitation of using the population-based health statistics compiled by these health authorities is that the geographical coverage of the health regions extends well beyond the Air Quality RSAs. However, the information obtained from the health authorities is still considered representative of the health status of people residing within the Air Quality RSAs because many of the communities that fall inside the health regions are comparable to those located in the RSAs. When available, sub-regional data for the Health Service Delivery Areas (HSDAs) that better represent the Air Quality RSAs were obtained and summarized.

The Air Quality RSA for the Sumas Terminal is located within the health region of the FHA. The FHA extends south to the BC/US border, north to the municipality of Lytton, west toward the municipalities of Burnaby and Delta, and east past the municipality of Hope. On a sub-regional basis, the relevant HSDA is the Fraser East HSDA, which makes up the largest portion of the FHA. The Sumas Terminal is located in the southwest portion of the HSDA.

The Air Quality RSA for the Burnaby Terminal is located within the health regions of both the FHA and VCHA, each of which extends over a large geographical area. The majority of the Air Quality RSA is located in the FHA, specifically in the southeast corner of the Fraser North HSDA. A very small portion of the Air Quality RSA is located within the North Shore/Coast Garibaldi HSDA of the VCHA.

Table 7.5.8-2 presents region-specific health statistics for health endpoints considered to be particularly relevant for assessing the potential health effects that can result from COPC exposures from Project-related tank terminals emissions. These endpoints include certain cancers and other chronic conditions, notably chronic respiratory illnesses. It is important to note that all these conditions arise from a complex combination of genetics, lifestyle, ethnicity, environment and other factors such as age and gender.

TABLE 7.5.8-2

RATES OF SELECT HEALTH CONDITIONS

Health Authorities	Edmonton Health Zone	Alberta	Fraser		Vancouver Coastal	British Columbia
Health Service Delivery Areas			Fraser East HSDA	Fraser North HSDA	North Shore/Coast Garibaldi	
Population Profile[1]						
Population	1,192,158	3,813,807	286,785		616,412	668,690

TABLE 7.5.8-2 Cont'd

Health Authorities / Health Service Delivery Areas	Edmonton Health Zone	Alberta	Fraser		Vancouver Coastal	British Columbia
			Fraser East HSDA	Fraser North HSDA	North Shore/Coast Garibaldi	
Health Conditions[2]						
Bladder cancer incidence (A-S per 100,000)	--	--	17.5		14.1	18.7
Bladder cancer mortality (A-S per 100,000)	--	--	4.7		3.6	4.6
Lung cancer incidence[3] (A-S per 100,000)	52.6	50.9	49.0	53.8	47.5	48.8
Lung cancer mortality[4]	41.5	38.5	37.1		28.1	37.5
Liver cancer incidence (A-S per 100,000)	--	M 6.0	4.1		6.8	4.8
Liver cancer mortality (A-S per 100,000)	--	M 4.0	1.9		3.9	2.2
Leukemia incidence (A-S per 100,000)	--	13	12.3		11.2*	11.6
Leukemia mortality (A-S per 100,000)	--	4	4.4		4.6	4.7
Ischemic heart disease death rate[4] (A-S per 100,000)	M 152.0 F 82.4	M 156.9 F 91.9	M 105.4 F 63.2	M 110.7 F 65.9	M 94.7 F 48.6	M 99.7 F 51.0
Asthma[5] (%)	9.4	9.0	9.4	6.5	7.6	7.5
Bronchitis, emphysema and asthma deaths[4] (A-S per 100,000)	--	2.3	3.2	2.4	1.7	2.8
COPD[5] (%)	3.8	3.4	6.6	2.4	--	3.8

Modified from the Community Health Technical Report of Volume 5D.

Sources: Alberta Health Services 2012, BC Cancer Agency 2011, Government of Alberta 2013, Statistics Canada 2013

Notes:

A-S = Age-Standardized

COPD = Chronic Obstructive Pulmonary Disorder

M = male

F = female

-- = No data available

1 Data were available for year 2011

2 Data were available for year 2009

3 Data were available for years 2007-2009

4 Data were available for years 2005-2007

5 Data were available for year 2009-2010

7.5.8.4 Potential Effects and Mitigation Measures

The HHRA evaluated the potential health risks to people associated with short-term and long-term exposures to the chemical emissions from the additional tanks to be installed at the existing Edmonton, Sumas and Burnaby terminals. The chemical emissions inventory for tank terminals consisted principally of lighter-end, volatile and semi-volatile hydrocarbons (C1 to C12), including both aliphatic and aromatic constituents. The latter constituents included BTEX (benzene, toluene, ethylbenzene and xylenes) as well as polycyclic aromatic hydrocarbons (PAHs). Trace amounts of sulphur-containing chemicals made up the remainder of the COPC. The HHRA was completed using a series of conservative assumptions reflecting worst-case circumstances, which collectively contributed to an exposure that is strictly hypothetical in nature, with a low probability of occurrence. In particular, the HHRA assumed that people

would be found on both a short-term and long-term basis at the location within the HHRA LSA corresponding to the "maximum point of impingement" (MPOI). The MPOI refers to the location at which the highest air concentrations of each of the COPC would be expected to occur, and at which the exposures received by the people within the HHRA LSA would be greatest. The choice of the MPOI location was meant to ensure that any potential health effects that could result from exposure to the chemical emissions associated with the Project, regardless of where people might be exposed, would not be underestimated. The decision to use the MPOI to represent the location at which people would be found was made by default; that is, consideration was not given as to whether or not the MPOI location was suitable for a permanent residence and/or for residents to obtain their entire complement of locally grown or harvested foodstuffs (including home-garden produce, beef, chicken, dairy, eggs, game meat, fish and wild plants) from the local area.

The results of the HHRA revealed that, despite the conservative assumptions employed, the maximum predicted levels of exposure to the COPC (acting either singly or in combination) remained below the levels of exposure that would be expected to cause health effects. In the majority of cases, the exposure levels were well below those associated with health effects. Adverse health effects would, therefore, not be expected among either the residents or area users from exposure to the emissions of the COPC from the additional tanks at the Edmonton, Sumas and Burnaby terminals.

7.5.8.5 Summary

Adverse health effects are not expected as a result of the COPC emissions from the additional tanks at the Edmonton, Sumas and Burnaby terminals.

7.6 Effects Assessment – Westridge Marine Terminal Expansion and Operations

Using the assessment methodology described in Section 7.1, the following subsections evaluate the potential socio-economic effects associated with the construction and operations of the Westridge Marine Terminal component of the Project. Socio-economic elements potentially interacting with construction and operations of the Westridge Marine Terminal are identified in Table 7.6-1.

TABLE 7.6-1

ELEMENT INTERACTION WITH THE PROPOSED WESTRIDGE MARINE TERMINAL COMPONENT

Element	Interaction with Westridge Marine Terminal Component	
	Construction	Operations[1]
Heritage Resources	Yes	No – surface or buried heritage resources sites, if present, would have been disturbed as a result of construction activities. Therefore, no interaction is anticipated during operations of the Westridge Marine Terminal.
Traditional Land and Resource Use/Traditional Marine Resource Use	Yes	Yes
Social and Cultural Well-Being	Yes	Yes
Human Occupancy and Resource Use	Yes	Yes
Infrastructure and Services	Yes	Yes
Navigation and Navigation Safety	Yes	Yes
Employment and Economy	Yes	Yes
Human Health Risk Assessment	No – construction was not included in the overall scope of the HHRA owing, in part, to the absence of supporting air quality data and the short-term nature of the emissions associated with construction. Instead, the HHRA focused on emissions that will be continuous in nature, thereby presenting the opportunity for long-term exposures.	Yes
Community Health	Yes	Yes

Note: 1 Activities during operations include loading and unloading operations, vegetation management, storage of jet fuel and spill response capabilities.

The potential socio-economic effects associated with the Westridge Marine Terminal, as well as the accompanying proposed mitigation and enhancement measures and resulting residual effects are presented in the following subsections for each socio-economic element. In addition, the evaluation of significance using the criteria presented in Table 7.1-2 for the residual effects associated with the applicable socio-economic elements is also provided.

7.6.1 Heritage Resources

The assessment of effects on heritage resources has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of heritage resources is the same for all components, whether on land or in a marine environment.

The assessment of effects on heritage resources for the Project as a whole is presented in Section 7.2.1. Section 7.2.1.5 provides the evaluation of potential residual effects of the construction and operations of the Westridge Marine Terminal on heritage resource indicators.

7.6.2 Traditional Land and Resource Use

This section describes the potential effects of the construction and operations of the Westridge Marine Terminal primarily on marine-based traditional resource use. The terrestrial (onshore) activities associated with the construction and operations of the Westridge Marine Terminal and its effect on TLRU, is discussed in an integrated manner for the Project as a whole in Section 7.2.2, with the exception of the marine component. This subsection does consider the unique potential for traditional marine resource use (TMRU) effects associated with the construction of the expanded facilities.

7.6.2.1 Assessment Indicators and Measurement Endpoints

Table 7.6.2-1 summarises the assessment indicators, measurement endpoints and the rationale for their selection. The indicators selected represent components of the marine environment that are of particular value or interest to Aboriginal communities. The indicators have been selected based on feedback from Aboriginal communities and regulatory authorities and were refined based on this feedback to reflect the components valued by traditional resource users, which are often holistic in nature and span both the biophysical and social disciplines. Potential Project-related effects on TMRU are linked to the biophysical elements (*e.g.,* marine fish, marine mammals and marine birds) and this assessment of TMRU relies in part on the results of the assessment of the relevant biophysical elements.

The measurement endpoints used to assess the effects of the Westridge Marine Terminal expansion on the indicators include quantitative and qualitative parameters, chosen based on available biophysical and socio-economic information, and a review of other assessments of similar projects.

TABLE 7.6.2-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR TRADITIONAL LAND AND RESOURCE USE RELATED TO THE CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL

Traditional Land and Resource Use Indicator	Measurement Endpoints	Rationale for Indicator Selection
Traditional Marine Resource Use	• Subsistence activities and sites • Cultural sites	The selection of indicators and measurement endpoints reflect the NEB *Filing Manual* (2013a) requirements for traditional land and resource use in Table A-3 and considered key issues and interests identified during Aboriginal and stakeholder engagement.

TMRU is a unique indicator for the assessment of TLRU effects for the Westridge Marine Terminal, which is not discussed in the assessment of the proposed pipeline and facilities. This is due to the fact that the only marine interface related to the Project occurs at the Westridge Marine Terminal. The discussion of TMRU in this subsection pertains only to the construction and direct operation of the expansion at the Westridge Marine Terminal, and it is assessed as a single indicator in which all four measurement endpoints are discussed.

Although legislation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in Volume 8A in accordance with the NEB's direction from their List of Issues for the Project, released on July 29, 2013. TMRU effects related to marine transportation) are discussed separately in Volume 8A, as a stand-alone element within that ESA. In Volume 8A, TMRU is assessed by several measurement endpoints, including hunting, fishing, plant gathering, travelways, gathering places and sacred areas. Full details can be found in the Traditional Marine Resource Use – Marine Transportation Technical Report of Volume 8B.

7.6.2.2 Spatial Boundaries

The spatial boundaries used in the assessment of marine-based effects associated with the construction and operations of the Westridge Marine Terminal on TLRU (Figure 5.2-1) considered one or more of the following areas:

- a Footprint Study Area of activities at the Westridge Marine Terminal (as defined in Section 7.1.3);
- a Marine TLRU LSA; and
- a Marine TLRU RSA.

For the marine component of the Westridge Marine Terminal, the spatial boundary of the Marine TLRU LSA encompasses and extends beyond the Footprint to include the zones of influence of air emissions, acoustic environment, marine fish and fish habitat, marine mammals and marine birds since TLRU is dependent on these resources (Table 7.6.2-2). The Marine TLRU LSA is the area where there is a reasonable potential for localized Project-related effects to affect existing uses of the land for traditional purposes. The potential effects of the Project are primarily assessed within the Footprint and the Marine TLRU LSA.

The spatial boundary for the Marine TLRU RSA is the area where the direct and indirect influences of other land uses and activities could overlap with Project-related effects and cause cumulative effects on the TLRU indicators. The Marine TLRU RSA includes the RSA boundaries of air emissions, acoustic environment, marine fish and fish habitat, marine mammals and marine birds (Table 7.6.2-2). This includes the area of Burrard Inlet east of the First Narrows, including Indian Arm and Port Moody Arm.

TABLE 7.6.2-2

INPUTS TO MARINE TRADITIONAL LAND AND RESOURCE USE STUDY AREA BOUNDARIES

Resource Component	Local Study Area	Regional Study Area	ESA Reference
Air Emissions	--	Consists of a 24 km x 24 km radius of a the Westridge Marine Terminal.	Section 7.2.4 of Volume 5A
Acoustic Environment	Extends 1.5 km from the fenceline or Footprint of the Westridge Marine Terminal.	Potential effects on human receptors are not anticipated to extend beyond the Acoustic Environment LSA; however, cumulative effects from other energy-related noise sources could occur within a 1.5 km radius of the other developments energy-related noise sources so an RSA of 5.0 km is considered.	Section 7.2.6 of Volume 5A
Marine Fish and Fish Habitat	The ZOI likely to be affected by construction and operations of the Westridge Marine Terminal, defined as the area within 500 m of the proposed water lease expansion	The area where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on marine fish and fish habitat. This includes the area of Burrard Inlet east of the First Narrows, including Indian Arm and Port Moody Arm.	Section 6.2 of Volume 5A
Marine Mammals	The ZOI likely to be affected by construction and operations of the Westridge Marine Terminal, defined as the area within 500 m of the proposed water lease expansion	The area where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on marine mammals. This includes the area of Burrard Inlet east of the First Narrows, including Indian Arm and Port Moody Arm.	Section 6.2 of Volume 5A
Marine Birds	The ZOI likely to be affected by construction and operations of the Westridge Marine Terminal, defined as the area within 300 m of the proposed water lease expansion	The area where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on marine birds. This includes the area of Burrard Inlet east of the First Narrows, including Indian Arm and Port Moody Arm.	Section 6.2 of Volume 5A

7.6.2.3 Traditional Marine Resource Use Context

Since April 2012, Trans Mountain has engaged with Aboriginal communities and Aboriginal groups to provide comprehensive information about and seek feedback on the Project and to identify anticipated impacts of the Project on their assertion of Aboriginal rights and title governing traditional and cultural use of the land along the proposed pipeline corridor to maintain a traditional lifestyle. As discussed in Section 7.2.2.3, 62 communities have been identified as having an interest in the Project or having interests potentially affected by the Project. Of these 62 communities, the following nine inlet communities have been identified as having an interest in the Westridge Marine Terminal or having interests potentially affected by the expansion of the Westridge Marine Terminal:

- Métis Nation British Columbia;
- Semiahmoo First Nation;
- Katzie First Nation;
- Kwikwetlem First Nation;
- Qayqayt First Nation;
- Tsleil-Waututh Nation;
- Squamish First Nation;
- Musqueam First Nation; and
- Tsawwassen First Nation.

Traditional marine resource use studies (TMRU studies) were initiated for the Project in 2012 and are ongoing. Participation in the TMRU studies, either as TERA-facilitated or community directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies (see Section 5.2). The Project scope, timetable and location were discussed. Project information packages, which included a Project description, facts on the nature, timing, scope and location of the Project and relevant contact information for communication with Trans Mountain and TERA, were sent to each community and meetings were subsequently scheduled. Communities were also provided with copies of the proposed TMRU study methods and a draft outline of TERA's TMRU study work plan. Participation in the TMRU studies, either as TERA-facilitated or community directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies.

Trans Mountain provided funding to assist Aboriginal communities that elected to conduct their own community directed TMRU studies. These communities often engaged other consultants to provide technical support and assistance with their TMRU studies for the Project (see Section 5.2).

Semiahmoo First Nation is currently conducting an independent TLU/TMRU study for the Project. To date, preliminary interests were identified to Trans Mountain by Semiahmoo First Nation that include:

- potential for spills within Semiahmoo First Nation's traditional territory, which could eliminate any traditional or cultural fishing;
- potential effects to land and water and in particular the ability to practice their traditions and culture; and
- potential effects to traditional fishing and shellfish gathering sites.

Trans Mountain continues to engage with Aboriginal communities and will continue to facilitate TMRU studies with interested communities. The results from ongoing TMRU studies will be provided to the NEB as completed.

A detailed summary of Trans Mountain's engagement activities with each potentially affected Aboriginal community is provided in Volume 3B and Appendix A of Volume 3B.

For further details on the marine resource use context, refer to the TLRU Setting in Section 5.2, the Traditional Land and Resource Use Technical Report of Volume 5D and the Traditional Marine Resource Use – Marine Transportation Technical Report of Volume 8B.

7.6.2.4 Potential Effects and Mitigation Measures

Potential effects associated with the construction and operations activities at the Westridge Marine Terminal on the TLRU indicators are listed in Table 7.6.2-3. These interactions were based on the results of the literature review, desktop analysis, engagement with Aboriginal communities, regulatory authorities and other stakeholders (Section 3.0), and the professional experience of the assessment team.

The results of the preliminary interests identified and the literature/desktop review indicate that Aboriginal communities have historically used or presently use waters within the Marine TLRU RSA to maintain a traditional lifestyle and continue to use marine resources throughout the Marine TLRU RSA for a variety of purposes including fishing, plant gathering, navigating between land-based traditional areas and cultural pursuits (Section 5.2.6).

Potential Project-related effects on social and cultural well-being, employment and economy, community health are considered in Sections 7.2.3, 7.2.7 and 7.2.8, respectively. Potential Project-related effects on community health unique to the Westridge Marine Terminal are considered in Section 7.6.8.

The potential occurrence and associated effects of disruption of watercourse users on navigable watercourses and safety of watercourse users on navigable watercourses are discussed in Section 7.2.6.

The potential effects associated with accidents and malfunctions on socio-economic elements are provided in Section 7.9.

The potential effects associated with accidents and malfunctions on biophysical elements are provided in Volume 5A. The potential effects associated with accidents and malfunctions during marine transportation are provided in Volume 8A. The potential direct and indirect effects of an operational pipeline or marine spill are evaluated in Volumes 7 and 8A, respectively, including the risk of a spill, the anticipated spill response and the potential effects for various spill scenarios. The potential effects associated with a small spill during loading as well as a large spill scenario at Westridge Marine Terminal are provided in Volume 7.

A summary of mitigation measures provided in Table 7.6.2-3 was principally developed in accordance with Trans Mountain standards as well as industry best practices.

TABLE 7.6.2-3

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL ON TRADITIONAL LAND AND RESOURCE USE

Potential Effect	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
1. TLRU Indicator – Traditional Marine Resource Use			
1.1 Disruption of subsistence activities	Marine TLRU RSA	• Provide Aboriginal communities with the anticipated construction schedule, a minimum of two weeks prior to the commencement of construction [Section 4.0]. • Install signage (*e.g.*, Warning – Construction in the Vicinity) off shore and on shore, notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Ensure equipment is well-maintained during construction to minimize air and noise emissions [Section 7.0].	• Sensory disturbances (from noise, air emissions, lighting, visual) during construction and operations (refer to Section 7.6.4 HORU).

TABLE 7.6.2-3 Cont'd

Potential Effect	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
1.1 Disruption of subsistence activities (cont'd)	See above	• Noise abatement and construction scheduling will be considered during noise-sensitive times, to limit disruption to sensitive receptors (*i.e.*, neighbouring landowners, wildlife migratory periods, nesting birds) [Section 7.0]. • Enclose noisy equipment and use baffles, where and when feasible, to limit the transmission of noise beyond the construction site [Section 7.0]. • Vessel operators will avoid rapid acceleration to control noise [Section 8.2]. • Direct the lighting for all construction activities downward and, where feasible, positioned to avoid or reduce impact to nearby residents [Section 7.0]. • Design lighting requirements at the Westridge Marine Terminal to meet the Canada Labour Code and Transport Canada - International Ship and Port Requirements [Section 7.0]. • Use low level and low intensity lighting and reduce night lighting, when feasible [Section 7.0]. • See all other noise, light and air emissions-related mitigation measures in the Westridge Marine Terminal EPP. • See Section 7.6.9 Marine Fish and Fish Habitat for mitigation measures relevant to potential effects on marine habitat, injury and mortality. • See Section 7.6.11 Marine Mammals of Volume 5A for mitigation relevant to sensory disturbance and injury. • See Section 7.6.12 Marine Birds of Volume 5A for mitigation relevant to sensory disturbance, change in habitat quality or availability, and wildlife mortality.	• Disruption to marine access and use patterns during construction and operations (refer to Section 7.6.4 HORU). • Alteration of subsistence resources.
1.2 Disturbance of cultural sites	Marine TLRU RSA	• Provide Aboriginal communities with the anticipated construction schedule, a minimum of two weeks prior to the commencement of construction [Section 4.0]. • Install signage (*e.g.*, Warning – Construction in the Vicinity) off shore and on shore, notifying of construction activities in the area [Section 4.0]. • Work with Aboriginal communities to develop strategies to most effectively communicate the construction schedule and work areas to its members [Section 4.0]. • Ensure equipment is well-maintained during construction to minimize air and noise emissions [Section 7.0]. • Noise abatement and construction scheduling will be considered during noise-sensitive times, to limit disruption to sensitive receptors (*i.e.*, neighbouring landowners, wildlife migratory periods, nesting birds) [Section 7.0]. • Enclose noisy equipment and use baffles, where and when feasible, to limit the transmission of noise beyond the construction site [Section 7.0]. • Vessel operators will avoid rapid acceleration to control noise [Section 8.2]. • Direct the lighting for all construction activities downward and, where feasible, positioned to avoid or reduce impact to nearby residents [Section 7.0]. • Design lighting requirements at the Westridge Marine Terminal to meet the Canada Labour Code and Transport Canada - International Ship and Port Requirements [Section 7.0]. • Use low level and low intensity lighting and reduce night lighting, when feasible [Section 7.0]. • See all other noise, light and air emissions-related mitigation measures in the Westridge Marine Terminal EPP.	• Sensory disturbances (from noise, air emissions, lighting, visual) during construction and operations (refer to Section 7.6.4 HORU). • Disruption to marine access and use patterns during construction and operations (refer to Section 7.6.4 HORU).

Note: 1 Detailed mitigation measures are outlined in the Westridge Marine Terminal EPP (Volume 6D).

7.6.2.5 Potential Residual Effects

The potential residual socio-economic effects on the TLRU indicators associated with the construction and operations activities at the Westridge Marine Terminal (Table 7.6.2-3) are:

- disruption to marine access and use patterns during construction and operations;

- sensory disturbance (from noise, air emissions, lighting, visual) during construction and operations; and

- alteration of subsistence resources.

As noted by the cross-references appearing in Table 7.6.2-3, all components of the marine environment are understood to support the marine resource base and habitat conditions essential to the practice of traditional activities. As such, many potential residual effects discussed below, though presented with respect to traditional marine resource use, are assessed in consideration of all pertinent biophysical resources known or assumed to be of importance to Aboriginal communities for traditional use.

7.6.2.6 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method is considered to be the appropriate method for determining the significance of the anticipated residual socio-economic. Consequently, a qualitative assessment of TLRU was determined to be the most appropriate approach with the evaluation of significance of each of the potential residual effects relying on the professional judgment of the assessment team.

Table 7.6.2-4 provides a summary of the significance evaluation of the potential residual effects of the construction and operations activities at the Westridge Marine Terminal on TLRU. The rationale used to evaluate the significance of each of the residual effects is provided below.

TABLE 7.6.2-4

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL ON TRADITIONAL LAND AND RESOURCE USE

Potential Residual Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
1. TLRU Indicators – Traditional Marine Resource Use									
1(a) Disruption to marine access and use patterns during construction.	Neutral to negative	Marine TLRU RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
1(b) Disruption to marine access and use patterns during operations.	Neutral to negative	Marine TLRU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1(c) Sensory disturbance (from noise, air emissions, lighting, visual) during construction.	Negative	Marine TLRU RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
1(d) Sensory disturbance (from noise, air emissions, lighting, visual) during operations.	Negative	Marine TLRU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1(e) Alteration of subsistence resources.	Negative	Footprint to Marine TLRU RSA	Long-term	Periodic	Medium-term to permanent	Low to medium	High	High	Not significant
1(f) Combined effects on the traditional marine resource use indicator (1[a] to 1[e]).	Negative	Marine TLRU RSA	Long-term	Isolated to periodic	Long-term	Low to medium	High	High	Not significant

Note: 1 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

TLRU Indicator – Traditional Marine Resource Use

The following provides the evaluation of significance of potential residual effects on the traditional marine resource use indicator.

Disruption to Marine Access and Use Patterns

The construction and operation of the Westridge Marine Terminal expansion may result in changes to disruptions to marine access and use patters for traditional resource users (Table 7.6.2-4, points 1[a] and 1[b]). These potential residual effects are assessed under the parks and protected areas indicator in Section 7.6.4 HORU. The significance evaluation of these residual effects is provided in Table 7.6.4-3, points 2[a] and 2[b]. A discussion of these residual effects in Section 7.6.4.6, which includes all land and resource users provides an explanation of the rationale of the significance criteria.

Sensory Disturbance (From Noise, Air Emissions, Lighting, Visual)

The construction and operations of the Westridge Marine Terminal may result in the sensory disturbance for traditional resource users (Table 7.6.2-4, points 1[c] and 1[d]). These potential residual effects are assessed under the aesthetic attributes indicator in Section 7.6.4 HORU. The significance evaluation of these residual effects is provided in Table 7.6.4-3, points 3[b] and 3[c]. A discussion of these residual effects in Section 7.6.4.6, which includes all land and resource users provides an explanation of the rationale of the significance criteria.

Alteration of Subsistence Resources

Based on the results of effects assessments for marine mammals, marine birds and marine fish and fish habitat, alteration of subsistence resources is a potential residual effect of interactions between traditional marine resources and to Westridge Marine Terminal expansion due to loss of marine shoreline, marine riparian habitat, intertidal habitat, and subtidal habitat, sensory disturbance, injury or mortality.

Based on the preliminary interests identified to date, ongoing Project engagement and the desktop analysis, subsistence marine resources harvested are found throughout the Marine TLRU RSA, and include marine fish, shellfish and marine vegetation. Harvesting of these marine resources can occur year round throughout the Marine TLRU RSA. Key issues and concerns relevant to the Westridge Marine Terminal expansion and the alteration of subsistence resources include potential change in the resources harvested. Changes to the distribution and abundance of resources could in turn result in loss or alteration of harvesting areas, which could result in indirect effects such as harvesters having to spend more time and money to travel further for subsistence activities. While the locations of subsistence activities within the Marine RSA can be approximated based on known locations of historical harvesting areas (Section 5.2.6), the extent and current use by traditional resource users of these locations is not precisely known (Table 7.6.2-4, point 1[e]).

Mitigation measures are in place in the event any unidentified subsistence activities and land users are discovered and given that the effects assessment results for fish and fish habitat, vegetation, wetlands, and wildlife and wildlife habitat demonstrate that equivalent land use capability will be maintained by the application of the mitigation strategies described in this ESA and in the Westridge Marine Terminal EPP for the Project (Volume 6D). The results of effects assessments for marine mammals, marine birds and marine fish and fish habitat indicate that although there may be residual effects due to the construction and operations of the Westridge Marine Terminal the effects are considered to be not significant.

The impact balance of this residual effect is considered negative. The spatial boundary ranges from permanent loss of marine fish habitat within the Footprint to sensory disturbances that extend into the Marine TLRU RSA. The anticipated loss of marine fish and fish habitat will be offset through the construction of compensation/offset habitat. Specific compensation/offset measures will be determined in consultation with DFO, Aboriginal communities, local stewardship groups and other interested parties during the permitting phase of the Project (see Section 7.6.9.6 of Volume 5A).

The duration of the event causing the effects to marine resources that support traditional harvesting activities are expected to extend throughout the operational life of the Westridge Marine Terminal. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Footprint to Marine TLRU RSA – effects could extend to outside the direct area of disturbance from construction and operational facilities associated with the Terminal expansion.

- Duration: long-term – the events causing combined effects on marine resources will be initiated during construction and extend throughout operations for the operational life of the Westridge Marine Terminal.

- Frequency: periodic – the events causing combined effects on marine resources (*e.g.,* noise and activity during construction and operations) will occur intermittently but repeatedly for the operational life of the Westridge Marine Terminal.

- Reversibility: medium-term to permanent– the effects of disturbance to traditionally harvested marine resources will be dependent on each target species' sensitivities throughout the Marine TLRU RSA while localized loss of marine riparian habitat will be permanent.

- Magnitude: low to medium– the effects assessment results for marine fish and fish habitat, marine mammals and marine birds indicates that effects to traditionally harvested marine resources may be detectable and is dependent on each target species' sensitivities.

- Probability: high – the effects of disturbance to traditionally harvested marine resources will also affect traditional marine resource users.

- Confidence: high – based on Project information and the professional experience of the assessment team.

Combined Effects on Traditional Marine Resource Use

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for traditional marine resource use evaluated in Section 7.6.2.6 (Table 7.6.2-4, points 1[a] to 1[e]) are of high probability and, consequently, were considered in the evaluation of combined effects on the traditional marine resource use indicator.

The combined Project-related marine effects on traditional marine resource use are related to changes in marine access and use patterns, sensory disturbances and alterations of subsistence resources. The impact balance of the combined residual effect is considered negative. The combined residual effect is considered to be reversible in the long-term (*i.e.,* it will continue through the operations phase due to the extension of the dock and increased presence of moored tankers) and of low to medium magnitude given that the effects to traditionally harvested marine resources may be detectable and are dependent on each target species' sensitivities. The expanded dock complex will become a permanent feature of the inlet and long-term traditional resource use patterns will likely adapt over time. A summary of the rationale for all of the significance criteria of combined effects on traditional marine resource use is provided below (Table 7.6.2-4, point 1[f]).

- Spatial Boundary: Marine TLRU RSA – the combined socio-economic effects on subsistence activities and sites could occur at any point in the Marine RSA.

- Duration: long-term – the events causing combined effects on marine resources will be initiated during construction and extend throughout operations for the operational life of the Westridge Marine Terminal.

- Frequency: isolated to periodic - the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.

- Reversibility: long-term – overall, the reversibility is long-term as the combined effects may occur for the duration of the operations phase

- Magnitude: low to medium – the effects assessment results for marine fish and fish habitat, marine mammals and marine birds indicates that effects to traditionally harvested marine resources may be detectable and is dependent on each target species' sensitivities.

- Probability: high – construction activities and the expanded dock will become a feature of the marine landscape in Burrard Inlet and the combined effects to marine resources are considered to be likely to occur during the life of the Project.

- Confidence: high – this is based on Project information and the professional experience of the assessment team.

7.6.2.7 Summary

As identified in Table 7.6.2-4, there are no situations for TLRU that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of construction and operations activities of the Westridge Marine Terminal on TLRU indicators will be not significant.

7.6.3 Social and Cultural Well-Being

The assessment of effects on social and cultural well-being has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal). Many potential effects on social and cultural well-being are related to presence of Project workers, employment and contracting opportunities and associated income and community way-of-life, which cannot be meaningfully disaggregated by Project component.

The assessment of effects on social and cultural well-being for the Project as a whole is presented in Section 7.2.3. Table 7.2.3-3 and accompanying discussion in Section 7.2.3.6 provide the evaluation of potential residual effects of the construction and operations of the Westridge Marine Terminal on social and cultural well-being indicators.

7.6.4 Human Occupancy and Resource Use

This section describes the potential effects of the construction and operations of the Westridge Marine Terminal primarily on marine-based HORU. The terrestrial (onshore) activities associated with the construction and operations of the Westridge Marine Terminal and its effect on general HORU, is discussed in an integrated manner for the Project as a whole in Section 7.2.4.

The exception is potential effects related to viewsheds. This subsection does consider the unique potential for viewshed effects associated with the construction of the expanded facilities at Westridge Marine Terminal for land-based occupants. The location of the new terminal is on the shore of Burrard Inlet, which is visible from various terrestrial human use areas both in Burnaby and other shore-line locations around Burrard Inlet. As such, the potential visual effects and viewshed alteration associated with the expanded Westridge Marine Terminal is a potential effect that straddles both the marine and terrestrial environment (*i.e.*, both marine users in Burrard Inlet and land occupants with views of the Westridge Marine Terminal may experience effects).

Given the location of the Westridge Marine Terminal and its geographic context, key human resource uses for consideration in this subsection are:

- parks and protected areas (marine);

- Indian Reserves, Métis Settlements and asserted traditional territories (marine and marine access);

- aesthetic attributes; and

- marine commercial, recreational and tourism use (MCRTU).

While this subsection touches on marine Aboriginal resource use areas at a high level, effects on specific traditional marine resource use areas and use patterns are discussed in a comprehensive manner in Section 7.6.2 Traditional Land and Resource Use/Traditional Marine Resource Use.

The Socio-Economic Technical Report of Volume 5D and the Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report of Volume 8B provide information pertaining to existing conditions, as well as issues and concerns identified by stakeholders related to HORU in the areas around the Westridge Marine Terminal.

7.6.4.1 Assessment Indicators and Measurement Endpoints

Table 7.6.4-1 summarizes the assessment indicators, measurement endpoints and their rationale for HORU. The indicators selected represent components of the socio-economic environment that are of particular value or interest to Aboriginal communities, regulatory authorities, local communities, and other interested groups and individuals. The indicators have been selected based on: the NEB *Filing Manual*, experience gained during previous projects with similar conditions/potential issues; feedback from Aboriginal communities, regulatory authorities and stakeholders; feedback from participants in ESA Workshops; public issues raised through media; and the professional judgment of the assessment team.

The measurement endpoints used to assess effects of construction and operations of the Westridge Marine Terminal on the indicators include qualitative parameters because quantitative parameters are unavailable. These parameters have been chosen based on available socio-economic information and previous experience in assessing the effects of other projects.

TABLE 7.6.4-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR HUMAN OCCUPANCY AND RESOURCE USE RELATED TO THE CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL

HORU Indicators	Measurement Endpoints	Rationale for Indicator Selection
Parks and protected areas	• Parks • Other protected areas	The selection of indicators and measurement endpoints considered NEB Filing Manual requirements as outlined in Table A-3 of the Filing Manual, and key issues and interests identified during stakeholder engagement. They also considered feedback from participants in the ESA Workshops and from key government departments.
Indian Reserves, Métis Settlements and asserted traditional territories	• IRs, Métis settlements and other Aboriginal communities • Asserted Aboriginal traditional territories	
Aesthetic attributes	• Sensory disturbance • Viewshed alteration	
Marine commercial, recreational and tourism use (MCRTU)	• Commercial fishing • Marine transportation • Marine recreational use • Marine tourism use	

MCRTU is a unique indicator for the assessment of HORU effects for the Westridge Marine Terminal, which is not discussed in the assessment of the proposed pipeline and facilities. This is due to the fact that the only marine interface related to the Project occurs at the Westridge Marine Terminal. The discussion of MCRTU in this subsection pertains only to the construction and direct operation of the expansion at the Westridge Marine Terminal, and it is assessed as a single indicator in which all four measurement endpoints are discussed.

Although legislation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in Volume 8A in accordance with the NEB's direction from their List of Issues for the Project, released on July 29, 2013. In Volume 8A, MCRTU is assessed by several measurement endpoints, including commercial fishing, other marine commercial use, marine recreational use and marine tourism use. Full details can be found in the Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report of Volume 8B.

7.6.4.2 Spatial Boundaries

The spatial boundaries used in the assessment of marine-based effects associated with the construction and operations of the Westridge Marine Terminal on HORU (Figure 5.4-9) considered one or more of the following areas:

- a Footprint Study Area of activities at the Westridge Marine Terminal (as defined in Section 7.1.3);
- a Marine HORU LSA; and
- a Marine HORU RSA.

For the marine component of the Westridge Marine Terminal, the spatial boundary of the Marine HORU LSA is defined by the marine area extending 500 m from the Westridge Marine Terminal. This is the area that could be directly affected by localized, Project-specific effects of construction and operations activities. The Marine HORU LSA was established to provide adequate consideration to existing marine uses (*e.g.,* commercial, recreational, tourism) in proximity to the Westridge Marine Terminal.

The spatial boundary for the Marine HORU RSA consists of the area extending beyond the Marine HORU LSA boundary where the direct and indirect influence of other activities could overlap with Project-specific effects and cause cumulative effects on MCRTU. This includes the area of Burrard Inlet east of the First Narrows Bridge.

The spatial boundaries used in the assessment of land-based aesthetic effects associated with the construction and operations of the Westridge Marine Terminal on HORU indicators considered one or more of the following areas:

- a Footprint Study Area (as defined in Section 7.1.3); and
- the Socio-economic RSA.

The spatial boundaries associated with the Footprint and the Socio-economic RSA used for the effects assessment of land-based aesthetic effects are described in Section 7.2.3 Social and Cultural Well-Being (Figure 5.0-7 for the Socio-economic RSA in the Metro Vancouver Region). The Socio-economic RSA was selected to reflect land and resource users that could be indirectly affected by the Project (*e.g.*, residential, commercial, industrial, recreational use), specifically in terms of viewsheds.

7.6.4.3 Marine Resource Use Context

Westridge Marine Terminal is located within Burrard Inlet in the Lower Mainland of BC. The terminal is located on approximately 6.2 ha of land owned by Trans Mountain, with the exception of a small portion of land located between the railway and the shoreline, which is leased from Canadian Pacific. The water lot is leased from PMV and covers about 13.8 ha of lands underlying Burrard Inlet. Some expansion of the existing water lot is expected to be required to accommodate the expanded dock facilities.

Over one million people live in the lower mainland in the eight municipalities surrounding Burrard Inlet, namely: the cities of Vancouver, Burnaby and Port Moody on the south shore; the villages of Belcarra and Anmore on the east shore of Indian Arm and Port Moody Inlet; and the City of North Vancouver, the District of North Vancouver and the District of West Vancouver on the north shore (BIEAP 2011, Statistics Canada 2012).

The land-based facilities at the terminal are on the shoreline of the City of Burnaby, facing central Vancouver Harbour in Burrard Inlet. Marine vessel traffic in Burrard Inlet is regulated by PMV. In 2012, marine vessel traffic in the area of Burrard Inlet around the Westridge Marine Terminal included tugs, tankers, barges and other cargo vessels, service vessels, passenger vessels (such as pleasure craft and harbour cruises), and fishing vessels. Most of the traffic was due to tug transits, at 80% of the total sailed nautical miles (NM) (TERMPOL Reports of Volume 8C). West of the terminal through the First and Second Narrows, tug and ferry traffic made up about 50% and 30% respectively of total sailed NM in 2012 (TERMPOL Reports of Volume 8C).

Commercial fishing activity in Burrard Inlet mainly targets Dungeness crab, prawn and shrimp and, typically smaller vessels are used than the vessels used by commercial fishers in the Strait of Georgia. A small commercial fishery for surf smelt takes place in Burrard Inlet, mostly off spawning beaches in English Bay (DFO 2012). A Rockfish Conservation Area is located around the Westridge Marine Terminal, which is fully within the Marine HORU LSA and parts of the Marine HORU RSA. Rockfish

Conservation Areas permit certain types of fishing that are unlikely to harm rockfish populations such as fishing by seine or gillnet; trap fisheries for prawn or crab; diving for or hand-picking of invertebrates; and mid-water trawl fisheries (DFO 2013a,b). Recreational fishing is not allowed within the Narrows for safety of navigation (PMV 2010a).

There are a range of recreational use areas in the vicinity that are popular for both terrestrial and marine recreational use. The shoreline and marine areas of Burrard Inlet have high recreational use from residents and visitors, particularly in areas such as Indian Arm, which is surrounded by provincial parks and is a popular destination for boat charters, kayakers, scuba divers and fishers. There are several parks which are near the Westridge Marine Terminal that support a variety of land and water-based recreational activities including Belcarra Regional Park, Barnet Marine Park and Cates Park. Other land uses in the vicinity of the Westridge Marine Terminal include residential, commercial and industrial.

For further details on the marine resource use context, refer to the HORU Setting in Section 5.4 and the Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report of Volume 8B.

7.6.4.4 Potential Effects and Mitigation Measures

Identified Potential Effects

Potential effects associated with the construction and operations activities at the Westridge Marine Terminal on the HORU indicators are listed in Table 7.6.4-2. These interactions were based on the results of the literature review, desktop analysis, engagement with Aboriginal communities, regulatory authorities and other stakeholders (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.6.4-2 was principally developed in accordance with Trans Mountain standards as well as industry best practices.

TABLE 7.6.4-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL ON HUMAN OCCUPANCY AND RESOURCE USE

Potential Effect	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
1. HORU Indicator – Parks and Protected Areas			
1.1 Disturbance to Rockfish Conservation Areas during construction	Marine HORU LSA	• See recommended mitigation measures pertaining to fish and fish habitat in the Westridge Marine Terminal EPP.	• Disturbance to Rockfish Conservation Areas (refer to Section 7.6.8 Marine Fish and Fish Habitat of Volume 5A).
1.2 Disruption to marine access to protected areas during construction and operations	Marine HORU RSA	• Dock has been designed so that it will not interfere with existing anchorages, will remain within the east-west limits of the current water lot, and will allow the safe passing of marine traffic. • Contact stakeholders, including municipal governments and marine use organizations, prior to construction activities. Provide maps and schedules of the construction activities [Section 4.0] so that implications for marine use patterns can be considered. • Ensure any changes in the construction schedule are communicated [Section 4.0]. • Place an announcement in local papers notifying the public and marine users of the location and timing of construction activities at least 14 days prior to activities [Section 4.0]. • Discourage unauthorized marine vessel access at the Westridge Marine Terminal through use of signs, markers and/or buoys [Section 4.0]. • Place warning signs (*e.g.,* Warning – Construction in the Vicinity) offshore and onshore, near construction activities. The signs are to be legible at a distance of 50 m [Section 4.0].	• Disruption to marine access and use patterns during construction. • Disruption to marine access and use patterns areas during operations.

TABLE 7.6.4-2 Cont'd

Potential Effect	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
1.2 Disruption to marine access to protected areas during construction and operations (cont'd)	See above	• Ensure barges used for heavy equipment access are placed (anchored or spudded down) in appropriate areas with minimal impacts [Section 8.2]. • Notify appropriate regulatory authorities and licensees and/or distribute a notification to the shipping industry in order to advise commercial and recreational marine operators of the Project schedule and construction activities at the Westridge Marine Terminal [Section 4.0]. • Communicate with marine and local fishing industry organizations, Aboriginal groups, marine recreation organizations and other affected stakeholders to provide Project information related to Project activities affecting marine use areas [SEMP Section 4.10]. • Apply other measures in the EPP pertaining to marine construction.	See above
1.3 Sensory disturbance of marine users in protected areas	Marine HORU RSA	• See recommended mitigation measures in potential effect 3.2 of this table.	• Sensory disturbances (from noise, air emissions, lighting, visual) during construction and operations (refer to potential effects 3.1 and 3.2 of this table).
2. HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories			
2.1 Physical disturbance to marine Aboriginal traditional use areas	Marine HORU RSA	• See recommended mitigation measures pertaining to traditional marine resource use in the Westridge Marine Terminal EPP.	• Disturbance to marine Aboriginal traditional use areas and subsequent disruption of traditional marine resource use activities (refer to Section 7.6.2 Traditional Marine Resource Use).
2.2 Disruption to marine access and use patterns of IRs and traditional territories	Marine HORU RSA	• See recommended mitigation measures in potential effect 1.2 of this table.	• Disruption to marine access and use patterns during construction (refer to potential effect 1.2 in this table). • Disruption to marine access and use patterns areas during operations (refer to potential effect 1.2 in this table).
2.3 Disruption of traditional marine resource use activities	Marine HORU RSA	• See recommended mitigation measures pertaining to traditional marine resource use in the Westridge Marine Terminal EPP.	• Disturbance to marine Aboriginal traditional use areas, and subsequent disruption of traditional marine resource use activities(refer to Section 7.6.2 Traditional Marine Resource Use).
2.4 Sensory disturbance of marine users	Marine HORU RSA	• See recommended mitigation measures in potential effect 3.2 of this table.	• Sensory disturbances (from noise, air emissions, lighting, visual) (refer to potential effects 3.1 and 3.2 of this table).
3. HORU Indicator – Aesthetic Attributes			
3.1 Alteration of viewsheds	Marine HORU RSA Socio-economic RSA	• Dock has been designed to reduce viewshed effects on nearby residential areas.	• Alteration of viewsheds.

TABLE 7.6.4-2 Cont'd

Potential Effect	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
3.2 Sensory disturbance during construction and operations (due to increases in nuisance air emissions, noise, lighting, visual)	Marine HORU RSA Socio-economic RSA	• Contact stakeholders, including municipal governments, prior to construction activities. Provide maps and schedules of the construction activities. Ensure any changes in the construction schedule are communicated, as warranted [Section 4.0]. • Place an announcement in local papers notifying the public and marine users of the location and timing of construction activities at least 14 days prior to activities [Section 4.0]. • Schedule construction activities to be conducted within 250 m of residences, during the period from 07:00 to 20:00, during weekdays, and 09:00 to 20:00, during weekends, if feasible, as per the City of Burnaby Noise and Sound Abatement Bylaw [Section 7.0]. • Ensure equipment is well-maintained during construction to minimize air and noise emissions [Section 7.0]. • Noise abatement and construction scheduling will be considered during noise-sensitive times, to limit disruption to sensitive receptors (*i.e.*, neighbouring landowners, wildlife migratory periods, nesting birds) [Section 7.0]. • Enclose noisy equipment and use baffles, where and when feasible, to limit the transmission of noise beyond the construction site [Section 7.0]. • Vessel operators will avoid rapid acceleration to control noise [Section 8.2]. • Direct the lighting for all construction activities downward and, where feasible, positioned to avoid or reduce impact to nearby residents [Section 7.0]. • Design lighting requirements at the Westridge Marine Terminal to meet the Canada Labour Code and Transport Canada - International Ship and Port Requirements [Section 7.0]. • Use low level and low intensity lighting and reduce night lighting, when feasible [Section 7.0]. • See all other noise, light and air emissions-related mitigation measures in the Westridge Marine Terminal EPP.	• Sensory disturbance (from noise, air emissions, lighting, visual) during construction. • Sensory disturbance (from noise, air emissions, lighting, visual) during operations.
4. HORU Indicator – Marine Commercial, Recreational and Tourism Use			
4.1 Sensory disturbance for commercial, recreation and tourism users (*e.g.*, noise, lighting, visual, air quality) during construction and operations	Marine HORU RSA	• See recommended mitigation measures in potential effect 3.2 of this table.	• Sensory disturbances (*from noise, air emissions, lighting, visual*) (refer to potential effects 3.1 and 3.2 of this table). • Decrease in quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users during construction. • Decrease in quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users during operations.
4.2 Change in distribution and abundance of harvested species	Marine HORU RSA	• See recommended mitigation measures pertaining to Fish and Fish Habitat in the Westridge Marine Terminal EPP.	• Effects on marine fish and fish habitat (refer to Section 7.6.8 Marine Fish and Fish Habitat of Volume 5A).
4.3 Displacement of commercial, recreational and tourism users around Westridge Marine Terminal during construction and operations	Marine HORU RSA	• See recommended mitigation measures in potential effects 1.2 and 3.2 of this table.	• Disruption to marine access and use patterns during construction and operations (refer to potential effect 1.2 in this table).
4.4 Change in commercial, recreational and tourism vessel routing/access routes during construction and operations	Marine HORU RSA		

Note: 1 Detailed mitigation measures are outlined in the Westridge Marine Terminal EPP (Volume 6D).

7.6.4.5 Potential Residual Effects

The potential residual socio-economic effects on the HORU indicators associated with the construction and operations activities at the Westridge Marine Terminal (Table 7.6.4-2) are:

- disruption to marine access and use patterns during construction and operations;
- alteration of viewsheds;
- sensory disturbance (from noise, air emissions, lighting, visual) during construction and operations; and
- decrease in quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users during construction and operations.

7.6.4.6 Significance Evaluation of Potential Residual Effects

Table 7.6.4-3 provides a summary of the significance evaluation of the potential residual effects of the construction and operations activities at the Westridge Marine Terminal on HORU. The rationale used to evaluate the significance of each of the residual effects is provided below.

TABLE 7.6.4-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL ON HUMAN OCCUPANCY AND RESOURCE USE

Potential Residual Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
1. HORU Indicators – Parks and Protected Areas									
1(a) Disruption to marine access and use patterns during construction.	Neutral to negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
1(b) Disruption to marine access and use patterns during operations.	Neutral to negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1(c) Sensory disturbance (from noise, air emissions, lighting, visual) during construction.	Negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
1(d) Sensory disturbance (from noise, air emissions, lighting, visual) during operations.	Negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1(e) Combined effects on the parks and protected areas indicator (1[a] to 1[d]).	Negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
2. HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories									
2(a) Disruption to marine access and use patterns during construction.	Neutral to negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
2(b) Disruption to marine access and use patterns areas during operations.	Neutral to negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
2(c) Sensory disturbance (from noise, air emissions, lighting, visual) during construction.	Negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
2(d) Sensory disturbance (from noise, air emissions, lighting, visual) during operations.	Negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant

TABLE 7.6.4-3 Cont'd

Potential Residual Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
2(e) Combined effects on the Indian Reserves, Métis Settlements and asserted traditional territories indicator (2[a] to 2[d]).	Negative	Marine HORU RSA	Short-term	Isolated to periodic	Short-term	Medium	High	High	Not significant
3. HORU Indicator – Aesthetic Attributes									
3(a) Alteration of viewshed.	Negative	Marine HORU RSA, Socio-economic RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
3(b) Sensory disturbance (from noise, air emissions, lighting, visual) during construction.	Negative	Marine HORU RSA, Socio-economic RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
3(c) Sensory disturbance (from noise, air emissions, lighting, visual) during operations.	Negative	Marine HORU RSA, Socio-economic RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
3(d) Combined effects on the aesthetic attributes indicator (3[a] to 3[c]).	Negative	Marine HORU RSA, Socio-economic RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
4. HORU Indicator – Marine Commercial, Recreational and Tourism Use									
4(a) Disruption to marine access and use patterns during construction.	Neutral to negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
4(b) Disruption to marine access and use patterns areas during operations.	Neutral to negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
4(c) Sensory disturbance (from noise, air emissions, lighting, visual) during construction.	Negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
4(d) Sensory disturbance (from noise, air emissions, lighting, visual) during operations.	Negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
4(e) Decrease in quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users during construction.	Negative	Marine HORU RSA	Short-term	Isolated	Short to medium-term	Low to medium	High	High	Not significant
4(f) Decrease in quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users during operations.	Negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
4(g) Combined effects on the MCRTU indicator (4[a] to 4[f]).	Negative	Marine HORU RSA	Short-term	Isolated	Short to medium-term	Low to medium	High	High	Not significant

Note: 1 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- High magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

HORU Indicator – Parks and Protected Areas

The following provides the evaluation of significance of potential residual effects on the parks and protected areas indicator.

Disruption to Marine Access and Use Patterns

This discussion examines disruption to marine access and use patterns for all marine users, including parks and protected area users, Aboriginal traditional users, commercial, recreational and tourism users in an integrated manner. The pathways that will affect marine movements are the same of all user categories.

Construction

Access to parks, protected areas, and to Aboriginal and non-Aboriginal use areas in the Marine HORU RSA may be temporarily disrupted during construction of the Westridge Marine Terminal. It is anticipated that barges will be used to transport most construction materials related to the Westridge Marine Terminal expansion because the access road off the Barnet Highway is narrow with a steep grade and has limited capacity to manage heavy equipment vehicles, as well as to reduce road disruption or inconvenience to nearby residents and neighbourhoods. As such, during the construction phase there will be numerous barge deliveries to the Westridge Marine Terminal site towed by tugs; and tugs, barges, other vessels and booms related to expansion of the docks will be around the new dock area as it is being built.

It is anticipated that the marine facilities will be built from the water using marine derricks, and construction-related equipment may extend up to about 100 m beyond the footprint of the expanded dock (the current dock extends 75 m into Burrard Inlet and the new dock is anticipated to extend approximately 250 m into Burrard Inlet; thus, maximum marine footprint of construction activities may be approximately 350 m into Burrard Inlet). It is not anticipated that construction-related vessels and marine equipment will obstruct passage of other vessels in Burrard Inlet, given the size of the inlet passage at the terminal site. In the unlikely event that there is any potential short-term obstruction of the waterway during construction that would affect safe navigation of other vessels, this would be coordinated in advance through the PMV Harbour Master and Coast Guard. Waterway users are notified of such activities through the Canadian Coast Guard's weekly Notice to Mariners. Increased activity at the terminal during construction may factor into certain users changing their movement patterns away from areas around the terminal or minor delays for certain users.

From a recreational use perspective, marine users may be deterred from visiting a particular location, such as parks, protected areas or other recreational use areas along the southern shorelines of Burrard Inlet. For example, marinas are present in Indian Arm and Port Moody Inlet, and boaters travel west past the Westridge Marine Terminal to access other areas of Burrard Inlet and the Strait of Georgia. Boaters, kayakers and fishers travel east past the Westridge Marine Terminal to access marine areas of Indian Arm Provincial Park, Belcarra Regional Park and other regional parks in the area. Recreational fishing for Dungeness crab and other species occurs around the current dock footprint, and fishers may be prevented from accessing these areas due to the presence of construction vessels and booms. Also, dive sites across from the Westridge Marine Terminal on the north shore of Burrard Inlet may be affected by construction noise and disturbance from dredging around the new dock footprint. Therefore, an increase in marine traffic and construction activity around the Westridge Marine Terminal during construction may cause recreational users to change their behaviours and seek alternative locations for their pursuits during the construction window.

Traditional Aboriginal marine users may change their marine access and use patterns during the construction period. Aboriginal communities that have been identified as having an interest in the Westridge Marine Terminal or having interests potentially affected by the expansion of the Westridge Marine Terminal are: Métis Nation British Columbia; Semiahmoo First Nation; Katzie First Nation; Kwikwetlem First Nation; Qayqayt First Nation; Tsleil-Waututh Nation; Squamish First Nation; Musqueam First Nation; and Tsawwassen First Nation. Traditional users may be deterred from using certain parts of Burrard Inlet to navigate between land-based traditional areas. The presence of construction vessels, equipment, and sensory disturbance may also cause a disruption in traditional marine use patterns in terms of marine subsistence harvesting (*e.g.,* for fish, shellfish and marine vegetation), since Aboriginal users would avoid these disturbed areas . Any disruption to access and use patterns related to Aboriginal

marine or land-based reserves and traditional use areas could have negative implications for traditional activities (*e.g.,* fishing, collection of marine plants, hunting and trapping areas that require marine access and travel). See Section 7.6.2 for a discussion of potential alteration of subsistence resources.

Commercial users may also experience minimal delays when accessing marine terminals in Port Moody Inlet during construction. Consultation with other marine commercial users of Burrard Inlet identified concerns regarding potential effects on other marine traffic from the increased extent of the expanded dock footprint at the Westridge Marine Terminal (Moller pers. comm.). However, as noted above, it is not anticipated that construction activities would restrict marine passage by the terminal site, and waterway users are notified of such activities through the Canadian Coast Guard's weekly Notice to Mariners.

In order to lessen the potential negative effects, Trans Mountain will communicate construction activities and schedule to the marine community in Burrard Inlet which will allow other users to consider alternate movement patterns during the construction window. The potential residual effect on marine access and use patterns is considered to be neutral to negative. Construction-related delivery barges and an increased construction zone around the terminal temporarily reduce marine access channels around the Westridge Marine Terminal, but they will not constrict marine passage; waterway users will be notified of all activity in the area (neutral impact balance). There may, however, be a negative implication for recreational or traditional marine users that change their use patterns to avoid the terminal area during construction (negative impact balance). The duration of the potential effect is considered short-term, since it is caused by activities occurring during the construction phase. The frequency of the effect is isolated and the reversibility is considered short-term. The Project's effect on marine access and use patterns during construction is low to medium in magnitude, as it is considered to be primarily that of an inconvenience or nuisance (low) but may have implications for livelihood practices for some traditional or tourism marine users (medium). The probability of a the effect is high, given the location of the Westridge Marine Terminal in relation to other marine use routes and the increased use of barges and marine derricks during construction (Table 7.6.4-3, point 1[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – some marine access routes affected by construction could be located in the Footprint while the recreation, commercial or traditional use areas connected by the access routes could be located in the Footprint, Marine HORU LSA and/or Marine HORU RSA.

- Duration: short-term – disruption to marine access and use patterns would be caused by construction activities in Burrard Inlet.

- Frequency: isolated – the event causing the disruption to marine access and use is confined to a specific period (*i.e.,* specific months of construction activity).

- Reversibility: short-term – the residual effect would occur during the construction phase.

- Magnitude: low to medium – it is not anticipated that marine passage through Burrard Inlet will be obstructed during construction, but for some marine users (*e.g.*, recreational, tourism, traditional) who choose to change their movement patterns away from the terminal, there may be some may be some inconvenience or nuisance (low). There is the possibility for implications for livelihood practices for some marine users (medium).

- Probability: high – based on Project information and the location of the Westridge Marine Terminal in relation to marine vessel traffic routes in Burrard Inlet.

- Confidence: high – based on location of shipping lanes, preliminary dock design, and information on locations of popular marine use areas in relation to the Westridge Marine Terminal.

Operations

Some minor disruption to marine access and use patterns in the Marine HORU RSA during operations may occur due to the presence of the expanded dock complex at the Westridge Marine Terminal. Disruption of access during operations is likely to be focused more on recreational and traditional marine users than commercial users. The expanded dock at the Westridge Marine Terminal will be a long-term

feature that may influence certain recreational users to avoid pre-existing marine access and change their use patterns. The area around the terminal is designated as a Rockfish Conservation Area, where fishing activities that may target rockfish are prohibited, but where other fishing activities such as trap fishing are permitted. Workers at the Westridge Marine Terminal indicated that the area outside the existing docks is used by recreational crab fishers and occasional kayakers. These users may be displaced by the expanded dock footprint. In addition, the expanded docks will extend farther out into Burrard Inlet (the extension of the dock into Burrard Inlet will go from approximately 75 m currently to approximately 250 m to the outer most side of a loading vessel), which may contribute to congestion when multiple vessels are transiting through the area. This effect may be more prominent when tankers are berthed at the terminal. However, the dock has been designed specifically to not interfere with existing anchorages and to reduce its footprint on Burrard Inlet (the dock will remain within the east-west limits of the current water lot, to facilitate the safety of passing marine traffic). These design features, along with regulated access flow by PMV, will minimize any potential disruption in access for other marine users.

The impact balance of this residual effect is considered neutral to negative, and of low magnitude given the design measures to reduce its footprint and not extend into the shipping lanes. The residual effect of operations on disruption to marine access and use patterns is considered to be reversible in the long-term (*i.e.,* it will continue through the operations phase). The expanded dock will become a feature of the inlet and long-term use patterns will likely adapt over time (Table 7.6.4-3, point 1[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – marine access routes affected by operations could be located in the Footprint while the recreational, traditional, commercial or protected areas connected by the access routes could be located in the Footprint, Marine HORU LSA and/or Marine HORU RSA.

- Duration: long-term – the event causing the disruption to marine access is the operation of the Westridge Marine Terminal Including the presence of moored tankers.

- Frequency: isolated to periodic – the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential disruption to marine access.

- Reversibility: long-term – the residual effect extends throughout the operations phase.

- Magnitude: low – dock design reduces the foot print on Burrard Inlet, does not interfere with existing anchorages, and does not extend into the shipping lanes. Access patterns to protected areas in Indian Arm and commercial areas in Port Moody will resume. Only inconvenience or nuisance effects are anticipated.

- Probability: high – operations will result in the expanded dock being added to the marine landscape, as well as the presence of additional tankers at certain times.

- Confidence: high – based on Project information and knowledge of locations of marine use areas in relation to the Westridge Marine Terminal.

Sensory Disturbance (From Noise, Air Emissions, Lighting, Visual)

The construction and operations of the Westridge Marine Terminal may result in the sensory disturbance for park and protected area users. The significance evaluation of these residual effects is provided in Table 7.6.4-3 (points 1[c] and 1[d]). A discussion of these residual effects under the aesthetic attributes indicator (points 3[b] and 3[c]), which includes users of parks and protected areas as well as several other marine user types, provides an explanation of the rationale of the significance criteria.

Combined Effects on Parks and Protected Areas

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for parks and protected areas evaluated in Section 7.6.4.6 (Table 7.6.4-3, points 1[a] to 1[d]) are of high probability and, consequently, were considered in the evaluation of combined effects on the parks and protected areas indicator.

The combined Project-related marine effects on parks and protected areas are related to changes in marine access to parks and protected areas and sensory disturbances those accessing parks and protected areas via Burrard Inlet passing by the Westridge Marine Terminal. The impact balance of the combined residual effect is considered negative, but low in magnitude. The combined residual effect is considered to be reversible in the long-term (*i.e.,* it will continue through the operations phase due to the extension of the dock and increased intermittent presence of moored tankers). The expanded dock complex will become a permanent feature of the inlet and long-term recreational use patterns will likely adapt over time (Table 7.6.4-3, point 1[e]). A summary of the rationale for all of the significance criteria of combined effects on parks and protected areas is provided below.

- Spatial Boundary: Marine HORU RSA – parks and protected areas with potentially disrupted marine access routes are located in various locations or the Marine HORU RSA.
- Duration: long-term – some changes in marine use patterns immediately around the dock and sensory disturbance may remain during operations.
- Frequency: isolated to periodic - the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.
- Reversibility: long-term – the residual effect extends throughout the operations phase.
- Magnitude: low – change will be detectable but is considered primarily that of an inconvenience or nuisance.
- Probability: high – the described potential effects on marine parks and protected areas users are likely to occur.
- Confidence: high – based on information about the Project, knowledge of marine use areas and the professional experience of the assessment team.

HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories

Disruption to Marine Access and Use Patterns

The construction and operations of the Project may result in the disruption to marine access and use patterns in terms of accessing IRs and asserted traditional territories. The significance evaluation of these residual effects is provided in Table 7.6.4-3 (points 2[a] and 2[b]). A discussion of these residual effects under the parks and protected areas indicator (points 1[a] and 1[b]), which includes IRs and asserted traditional territories, provides an explanation of the rationale of the significance criteria.

Sensory Disturbance (From Noise, Air Emissions, Lighting, Visual)

The construction and operations of the Project may result in the sensory disturbance for Aboriginal and non-Aboriginal residents and marine users. The significance evaluation of these residual effects is provided in Table 7.6.4-3 (points 2[c] and 2[d]). A discussion of these residual effects under the aesthetic attributes indicator (points 3[b] and 3[c]), which includes users of IRs and asserted traditional territories as well as several other user types, provides an explanation of the rationale of the significance criteria.

Combined Effects on Indian Reserves, Métis Settlements and Asserted Traditional Territories

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for IRs and asserted traditional territories evaluated in Section 7.6.4.6 (Table 7.6.4-3, points 2[a] to 2[d]) are of high probability and, consequently, were considered in the evaluation of combined effects on the IRs, Métis Settlements and asserted traditional territories indicator.

The combined Project-related marine effects on IRs and asserted traditional territories are related to changes in marine access and sensory disturbances for Aboriginal users accessing IRs and traditional use areas via Burrard Inlet. It also considers direct disturbance to, or change in access to, marine traditional use areas in Burrard Inlet that are used for marine harvesting (*e.g.*, fishing, shellfish collection

and collection of marine vegetation). Harvesting of these marine resources can occur year round throughout the Marine TLRU RSA. Aboriginal communities that have been identified as having an interest in the Westridge Marine Terminal or having interests potentially affected by the expansion of the Westridge Marine Terminal are: Métis Nation British Columbia; Semiahmoo First Nation; Katzie First Nation; Kwikwetlem First Nation; Qayqayt First Nation; Tsleil-Waututh Nation; Squamish First Nation; Musqueam First Nation; and Tsawwassen First Nation.

The impact balance of the combined residual effect is negative. The combined residual effect is considered to be reversible in the short-term (*i.e.,* it will cease after construction); the longer-term implications of the operations of the dock are considered negligible, given the design features of the dock expansion to allow the safety passage of traffic and reduce its footprint in Burrard Inlet. The expanded dock will become a permanent feature of the inlet and long-term traditional use patterns will likely adapt over time. The overall effect is considered of medium magnitude as changing use patterns, even in the short-term, could have implications for traditional livelihood practices (Table 7.6.4-3, point 2[e]). A summary of the rationale for all of the significance criteria of combined effects on IRs and asserted traditional territories is provided below.

- Spatial Boundary: Marine HORU RSA – IRs and asserted traditional territories with potentially disrupted marine access routes are located in various locations or the Marine HORU RSA.
- Duration: short-term – effects are primarily related to construction phase activity in Burrard Inlet.
- Frequency: isolated to periodic - the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.
- Reversibility: short-term – the effect will occur primarily during construction; the longer term incremental implications of the dock operations are considered negligible.
- Magnitude: medium – changes in marine use access and patterns may have implications for traditional livelihood practices (*i.e.,* more than a nuisance or inconvenience).
- Probability: high – the described potential effects are likely to occur.
- Confidence: high – based on information about the Project, asserted marine traditional marine use areas and the professional experience of the assessment team.

HORU Indicator – Aesthetic Attributes

Alteration of Viewsheds

The existing operating Westridge Marine Terminal is visible from numerous points on and near the south and north shore of Burrard Inlet in the Metro Vancouver Region. As such, the expanded operating docks will be visible from similar locations. While the new docks will extend further into Burrard Inlet, the current design has explicitly reduced the potential incremental visual impact particularly from the perspective of nearby residential areas on the south shore of Burrard Inlet within the City of Burnaby (*i.e.,* Capitol Hill, Westridge neighbourhoods). The presence of the expanded Westridge Marine Terminal has been modelled from three public observation viewpoints in the visual modelling analysis to demonstrate how it may appear from select locations accessible and commonly used by the general public. The new dock, berths and moored tankers will be clearly visible from multiple viewpoints, and, given their location in Burrard Inlet, there is generally low visual absorption capacity. However, the tankers will not always be moored at the terminal and, therefore, the terminal will detract less from the visual experience when tankers are absent. Refer to the Viewshed Modelling Analysis Technical Report in Volume 5D for visual modelling results for the expanded Westridge Marine Terminal.

The overall effect of the terminal expansion on viewsheds is considered to be reversible in the long-term, as the expanded Westridge Marine Terminal dock and berths and additional moored tankers will be present throughout operations. However, the magnitude of residual viewshed effect is considered low. While Project features will be detectable from certain vantage points in the Marine HORU RSA and Socio-economic RSA, the incremental viewshed effect is considered to be that of a nuisance or

inconvenience particularly given the pre-existing industrial context in which the facility changes are being made and that tankers have been repeatedly present at the terminal for 60 years. The duration of the potential residual effect is considered long-term, and the frequency is considered isolated to periodic, as the events causing the alteration in viewshed are the construction of the expanded facility and the intermittent but repeated mooring of additional tankers during operations (Table 7.6.4-3, point 3[a]). Trans Mountain will continue to consult with stakeholders regarding visual effects of the Westridge Marine Terminal throughout the detailed design process. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA and Socio-economic RSA – the expanded Westridge Marine Terminal and berthed tankers will be visible from various locations in the Marine HORU RSA and Socio-economic RSA.

- Duration: long-term – the event causing the alteration of viewsheds initiates during the construction of the expanded dock, and extends throughout operations due to the mooring of additional tankers.

- Frequency: isolated to periodic – the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.

- Reversibility: long-term – the alteration of viewsheds will occur until the facility is decommissioned and reclaimed.

- Magnitude: low – while change in views will be detectable, it is considered to be that of an inconvenience or nuisance.

- Probability: high – the Westridge Marine Terminal will change in appearance and tankers will berth at the terminal more frequently.

- Confidence: high – based on data pertinent to the Project area, viewshed modelling results, and the professional experience of the assessment team.

Sensory Disturbance (From Noise, Air Emissions, Lighting, Visual)

Construction

Nuisance air emissions, noise and lighting will occur during the construction of the Project which may affect Aboriginal and non-Aboriginal local residents and marine users around the Westridge Marine Terminal. Construction activities at the Westridge Marine Terminal will include pile driving and depending on the exact configuration of the new docks, near shore dredging may be necessary. Any construction activities will occur as per the City of Burnaby Noise and Sound Abatement Bylaw; further, standard construction noise and air emission abatement best practices and low level and low intensity night lighting will be used as outlined in the Westridge Marine Terminal EPP (Volume 6D). Residents and marine users who could be impacted by this sensory residual effects, including the visual presence of construction activity on shore and in Burrard Inlet, include Aboriginal and non-Aboriginal users who recreate or travel for commercial purposes on Burrard Inlet around the Westridge Marine Terminal, or who reside or work on land in the vicinity of the Westridge Marine Terminal. There may also be sub-marine sensory disturbance effects for recreational divers using the area as the dredging (if it occurs) may cause visual disruption and pile-driving may cause noise disturbances for divers.

The impact balance of this residual effect is considered negative, but low in magnitude. Given the use of well-maintained equipment and limiting idling of equipment, adherence to all noise legislation, and the use of low intensity night lighting, the residual effect of sensory disturbance on Aboriginal and non-Aboriginal local residents and marine users during construction is anticipated to be that only of an inconvenience or nuisance. Trans Mountain will also communicate with marine and local fishing industry organizations, Aboriginal communities, marine recreation organizations and other affected stakeholders to provide Project information related to Project activities affecting marine use areas. The effects is considered reversible in the short-term as it is limited to the construction phase (Table 7.6.4-3, point 3[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA and Socio-economic RSA – noise, light and air emissions emanating from the construction activity can extend into the Marine HORU LSA and Marine HORU RSA as well as the Socio-economic RSA.

- Duration: short-term – the event causing the marine or land users to be affected by an increase in nuisance air, noise and light emissions is the construction phase.

- Frequency: isolated – the event causing the residual effect is confined to a specific period (*i.e.*, construction).

- Reversibility: short-term – the residual effect is limited to the construction phase.

- Magnitude: low – the implementation of the proposed mitigation measures is expected to effectively reduce the effects of noise, air and light emissions on local residents and marine users to that of an inconvenience or nuisance.

- Probability: high – facility construction will involve the use of heavy equipment.

- Confidence: high – based on a good understanding of cause-effect relationships and the professional experience of the assessment team.

Operations

Nuisance air and noise emissions will occur during operations and periodic site-specific maintenance activities during the operation phase of the Project. Operations activities at the Westridge Marine Terminal will include: loading crude oil tankers and barges, unloading jet fuel tankers and barges, storage of jet fuel, practicing spill-response capabilities, and storage of the WCMRC skimmers. Site-specific maintenance activities at the Westridge Marine Terminal will include equipment maintenance and vegetation management. Residents and marine users who could be affected by residual sensory effects during operations include Aboriginal and non-Aboriginal users who recreate or travel for commercial purposes on Burrard Inlet around the Westridge Marine Terminal or who reside or work in the vicinity of the Westridge Marine Terminal.

Aside from the visual effect of the increased presence of Project-related tankers at Westridge Marine Terminal berths, noise from the normal operations of the proposed Westridge Marine Terminal expansion will be sound from pumps, ship loading, ship berthing (including anchor chains) and support equipment located on the site. Since this is an expansion of the existing terminal, the types of sounds would be similar to those already generated on the site. However, given the increased frequency of vessels over current day, sounds related to ship loading and berthing may occur more frequently than during current day. Participants at Community Workshops in Burnaby and Belcarra noted concerns about noise from two or three tankers and berths operating at the same time during operations (compared to the current single berth), as well from increased anchor chain noise associated with tankers anchoring in Burrard Inlet. Participants also noted concerns about noise associated with spill response drills (*e.g.*, alarms, lights and system announcements). However, nuisance sensory disturbance from spill response drills at Westridge Marine Terminal is not anticipated to change incrementally as a result of the Project since emergency response protocols themselves are not anticipated to change. The expanded docks will be lit throughout the night after completion, for navigation safety and, therefore, may contribute to increased nuisance light disturbance for land-based residents and marine users. Lighting will be directional to reduce nuisance light. The results of the acoustic assessment related to the operations of the Westridge Marine Terminal indicate a negligible to low magnitude effect on noise during normal operations (see Section 7.6.6 of Volume 5A).

The impact balance of this residual effect is considered negative, and reversible in the long-term since the residual effect occurs throughout the life of the Project. The effect is considered to be of low magnitude since it will be detectable but largely that of a nuisance or inconvenience. Over time, the expanded Westridge Marine Terminal is likely to become an accepted part of the industrial shoreline landscape particularly as the facility has been in operation for 60 years (Table 7.6.4-3, point 3[c]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA and Socio-economic RSA – noise, air and light emissions emanating from operations may extend into the Marine HORU LSA and RSA, as well as the Socio-economic RSA.

- Duration: long-term – the events causing sensory disturbance are operations and maintenance activities, and the increased presence of moored tankers, which are ongoing for the life of the Project.

- Frequency: isolated to periodic – the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.

- Reversibility: long-term – the residual effect extends throughout the operations phase.

- Magnitude: low – change may be detectable but is considered to be that of an inconvenience or nuisance.

- Probability: high – operations will involve incremental site-specific maintenance, lighting and noise related to ship movement and berthing.

- Confidence: high – based on a good understanding of cause-effect relationships and the professional experience of the assessment team.

Combined Effects on Aesthetic Attributes

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for aesthetic attributes evaluated in Section 7.6.4.6 (Table 7.6.4-3, points 3[a] to 3[c]) are of high probability and, consequently, were considered in the evaluation of combined effects on the aesthetic attributes indicator.

The combined Project-related effects on aesthetic attributes associated with the Westridge Marine Terminal are related to changes in nuisance sensory disturbance during construction and operations (*e.g.*, nuisance noise, air and light emissions) as well as changes in viewshed associated with the altered configuration of the dock and berths and the increased presence of moored tankers at the terminal. The impact balance of the combined residual effect is considered negative, but low in magnitude as aesthetic disturbances are considered to be limited to that of an inconvenience or nuisance. The duration of the combined effect is considered long-term as the events causing aesthetic disturbances will initiate during construction and some will continue throughout operations. The combined residual effect is considered to be reversible in the long-term, as some aesthetic disturbances related to change in viewshed and altered noise related to anchor chains or site-specific maintenance at the expanded berths will continue throughout operations (Table 7.6.4-3, point 3[d]). A summary of the rationale for all of the significance criteria for combined effects on aesthetic attributes is provided below.

- Spatial Boundary: Marine HORU RSA and Socio-economic RSA – changes in aesthetic attributes *(i.e.,* visual effects/viewshed alteration and sensory disturbance) may extend into the Marine HORU RSA and Socio-economic RSA;

- Duration: long-term – the events causing aesthetic disturbances initiate during construction (*i.e.*, construction phase sensory disturbance) and extend for the life the Project (*e.g.*, incremental anchor noise and changes in viewshed);

- Frequency: isolated to periodic – the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.

- Reversibility: long-term – certain potential aesthetic effects extend throughout the operations phase.

- Magnitude: low – aesthetic disturbance may be detectable to some, but is considered to be that of an inconvenience or nuisance.

- Probability: high – the operations phase will involve incremental site-specific maintenance, lighting and anchor chain noise from additional tankers, and the terminal will have a changed visual appearance compared to current day.

- Confidence: high – based on Project information, viewshed modelling results, a good understanding of cause-effect relationships and the professional experience of the assessment team.

HORU Indicator – Marine Commercial, Recreational and Tourism Use

Disruption to Marine Access and Use Patterns

The construction and operations of the Project may result in the disruption to marine access and use patterns for a variety of marine commercial, recreational and tourism users. The significance evaluation of these residual effects is provided in Table 7.6.4-3 (points 4[a] and 4[b]). A discussion of these residual effects under the parks and protected areas indicator (points 1[a] and 1[b]), which includes MCRTU, provides an explanation of the rationale of the significance criteria.

Sensory Disturbance (From Noise, Air Emissions, Lighting, Visual)

The construction and operations of the Project may result in the sensory disturbance for marine commercial, recreational and tourism users. The significance evaluation of these residual effects is provided in Table 7.6.4-3 (points 4[c] and 4[d]). A discussion of these residual effects under the aesthetic attributes indicator (points 3[b] and 3[c]), which includes marine commercial, recreational and tourism user areas as well as several other user types, provides an explanation of the rationale of the significance criteria.

Decrease in Quality of the Experience of Aboriginal and Non-Aboriginal Marine Commercial, Recreation and Tourism Users

Construction

The overall quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users may be affected by a range of factors already discussed, including changes in the distribution and abundance of harvested species, aesthetic disturbances, displacement by the new docks and activity in the marine construction areas, and the increase in movement of construction-related barges. A change in harvested species during construction may displace commercial and recreational fishers. The results of the fish and fish habitat assessment (Section 7.6 of Volume 5A) indicates that there may be some disruption to certain fish species the vicinity of the Westridge Marine Terminal due to construction, but that no net loss of the productive capacity of marine fish habitat in the Marine Fish and Fish Habitat LSA is anticipated in the long-term. High-value marine fish habitat will be created through the marine fish habitat compensation program; a diverse community of algae, invertebrates, and fish are expected become established within 1 to 2 years of construction.

During construction fishers may have to venture away from any fishing locations immediately around the terminal, which could result in a decrease in catch, and/or nuisance and inconvenience. Recreation and tourism users including kayakers, canoeists and local day cruise operators may be displaced during construction. This displacement may result in a temporary change in business practices for tourism operators. For scuba divers, the quality of the dive experience may be reduced due to noise from dock construction. Local underwater visibility for diving may also be temporarily reduced if dredging is required for the expanded docks.

The impact balance of this residual effect is considered negative. The residual effect is considered to be reversible in the short-term as it is related to construction activity; however, it may extend into the medium term related to the re-establishment of marine fish habitat from the compensation program. Mitigation measures designed to communicate construction locations and timing to the users of the marine environment in the vicinity of the Westridge Marine Terminal will lessen the effect since it is expected that some users may choose an alternative location during active construction. It is anticipated that marine passage through Burrard Inlet will not be obstructed during construction, but there may be minor delays in some circumstances and some traditional, recreation and tourism users may be deterred from using certain areas around the terminal. Overall, the magnitude is considered low to medium; it is considered to

mostly be that of an inconvenience or nuisance (low), but there may be implications for livelihood practices for some users (medium) (Table 7.6.4-3, point 4[e]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – sensory disturbances emanating from construction can extend into the Marine HORU LSA and Marine HORU RSA.

- Duration: short-term – the event causing the marine users to be affected is the construction phase.

- Frequency: isolated – the event causing the marine users to be affected is confined to a specific period (*i.e.*, construction).

- Reversibility: short to medium-term – the residual effect is limited to the construction phase; it may extend into the medium term in terms of the re-establishment of fish habitat through the marine fish habitat compensation program.

- Magnitude: low to medium – it is not anticipated that marine passage through Burrard Inlet will be obstructed during construction, but for some marine users (*e.g.*, recreational, tourism, traditional) who choose to change their movement patterns away from the terminal, there may be some may be some inconvenience or nuisance (low). There is the possibility for implications for livelihood practices for some marine users (medium).

- Probability: high – facility construction will involve the use of heavy equipment in marine areas and increased barge/tug traffic.

- Confidence: high – based on Project information, information on marine use patterns, and the professional experience of the assessment team.

Operations

The overall quality of the experience of Aboriginal and non-Aboriginal marine commercial, recreation and tourism users may be affected by a change in the distribution and abundance of harvested species, aesthetic disturbances and displacement during operations of the Westridge Marine Terminal, due to the more frequent loading of tankers at the docks and within boomed areas. Operational activities at the Westridge Marine Terminal includes loading crude oil tankers and barges, unloading jet fuel tankers and barges, storage of jet fuel, practicing spill-response capabilities, and storage of the WCMRC skimmers. The results of the fish and fish habitat assessment (Section 7.6 in Volume 5A) indicates that activities associated with routine operations at Westridge Marine Terminal are not expected to result in a measurable effect on fish and fish habitat, and that there is no evidence in the literature that suggests vessel noise will result in the large-scale displacement of fish or invertebrate populations from foraging, spawning, rearing, or migration areas or otherwise affect their distribution or abundance. However, the area available for fishing may be permanently reduced as a result of the dock expansion and increased presence of tankers, which could affect patterns of movement for fishers and reduce the quality of the fishing experience.

The impact balance of this residual effect is considered negative. This effect will be managed through communications measures established with the marine stakeholders, as well as noise and air emissions abatement measures. The residual effect is reversible in the long-term since the residual effect occurs throughout the life of the Project and is considered to be of low magnitude. The results of the acoustic assessment (Section 7.6 Volume 5A) indicate a negligible to low magnitude of effect on noise due to normal terminal operations and with the implementation of appropriate mitigation measures sound emitted from the Westridge Marine Terminal and ship loading activities is expected to be controlled within BC OGC *Noise Control Best Practices Guideline* and Health Canada guidance (Table 7.6.4-3, point 4[f]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – sensory disturbances emanating from operations can extend into the Marine HORU LSA and Marine HORU RSA.

- Duration: long-term – the events causing marine users to be affected are operations activities which are ongoing for the life of the Project.

- Frequency: isolated to periodic – the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.

- Reversibility: long-term – the residual effect extends throughout the operations phase.

- Magnitude: low – ongoing change may be detectable but it is likely to be that of an inconvenience or nuisance.

- Probability: high – operations may involve incremental sensory changes over current day due to changes in dock lighting and increased presence of tankers.

- Confidence: high – based on Project information, information on marine use patterns, outcomes of biophysical element assessments, and the professional experience of the assessment team.

Combined Effects on Marine Commercial, Recreation and Tourism Use

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. All of the potential residual socio-economic effects for MCRTU evaluated in Section 7.6.4.6 (Table 7.6.4-3, points 4[a] to 4[f]) are of high probability and, consequently, were considered in the evaluation of combined effects on the MCRTU indicator.

The combined effects on MCRTU consider changes in marine access and use patterns, sensory disturbance to marine users, and changes in the overall quality of the experience of Aboriginal and non-Aboriginal marine users related to construction and operations of the Westridge Marine Terminal. Though some sensory disturbance incremental over current day is anticipated during operations, the combined effect is anticipated to be primarily related to the increase marine vessel activity, marine construction activity (*e.g.*, marine derricks, steel pipe piles driven into the marine sediment, some dredging) and sensory disturbance associated with the construction activities in the marine waters of Burrard Inlet. Operations phase nuisance disturbance due to increased presence of tankers and changes in lighting are likely to become normalized as the Westridge Marine Terminal has been a feature of the industrial shoreline of Burrard Inlet for almost 60 years. The impact balance of the combined effect is negative. For the balance of combined effects, the duration is considered short-term and the frequency is considered isolated, as effects are caused primarily by construction-related activity and it is anticipated that marine users will likely adapt to the presence of the expanded dock complex and increased presence of tankers over time. The combined effect is considered reversible in the short to medium-term; primary effects will cease with the end of construction (short-term), however, the restoration of disturbed fish habitat may take several years into operations (medium-term) (Table 7.6.4-3, point 4[g]). A summary of the rationale for all of the significance criteria of combined effects on MCRTU is provided below.

- Spatial Boundary: Marine HORU RSA – marine commercial, recreational, and tourism users travelling to and from different parts of the Marine HORU RSA may be affected.

- Duration: short-term – the combined residual effect will be primarily caused by construction phase activity.

- Frequency: isolated – the events causing the combined effects will primarily be the construction phase activities.

- Reversibility: short to medium-term – the combined effects will primarily be reversible in the short-term, as it is anticipated that presence of the expanded dock complex is likely to become normalized for marine users within the first year of operations; however, it may take several years for disturbed fish habitat to be re-established through the marine fish habitat compensation program.

- Magnitude: low to medium – marine passage by the terminal will not be disrupted and in most cases effects on marine users will be that of an inconvenience or nuisance (low); in some cases changes in use patterns may have implications for business or livelihood practices for certain users (commercial,

tourism, traditional marine users) and the combined residual effect could be more than a nuisance or inconvenience (medium).

- Probability: high – given Project activity is occurring in Burrard Inlet where there are multiple marine commercial, recreational and tourism users.

- Confidence: high – based on information about the Project, information on marine use patterns, and the professional experience of the assessment team.

7.6.4.7 Summary

As identified in Table 7.6.4-3, there are no situations for HORU that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of construction and operations activities of the Westridge Marine Terminal on HORU indicators will be not significant.

7.6.5 Infrastructure and Services

The assessment of effects on infrastructure and services has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to presence of temporary construction workforce, the transportation of workers and materials during construction, general construction practices pertaining to interfacing with existing infrastructure, and Project interactions with emergency services. Infrastructure and service effects are experienced in a combined manner by construction hub communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on infrastructure and services for the Project as a whole is presented in Section 7.2.5. Table 7.2.5-3 and accompanying discussion in Section 7.2.5.6 provide the evaluation of potential residual effects of the construction and operations of the Westridge Marine Terminal on infrastructure and services indicators.

7.6.6 Navigation and Navigation Safety

This subsection discusses the potential effects of the construction phase and subsequent operations at the Westridge Marine Terminal on navigation and navigation safety in the marine waters of Burrard Inlet. The Socio-Economic Technical Report in Volume 5D provides information on existing conditions, as well as issues and concerns identified by stakeholders related to navigation and navigation safety in the areas around the Westridge Marine Terminal. The Marine Commercial, Recreational and Tourism Use – Marine Transportation Technical Report in Volume 8B provides detailed information pertaining to marine navigation and navigation safety in Burrard Inlet.

7.6.6.1 Assessment Indicators and Measurement Endpoints

The indicator and measurement endpoint used in the assessment of the expansion of Westridge Marine Terminal on navigation and navigation safety are the same as those used in the assessment of pipeline construction and operations. Section 6.2.6 provides the selected indicator and measurement endpoint, as well as the rationale for their selection.

7.6.6.2 Spatial Boundaries

The spatial boundaries used in the assessment of navigation and navigation safety are the same as the marine-based effects associated with the construction and operations of the Westridge Marine Terminal on HORU in Section 7.6.4 (Figure 5.4-9).

7.6.6.3 Navigable Water Use Context

The context for navigation and navigation safety in the marine waters of Burrard Inlet relevant to the Westridge Marine Terminal is the same as that discussed in Section 7.6.4.3 HORU context. Section 7.6.4.3 discusses the existing use of Burrard Inlet by a range of marine commercial, recreational and tourism users.

7.6.6.4 Potential Effects and Mitigation Measures

Identified Potential Effects

Potential effects associated with the construction and operations activities at the Westridge Marine Terminal on the navigation and navigation safety indicator are listed in Table 7.6.6-1. These interactions are based on the results of the literature review, desktop analysis, engagement with Aboriginal communities, regulatory authorities, and other stakeholders (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.6.6-1 was principally developed in accordance with Trans Mountain standards as well as industry best practices.

TABLE 7.6.6-1

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS AT THE WESTRIDGE MARINE TERMINAL ON NAVIGATION AND NAVIGATION SAFETY

Potential Effect	Spatial Boundary	Key Recommendations/Mitigation Measures [SEMP or EPP Reference][1]	Potential Residual Effect(s)
1. Navigation and Navigation Safety Indicator – Navigable Watercourses			
1.1 Disruption to navigable water	Marine HORU RSA	• Dock has been designed so that it will not interfere with existing anchorages, will remain within the east-west limits of the current water lot, and will allow the safe passing of marine traffic. • Contact stakeholders, including municipal governments and marine use organizations, prior to construction activities. Provide maps and schedules of the construction activities [EPP Section 4.0], so that implications for marine use patterns can be considered Ensure any changes in the construction schedule are communicated [EPP Section 4.0]. • Place an announcement in local papers notifying the public and marine users of the location and timing of construction activities at least 14 days prior to activities [Section 4.0]. • Ensure barges used for heavy equipment access are placed (anchored or spudded down) in appropriate areas with minimal impacts [EPP Section 8.2] • Communicate with marine and local fishing industry organizations, Aboriginal groups, marine recreation organizations and other affected stakeholders to provide Project information related to Project activities affecting marine use areas [SEMP Section 8.4.10], include provision of regularly updated information on Project-related construction delivery vessels. • Notify appropriate regulatory authorities and licensees and/or distribute a notification to the shipping industry in order to advise commercial and recreational marine operators of the Project schedule and construction activities at the Westridge Marine Terminal [EPP Section 4.0]. • Apply other measures in the EPP pertaining to marine construction. Ensure compliance with all established legislation, including the *Navigation Safety Regulations* under the *Canada Shipping Act*, *Fisheries Act* and other applicable legislation. • Comply with PMV's Marine Restricted Area (MRA) legislation, including *Clear Narrows Regulations*.	• Disruption to a navigable water (Burrard Inlet) during construction and operations (refer to Section 7.6.4 HORU; disruption of marine access and use patterns during construction and operations).
1.2 Concern for safety of watercourse users	Marine HORU RSA	• See recommended mitigation measures in potential effect 1.1 of this table. • Notify marine commercial and recreational operators of the hazards associated with construction in accordance with NEB requirements or approval conditions for navigable waters [EPP Section 4.0]. • Place warning signs (*e.g.*, Warning – Construction in the Vicinity) offshore and onshore, near construction activities. The signs are to be legible at a distance of 50 m [EPP Section 4.0]. • Operate Project-related vessels at slow speeds during construction in order to decrease the likelihood of striking other vessels [EPP Section 8.2]. • Discourage unauthorized marine vessel access at the Westridge Marine Terminal through use of signs, markers and/or buoys [EPP Section 4.0].	• Concern for safety of marine users due to changing movement patterns.

Note: 1 Detailed mitigation measures are outlined in the SEMP (Volume 6B) and Westridge Marine Terminal EPP (Volume 6D).

7.6.6.5 Potential Residual Effects

The potential residual socio-economic effect on navigation and navigation safety associated with the construction and operations activities at the Westridge Marine Terminal (Table 7.6.6-1) is that there will be an increased possibility of marine collisions due to changing movement patterns.

7.6.6.6 Significance Evaluation of Potential Residual Effects

Table 7.6.6-2 provides a summary of the significance evaluation of the potential residual socio-economic effects of the construction and operations activities at the Westridge Marine Terminal on navigation and navigation safety. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below.

TABLE 7.6.6-2

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS AT THE WESTRIDGE MARINE TERMINAL ON NAVIGATION AND NAVIGATION SAFETY

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Navigation and Navigation Safety Indicator– Navigable Watercourses									
1(a) Disruption to a navigable water (Burrard Inlet) during construction (see Table 7.6.4-3 point 1[a], disruption to marine access and use patterns during construction).	Neutral to negative	RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
1(b) Disruption to a navigable water (Burrard Inlet) during operations (see Table 7.6.4-3 point 1[b], disruption to marine access and use patterns during operations.)	Neutral to negative	RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1(c) Concern for safety of marine users due to changing movement patterns.	Negative	RSA	Immediate	Accidental	Short-term	Low to high	Low	Moderate	Not significant
1(d) Combined effect on navigable watercourses indicator (points 1[a] to 1[c]).	Neutral to negative	RSA	Short to long-term	Isolated to periodic	Long-term	Low	High	High	Not significant

Notes: 1 RSA = Marine HORU RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Disruption to a Navigable Water (Burrard Inlet) during Construction and Operations

This potential residual effect is captured under the discussion of disruption of marine access and use patterns during construction and operations in Section 7.6.4.6 (HORU), as Burrard Inlet is the only marine use area and navigable water that will be directly affected by the construction and operations of Westridge Marine Terminal. The significance evaluation of these residual effects is provided in Table 7.6.6-2 (points 1[a] and 1[b]). A discussion of these residual effects is found in Section 7.6.4.6 under the parks and protected areas indicator (Table 7.6.4-7, points 1[a] and 1[b]) which provides an explanation of the rationale of the significance criteria.

Concern for Safety of Marine Users Due To Changing Movement Patterns

The increase in marine vessel traffic around Westridge Marine Terminal associated with construction tugs and barges may reduce the available marine area for passage of other marine users, leading to an increased possibility of marine collisions, vessel damages or injury. Marine users may also inadvertently enter the construction zone. This may have implications for the safety of commercial, recreational, tourism

and Aboriginal users of Burrard Inlet who typically travel in the vicinity of the Westridge Marine Terminal. Reduced safety is a negative potential residual effect that could occur in the areas around the Westridge Marine Terminal during construction. The frequency of the effect is considered to be accidental, since the event that would cause the effect would be an accident which would be a rare occurrence. The reversibility of the effect is considered short-term, as it is related primarily to presence of construction-phase delivery vessels and reduced passage around the dock due to construction zone limits. Over the long term, marine users are anticipated to adapt to the presence of the expanded dock, such that movement patterns will resume and safety concerns would not differ from the present day. To ensure optimal navigation safety, the dock has been designed specifically to not interfere with existing anchorages and minimize its footprint in Burrard Inlet. The probability of the effect is low, as it is unlikely that a collision would occur which would result in harm to a marine user. The Transportation Safety Board of Canada (TSB) is notified of marine collisions and other incidents involving commercial vessels that occur in Canadian waters, and also monitors statistics to identify trends and emerging safety issues (TSB 2013). For example, in 2012 there were 236 reportable incidents across Canada; and only 6 of the 236 incidents were collisions between vessels. Reported incidents involving fishing or other small vessels, and cargo ships or tankers point to multiple potential causes such as lack of communications between vessels, sudden course changes, excessive speeds of the larger vessel in the presence of the smaller vessels and poor estimation of the collision risk from both parties (TSB 2013).

The magnitude of the effect is considered low to high, depending on the severity of an accident (Table 7.6.6-2, point 1[b]). It is understood that vessel damage or loss, and personal injury or loss of life, though unlikely, would have serious ramifications for the marine user. Vessel damage or loss can result in lost economic and long-term financial effects while the owner waits for repairs or replacement. In the case of injury, the effects equate to possible permanent loss in economic opportunity. Compensation for vessel damages and injury are regulated by the *Canada Marine Liability Act*. Marine vessels carry insurance and liability is determined through the court process.

The standard measures taken by marine construction vessels should aid in avoidance of collisions under most circumstances. These measures include the widespread use of ships' radar, the compulsory use of Vessel Traffic Services for most commercial vessels to facilitate communications with ports and other vessels, and other standard navigational measures. Additionally, Trans Mountain's mitigation measures pertaining to the communication of information in regards to construction activities and schedules with the marine community will also aid other marine users in being aware of increased risks and taking their own precautions.

A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – marine vessels associated with construction of the Westridge Marine Terminal will be located in the Marine HORU RSA.

- Duration: immediate – the event causing concern for safety of marine users is an accident, the duration of which would be less than or equal to two days.

- Frequency: accidental – an accident resulting in harm or safety concern for marine users is rare.

- Reversibility: short-term - the increase in marine delivery vessels and construction activity around the dock, leading in turn to the increased possibility of collisions, is limited to the construction phase.

- Magnitude: low to high – depending on the severity of an accident involving a marine user.

- Probability: low – it is unlikely that an accident would occur which would result in harm to a marine user.

- Confidence: moderate – based on available information on marine user patterns in the vicinity of the Westridge Marine Terminal and information provided by Trans Mountain about marine movement of construction materials.

Combined Effects on Navigable Watercourses

An evaluation of the combined effects considers those residual effects that are likely to occur. Only the effects related to disruption to a navigable watercourse (Burrard Inlet) evaluated in Section 7.6.4.6 (Table 7.6.6-2, points 1[a] and 1[b]) are of high probability and, consequently, were considered in the evaluation of combined effects on the MCRTU indicator. Effects related to the safety of marine users due to changing movement patterns (Table 7.6.6-2, point 1[c]) was considered of low probability and thus was not considered in the evaluation of combined effects.

The combined effects on navigable watercourses considers the potential for disruption to marine navigation in Burrard Inlet related to the construction and operations of the Westridge Marine Terminal. During the construction phase, it is anticipated that the marine facilities will be built from the water using marine derricks, and construction-related equipment may extend up to about 100 m beyond the footprint of the expanded dock (the current dock extends 75 m into Burrard Inlet and the new dock is anticipated to extend approximately 250 m to the outer most side of a loading vessel; thus, maximum marine footprint of construction activities may be approximately 350 m into Burrard Inlet). It is not anticipated that construction-related vessels and marine equipment will obstruct passage of other vessels in Burrard Inlet, given the size of the inlet passage at the terminal site. In the unlikely event that there is any potential short-term obstruction of the waterway during construction that could affect safe navigation of other vessels, this would be coordinated in advance through the PMV Harbour Master and Coast Guard. Waterway users are notified of such activities through the Canadian Coast Guard's weekly Notice to Mariners. Trans Mountain will also communicate with marine and local fishing industry organizations, Aboriginal communities, marine recreation organizations and other affected stakeholders to provide Project information related to Project activities affecting marine use areas.

During operations, there will be an on-going extended footprint in Burrard Inlet associated with the expanded dock complex and the intermittent presence of moored tankers. However, the dock has been designed specifically to not interfere with existing anchorages and to reduce its footprint on Burrard Inlet. These design features, along with regulated access flow by PMV, will minimize any effects on navigation in the longer term. Navigation patterns of some small traditional and recreational marine craft (*e.g.,* kayaks, canoes, small boats) may be disrupted over the longer-term, as they may choose to avoid the areas around the terminal or have to navigate out further from shore to move around the docks and loading vessels when present.

The impact balance of the combined effect on navigable watercourses (Burrard Inlet) is considered neutral to negative. Construction-related delivery barges and an increased construction zone around the terminal during operations and the presence of moored tankers will reduce the marine channel around the Westridge Marine Terminal, but the Project will not constrict marine passage. Waterway users will be notified of all activity in the area (neutral impact balance). There may, however, be minor negative implications for recreational or traditional marine craft (*e.g.,* kayaks, canoes, small boats) that currently navigate close to shore in the immediate area around the terminal related to the larger dock footprint (negative impact balance). The duration of the potential combined effect is considered short to long-term, and the frequency is considered periodic to isolated, as the effect is caused both by the construction of the expanded dock complex and the intermittent presence of moored tankers during operations. The magnitude of the effect is considered low, as marine passage will not be constricted during construction or operations, though use patterns for smaller vessels that navigate closer to shore may be altered which may result in some nuisance or inconvenience (Table 7.6.6-2, point 1[d]). A summary of the rationale for all of the significance criteria of combined effects on navigable watercourses is provided below.

- Spatial Boundary: Marine HORU RSA – navigation in Burrard Inlet by marine vessels transiting to and from different parts of the Marine HORU RSA may be affected.

- Duration: short to long-term – the combined potential residual effect is caused by construction of the dock complex as well as the presence of moored tankers during operations.

- Frequency: isolated to periodic – the construction of the expanded dock complex (isolated) and the intermittent but repeated presence of moored tankers (periodic) are the events causing the potential effect.

- Reversibility: long-term - the potential combined residual effect extends throughout the operations phase

- Magnitude: low – marine passage by the terminal will not be disrupted; there may be some nuisance or inconvenience for smaller vessels that navigate close the shore in the areas around the terminal.

- Probability: high – given Project activity is occurring in Burrard Inlet where there are multiple marine commercial, recreational, tourism and traditional navigation uses.

- Confidence: high – based on information about the Project, information on marine use patterns and areas, and the professional experience of the assessment team.

7.6.6.7 Summary

As identified in Table 7.6.6-2, there are no situations for navigation and navigation safety that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effect of construction and operations activities at the Westridge Marine Terminal on navigation and navigation safety will be not significant.

7.6.7 Employment and Economy

The assessment of effects on employment and economy has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities, and the Westridge Marine Terminal), since many potential effects are related to construction and operations expenditures, regional employment opportunities, contracting/procurement approaches, and local economic benefits associated with worker spending and property taxes and training and capacity development, which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on employment and economy for the Project as a whole is presented in Section 7.2.7. Table 7.2.7-3 and accompanying discussion in Section 7.2.7.6 provide the evaluation of potential residual effects of the construction and operations of the Westridge Marine Terminal on employment and economy indicators.

7.6.8 Community Health

Section 7.2.8 describes the effect of the Project on community health indicators and measurement endpoints in a combined manner; that is, all elements of the Project (construction and operations activities related to the pipeline, pump stations, tanks, temporary facilities and all other activities and facilities) are considered in an integrated manner to result in the characterization of effect.

There are, however, two measurement endpoints that may be distinctly or differently affected by the Westridge Marine Terminal expansion and, therefore, are discussed below. These are: stress and anxiety related to the perception of contamination; and demand on and capacity of emergency medical response.

It should be noted that the assessment of the Westridge Marine Terminal in this subsection relates only to the terrestrial (onshore) activities associated with the construction and operations of the Westridge Marine Terminal. Activities associated with offshore operation of the Westridge Marine Terminal are discussed as part of Volume 8A.

7.6.8.1 Assessment Indicators and Measurement Endpoints

Table 7.6.8-1 summarizes the assessment indicators, measurement endpoints and their rationale for community health. The key measurement endpoints represent specific data points that can be tied directly to community health changes. They do not represent all relevant information about the indicator; additional, and often qualitative data, is necessary to fully understand potential effects.

TABLE 7.6.8-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR COMMUNITY HEALTH

Community Health Indicators	Measurement Endpoints	Rationale for Indicator Selection
Environmental health effects	• Stress and anxiety related to perceived contamination	The three primary categories of environmental health effects — effects of exposure to chemical substances, noise and odours — are examined in the HHRA (Volume 5D), Air Quality and Greenhouse Gas Technical Report (Volume 5C) and Terrestrial Noise and Vibration Technical Report (Volume 5C). The potential for contaminant, noise and odour effects, both under normal construction/operation conditions and in the context of spills, have been raised repeatedly by health officials, local residents and other stakeholders. The perception of contamination—regardless of the actual extent of contamination—has been shown to cause effects that include stress and anxiety. The perception of contamination is considered as a measurement endpoint under community health since it is not addressed elsewhere in this application.
Health care service provision	• Demand on and capacity of emergency medical response	Health outcomes may be affected by the capacity and readiness of emergency health response providers to respond to public safety emergencies including traffic incidents and workplace accidents/malfunctions.

7.6.8.2 Spatial Boundaries

The spatial boundaries used in the community health effects assessment for the Westridge Marine Terminal expansion are the same as the boundaries described in Section 7.6.4.2 HORU.

7.6.8.3 Community Health Context

Refer to Section 7.2.8.3 for a summary of the community health context in relation to the Westridge Marine Terminal.

7.6.8.4 Potential Effects and Mitigation Measures

Identified Potential Effects

Potential effects associated with the construction and operations activities at the Westridge Marine Terminal on the community health indicators listed in Table 7.6.8-2 were based on the results of the literature review, desktop analysis, consultation with regulatory authorities and stakeholders and the professional experience of the assessment team.

A summary of mitigation measures is provided in Table 7.6.8-2. These recommendations are intended to eliminate, reduce or minimize potential adverse effects on community health and to maximize health co-benefits where possible. The mitigation measures were developed in accordance with public health principles of harm avoidance: that emphasis should be placed on preventing or avoiding harm, rather than managing its consequences (Public Health Leadership Society 2002).

Mitigation measures have been developed based on input from a number of sources including industry best practice publications, government and other agency reports, suggestions made by key informed sources and a review of community health recommendations in other environmental impact assessments.

TABLE 7.6.8-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL ON COMMUNITY HEALTH

Potential Effect	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
1. Community Health Indicator – Environmental Health Effects			
1.1 Stress and anxiety related to perceived contamination	Marine HORU RSA	• See recommended mitigation measures outlined in potential effect 3.1 of Table 7.2.8-3 Community Health.	• Increase in stress and anxiety related to perceived contamination.

TABLE 7.6.8-2 Cont'd

Potential Effect	Spatial Boundary[1]	Key Recommendations/Mitigation Measures [SEMP Reference][2]	Potential Residual Effect(s)
2. Community Health Indicator – Health Care Service Provision			
2.1 Demand on and capacity of emergency medical response	Marine HORU RSA	• See recommended mitigation measures outlined in potential effect 5.2 of Table 7.2.8-3 Community Health.	• Increased demand on emergency medical response.

Notes: 1 RSA = Marine HORU RSA.

2 Detailed mitigation measures are outlined in the SEMP (Volume 6B).

7.6.8.5 Potential Residual Effects

The potential residual effects on the community health indicators associated with the construction and operations activities of the Westridge Marine Terminal (Table 7.6.8-2) are:

- increase in stress and anxiety related to perceived contamination; and
- increased demand on emergency medical response.

The residual effect of increased demand on hospitals and health care facilities is considered for the Project as a whole in Section 7.2.8, including the Westridge Marine Terminal, but is included in Table 7.6.8-3 to accurately assess the potential combined residual effects on health care service provision.

7.6.8.6 Significance Evaluation of Potential Residual Effects

Table 7.6.8-3 provides a summary of the significance evaluation of the potential residual effects of the construction and operations activities of the Westridge Marine Terminal on community health outcomes. The rationale used to evaluate the significance of each of the residual effects is provided below.

TABLE 7.6.8-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF CONSTRUCTION AND OPERATIONS OF THE WESTRIDGE MARINE TERMINAL ON COMMUNITY HEALTH

Potential Residual Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Community Health Indicator – Environmental Health Effects									
1(a) Increase in stress and anxiety related to the perception of contamination.	Negative	RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
2. Community Health Indicator – Health Care Service Provision									
2(a) Increased demand on emergency medical response.	Negative	RSA	Long-term	Continuous	Long-term	Negligible to low	High	Moderate	Not significant

Notes: 1 RSA = Marine HORU RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Community Health Indicator - Environmental Health Effects

Increase in Stress and Anxiety Related to Perceived Contamination

Stakeholder engagement and communication activities have shown that there is a potential for Project activities around the Westridge Marine Terminal to cause stress and anxiety related to the possibility of human exposure to environmental contamination. This strain, experienced as a result of anxiety or the perception of contamination, seems to be related to the possibility of a spill or other malfunction that causes exposure to petroleum products in Burrard Inlet as well as exposure to pollution caused by increased tanker traffic.

The impact balance of this effect is characterized as negative, since it poses a detriment to community health. The effects would be in the Marine HORU RSA; however, the communities in the Fraser Valley and Metro Vancouver regions have to date voiced concern most strongly, especially regarding tanker traffic pollution. The duration is characterized as long-term and the frequency as continuous since the exposure event would last as long as the Westridge Marine Terminal is in place and in active use, unless attitudes about the Westridge Marine Terminal change. The reversibility is characterized as long-term, since the effect would last for the duration of use of the Westridge Marine Terminal, although any effect would likely be able to mitigate with decommissioning and remediation. In terms of magnitude, no regulatory, environmental or social standards exist that describe acceptable threshold levels of stress and anxiety. The residual effects on stress and anxiety would likely be detectable since some segments of the population will likely continue to be vocal about their concern, but the extent to which this stress and anxiety are experienced in the population cannot be predicted. Consequently, the magnitude is characterized as low to medium. The probability is rated as high since this effect has already been described by stakeholders in relation to the Project. Research literature, stakeholder concerns and key informant interviews support this relationship; therefore, the level of confidence in this evaluation is high (Table 7.6.8-3, point 1[a]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – the effects are confined to the Marine HORU RSA.
- Duration: long-term – the event causing increase in stress and anxiety is the operations of the Westridge Marine Terminal.
- Frequency: continuous – the event causing increase in stress and anxiety is the operations of the Westridge Marine Terminal, which extends continually over the assessment period.
- Reversibility: long-term – the residual effect would extend over the lifetime of the Westridge Marine Terminal.
- Magnitude: low to medium – no regulatory standards exist; concerns will likely continue to be voiced by affected residents but the extent to which the stress and anxiety will be experienced by the population at large is not known.
- Probability: high – the effect has already been described by stakeholders in relation to the Project.
- Confidence: high – there is a good understanding of this relationship with supporting literature as well as from stakeholders in the Project area.

Community Health Indicator - Health Care Service Provision

Increased Demand on Emergency Medical Response

The potential for an increase in demand on emergency medical response for the construction of the Westridge Marine Terminal is discussed in Section 7.2.8 as part of the integrated assessment of the Project as a whole. This subsection considers the potential for an increase in emergency medical response associated with the ongoing operations of the Westridge Marine Terminal.

The impact balance of this effect is characterized as negative since it poses a potential detriment to community health as well as a burden on the emergency medical response infrastructure. The potential for an increase in emergency medical response during operations of the Westridge Marine Terminal will affect those communities within the Marine HORU RSA that provide ground ambulance dispatch and

water-based emergency response to the Westridge Marine Terminal, namely Burnaby, North Vancouver, Vancouver and Port Moody in the Metro Vancouver Region. The duration of effect is considered to be long-term and the frequency is continuous since the event causing the potential increase in emergency medical response is the operation of the Westridge Marine Terminal. The reversibility is long-term since the effects are expected to extend for the duration of operation of the terminal. The magnitude of effect is negligible to low because in the Greater Vancouver area, the residual effect is unlikely to be detectably different from existing conditions for normal operations for emergency medical response. The probability is rated as high since this effect has been noted in other development projects in BC and Alberta. The level of confidence in this evaluation is moderate (Table 7.6.8-3, point 2[b]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Marine HORU RSA – the effects are confined to the Marine HORU RSA.
- Duration: long-term – the event causing the potential for an increase in emergency medical response during operations of the Westridge Marine Terminal is the operations of the terminal.
- Frequency: occasional – the event that would cause the effect would occur intermittently and sporadically.
- Reversibility: long-term – the residual effects of increased demand on emergency medical response would be expected to cease after the Westridge Marine Terminal is no longer in use.
- Magnitude: negligible to low – the magnitude of the effect in the Metro Vancouver Region is unlikely to be detectably different from existing conditions for normal operations for emergency medical response.
- Probability: high – research literature has clearly documented these types of effects with development projects.
- Confidence: moderate – the possibility of an effect associated with normal operations of the Westridge Marine Terminal on emergency medical response exists but is not certain.

7.6.8.7 Summary

As identified in Table 7.6.8-3, there are no situations for community health indicators that would result in a significant residual socio-economic effect. Consequently, it is concluded that the residual socio-economic effects of construction and operations activities of the Westridge Marine Terminal on community health indicators will be not significant.

7.6.9 Human Health Risk Assessment

This subsection outlines the nature of potential health risks to people associated with short-term and long-term exposures to the chemical emissions associated with the expansion of the Westridge Marine Terminal. The HHRA was performed step-wise following a conventional risk assessment paradigm described in Section 7.5.8.

Details on HHRA methods, results and conclusions can be found in the HHRA of Volume 5D.

7.6.9.1 Assessment Indicators and Measurement Endpoints

The assessment indicators and measurement endpoints for the HHRA are described in Section 7.5.8.1, and specified in Table 7.6.9-1 below.

TABLE 7.6.9-1

ASSESSMENT INDICATORS AND MEASUREMENT ENDPOINTS FOR THE HUMAN HEALTH RISK ASSESSMENT

HHRA Indicator[1]		Measurement Endpoint	Rationale
Residents	Aboriginal Peoples Urban Dwellers	• Adverse health effects associated with short-term and long-term inhalation of the COPC, as well as long-term exposures to the COPC through multiple pathways.	The selection of indicators and measurement endpoints was guided by information contained in the NEB *Filing Manual* as well as guidance provided by BC MOE, Health Canada and CCME. Specific consideration was given to the human health-related concerns identified through the various Aboriginal engagement and stakeholder consultation activities.
Area Users		• Adverse health effects associated with short-term inhalation of the COPC.	

Note: 1 A non-urban dweller was not assessed for the Westridge Marine Terminal because agricultural lands were not identified within the HHRA LSA (*i.e.*, 5 km radius of the Westridge Marine Terminal).

7.6.9.2 Spatial Boundaries

The spatial boundaries that applied to the HHRA took into account:

- the predicted spatial extent of the COPC emissions associated with the expansion of the Westridge Marine Terminal; and
- the locations of communities, including Aboriginal communities, surrounding the Westridge Marine Terminal.

The spatial boundaries were defined in terms of an HHRA LSA and Air Quality RSA, as described below.

- HHRA LSA: the area in the immediate vicinity of the Westridge Marine Terminal where exposure to the chemical emissions from the terminal might be expected to occur. The HHRA LSA represents the predicted spatial extent of the chemical emissions from the expansion of the Westridge Marine Terminal to which people might be exposed. The HHRA LSA extends over a 5 km radius centred on the Westridge Marine Terminal.
- Air Quality RSA: the area specified in the air quality assessment (see the Air Quality and Greenhouse Gas Technical Report of Volume 5C) extending beyond the HHRA LSA where other activities could directly or indirectly influence air quality within the HHRA LSA on a cumulative basis, and potentially contribute to cumulative effects on human health. The Air Quality RSA for the Westridge Marine Terminal is comprised of a 24 km x 24 km area centred on the existing Westridge Marine Terminal. The Burnaby Terminal Air Quality RSA was combined with the Westridge Marine Terminal Air Quality RSA due to their close proximity to one another (*i.e.*, less than 3 km apart).

Figure 7.6.9-1 shows the spatial boundaries surrounding the Westridge Marine Terminal.

TRANS MOUNTAIN

FIGURE 7.6.9-1

HUMAN HEALTH STUDY AREA BOUNDARIES FOR WESTRIDGE MARINE TERMINAL

TRANS MOUNTAIN EXPANSION PROJECT

- Kilometre Post (KP)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal Property Boundary
- Air Quality RSA
- Westridge Marine Terminal HHRA Local Study Area (5 km Buffer)
- Village / Hamlet / Community
- Highway
- Paved Road
- Railway
- City / Town
- Indian Reserve / Métis Settlement
- National Park / Provincial Park / Protected Area

Projection: NAD 1983 UTM Zone 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; B/W & Colour Imagery: 2005-2011 provided by KMC, 2012, NASA, 2005, Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community; Existing Infrastructure: IHS Inc., 2013; Transportation: IHS Inc., 2013, Natural Resources Canada, 2011; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011, ESRI, 2005; First Nation Lands: Government of Canada, 2013, AltaLIS, 2010, IHS Inc., 2011; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012.

TERA ENVIRONMENTAL CONSULTANTS

MAP NUMBER 201310_MAP_TERA_HEA_00432_REV0_04			PAGE SHEET 1 OF 1
DATE December 2013	TERA REF. 7894		REVISION 0
SCALE 1:100,000	PAGE SIZE 11x17		DISCIPLINE HEA
DRAWN AJS	CHECKED TGG		DESIGN TGG

0 1 2 3 4 km

ALL LOCATIONS APPROXIMATE

201310_MAP_TERA_HEA_00432_Rev0_04.mxd

7.6.9.3 HHRA Context

As previously described for the tank terminals (Section 7.5.8.3), this subsection outlines the current health status of people residing in the Air Quality RSA, with the information consisting of population-based health statistics compiled by several Canadian health agencies based on healthcare data collected by the health authorities in BC. More specifically, the information was based on health data compiled by the Fraser North HSDA of the FHA and the North Shore/Coast Garibaldi HSDA of the VCHA. The baseline health status is described principally in terms of two endpoints, namely cancer and respiratory health, since these indices have been identified as two of the more commonly-cited health concerns in the region and they are among the most relevant endpoints for assessing the potential effects of exposures to chemical emissions. The information is summarized in Table 7.5.8-2 in Section 7.5.8.3.

7.6.9.4 Potential Effects and Mitigation Measures

The HHRA evaluated the potential health risks to people associated with short-term and long-term exposures to the chemical emissions associated with the expansion of the Westridge Marine Terminal. The chemical emissions inventory for the Westridge Marine Terminal consisted of more than 100 chemicals, including criteria air contaminants (CACs), metals, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), sulphur-containing chemicals and volatile organic compounds (VOCs) that were carried forward for consideration as COPC in the HHRA. The HHRA was completed using a series of conservative assumptions reflecting worst-case circumstances, which collectively contributed to an exposure event being strictly hypothetical in nature, with a low probability of occurrence. In particular, the HHRA assumed that people would be found on both a short-term and long-term basis at the location within the HHRA LSA corresponding to the “maximum point of impingement” (MPOI). The MPOI refers to the location at which the highest air concentrations of each of the COPC would be expected to occur, and at which the exposures received by the people within the HHRA LSA would be greatest. The choice of the MPOI location was meant to ensure that any potential health effects that could result from exposure to the chemical emissions associated with the Project on the health of the people, regardless of where they might be found, would not be underestimated. The decision to use the MPOI to represent the location at which people would be found was made by default; that is, consideration was not given as to whether or not the MPOI location was suitable for a permanent residence and/or for residents to obtain their entire complement of locally grown or harvested foodstuffs, including home-garden produce, fish, beach foods, game meat and wild plants from the local area.

The results of the HHRA revealed that, despite the conservative assumptions employed, with very few exceptions, the maximum predicted levels of exposure to the COPC (acting either singly or in combination) remained below the levels of exposure that would be expected to cause health effects. In the majority of cases, the exposure levels were well below those associated with health effects. The exceedances revealed by the HHRA were very few in number and in virtually all cases were modest in magnitude. The high degree of conservatism incorporated into both the exposure estimates and the exposure limits used for comparison as part of the HHRA must be considered in the interpretation of the exceedances. Based on the weight of evidence, it is unlikely that people would experience health effects as a result of the expansion of the Westridge Marine Terminal. A detailed quantitative HHRA will be conducted to expand on the findings and conclusions of the HHRA, with a report discussing the detailed quantitative HHRA to be submitted to the NEB in early 2014.

7.7 Effects Assessment – Pipeline Reactivation Activities

Using the assessment methodology described in Section 7.1, the following subsection evaluates the potential socio-economic effects associated with the reactivation of the existing pipeline segments from Hinton to Hargreaves and Darfield to Black Pines, as well as associated activities such as the installation of automated valves.

Socio-economic elements potentially interacting with the pipeline reactivation include socio-economic elements such as TLRU, social and cultural well-being, HORU, infrastructure and services, employment and economy, and community health.

Socio-economic elements which are not considered to interact with the reactivation of the Hinton to Hargreaves or the Darfield to Black Pines pipeline segments are summarized in Table 7.7-1. Spatial

boundaries for the assessment of the reactivation of the existing pipeline segments are the same as in the applicable subsection of Section 7.2 unless otherwise noted.

TABLE 7.7-1

ELEMENTS NOT INTERACTING WITH PIPELINE REACTIVATION AND ASSOCIATED ACTIVITIES

Element	Justification
Heritage Resources	No new lands are needed for the reactivation of the existing pipeline segments; therefore, there is no potential to discover previously unidentified heritage resources sites.
Navigation and Navigation Safety	No – the pipeline reactivation activities will not be located in, on, over, under, through or across a navigable waterway.
Human Health Risk Assessment	No – emissions from pipeline reactivation activities are not expected to affect human health.

7.7.1 Traditional Land and Resource Use

The assessment of effects on TLRU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and terrestrial portion of the Westridge Marine Terminal). The evaluation of TLRU is the same for all of these components.

The assessment of effects on TLRU for the Project as a whole is presented in Section 7.2.2. Section 7.2.2.5 provides the evaluation of potential residual effects of pipeline reactivation activities on TLRU indicators.

7.7.2 Social and Cultural Well-Being

The assessment of effects on social and cultural well-being has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal). Many potential effects are related to presence of Project workers, employment and contracting opportunities, and overall community perspectives which cannot be meaningfully disaggregated by Project component.

The assessment of effects on social and cultural well-being for the Project as a whole is presented in Section 7.2.3. Table 7.2.3-3 and accompanying discussion in Section 7.2.3.6 provide the evaluation of potential residual effects of pipeline reactivation activities on social and cultural well-being indicators.

7.7.3 Human Occupancy and Resource Use

The assessment of effects on HORU has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, ancillary facilities and terrestrial portion of the Westridge Marine Terminal), since many potential human use effects are experienced in a combined manner by construction communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on HORU for the Project as a whole is presented in Section 7.2.4. Table 7.2.4-3 and accompanying discussion in Section 7.2.4.6 provide the evaluation of potential residual effects of pipeline reactivation activities on HORU indicators.

7.7.4 Infrastructure and Services

The assessment of effects on infrastructure and services has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities, and the Westridge Marine Terminal), since many potential effects are related to presence of temporary construction workforce, the transportation of workers and materials during construction, overall Project power needs, and general construction practices for pipeline crossing of linear infrastructure. Infrastructure and service effects are experienced in a combined manner by host communities, and cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on infrastructure and services for the Project as a whole is presented in Section 7.2.5. Table 7.2.5-3 and accompanying discussion in Section 7.2.5.6 provide the evaluation of potential residual effects of pipeline reactivation activities on infrastructure and services indicators.

7.7.5 Employment and Economy

The assessment of effects on employment and economy has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to capital and operational expenditures, regional employment opportunities and contracting/procurement approaches, which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of effects on employment and economy for the Project as a whole is presented in Section 7.2.7. Table 7.2.7-3 and accompanying discussion in Section 7.2.7.6 provide the evaluation of potential residual effects of pipeline reactivation activities on employment and economy indicators.

7.7.6 Community Health

The assessment of effects on community health has been conducted considering all the Project components in an integrated manner (*e.g.,* pipeline, pump stations, tanks, other ancillary facilities and the Westridge Marine Terminal), since many potential effects are related to factors such as population movement, employment and community change which cannot be meaningfully disaggregated by Project component from a community perspective.

The assessment of potential effects on community health indicators for the Project as a whole is presented in Section 7.2.8. Table 7.2.8-4 and accompanying discussion in Section 7.2.8.6 provide the evaluation of potential residual effects of pipeline reactivation activities on community health indicators.

7.8 Effects Assessment - Decommissioning and Abandonment

The NEB defines decommissioning as the permanent cessation of the operations of a pipeline without discontinuance of service, abandonment as the permanent cessation of the operation of a pipeline which results in the discontinuance of service and deactivation as to remove temporarily from service. The abandonment of a facility requires an application to the NEB under Section 74 of the *NEB Act*, as described in Guide B of the NEB *Filing Manual*.

It is difficult at this time to predict when or how the pipeline and facilities will be decommissioned or abandoned at the end of the Project's useful life. However, it can be anticipated that a combination of the following three scenarios may occur during pipeline decommissioning or abandonment: pipeline removal; abandonment-in-place; or a combination of abandonment-in-place and pipeline removal. The existing TMPL has been successfully operating for 60 years and will be safe and reliable for many more years as a result of continuing proactive maintenance and integrity programs. The useful life of the Project will be as long or longer.

Trans Mountain is participating in and will comply with the process established by Stream 3 of the NEB Land Matters Consultation Initiative and Reasons for Decision [RH-2-2008]. In addition, as part of this application, Trans Mountain filed with the NEB a Preliminary Abandonment Plan (see Volume 4C) providing a discussion of the abandonment planning strategy for the pipelines and facilities to be constructed for TMEP. The plan discusses general activities for the types of facilities that would be abandoned in place, abandoned in place with special treatment or removed. The plan also discusses general reclamation objectives and principles that would be applied during abandonment to return the right-of-way and facility sites to a state comparable with the surrounding environment.

The methods of abandonment that will ultimately be implemented for the pipeline segments and facilities constructed for the Project will be determined at the time of the planning for abandonment and will be based on the most current body of scientific knowledge and accepted industry practices. It is expected that most of the pipeline will be abandoned in place; however, land use considerations and other factors may lead to pipeline segments being removed.

Current and future land use will be one of the most important factors in the determination of pipeline abandonment rationale. It is unlikely that any one abandonment technique will be appropriate for all land uses and the decision to abandon in place, abandon in place with special measures, or remove pipeline segments will be made on a site-specific basis and after consultation with affected parties and at the time of abandonment.

Environmental issues associated with potential abandonment methodologies such as ground subsidence, soil erosion and soil and water contamination may be regarded on a site-specific basis in determining the most appropriate abandonment methodology. Additionally, an assessment will be conducted to determine if there is any contamination of the associated land and, if warranted, special soil handling and remediation procedures would be implemented. Any lands disturbed by physical activities will be reclaimed to the appropriate land use at that time. For the Project, which is not expected to be abandoned for another 50-70 years, mitigation to address the environmental issues associated with pipeline abandonment and the determination of significance for any of the potential remaining effects cannot be meaningfully or realistically assessed at this time. The significance of any effects remaining following mitigation, including the significance of cumulative effects, will be determined and provided at the time Trans Mountain files for abandonment.

The reclamation objectives or principles to be applied to abandonment of the pipeline segments and facilities constructed for the Project will be in accordance with legislative and regulatory requirements in place at that time and likely similar to those required for Project construction. The primary goal of the reclamation is to stabilize and revegetate affected lands such that they will, in time, achieve productivity equivalent to the adjacent land use, ensuring the ability of the land to support various land uses.

The process of reclamation post-abandonment will likely involve a combination of measures such as: topsoil and root zone material salvage; subsoil conditioning and grade and drainage re-establishment; topsoil and root zone material replacement; installation and maintenance of temporary and permanent erosion and sediment control measures; and revegetation. Parameters such as vegetation, soil and landscape will be used as criteria to measure the degree of reclamation success, ensuring that land productivity is equivalent to the adjacent lands. Where no known or visible limitations to normal management, access, soil productivity and ecosystem function are evident during the evaluation, land reclamation will be determined to be successful.

Future decommissioning or abandonment activities will require prior approval by the NEB and other applicable regulatory authorities. Information regarding abandonment costs are provided in Section 2.0 of Volume 2. Volume 4C, Project Design and Execution – Operations and Maintenance, Section 12.0 provides additional details on abandonment plans.

7.9 Accidents and Malfunctions

Accidents and malfunctions are unplanned events that could result in significant adverse effects to human health, property or the environment, but are unlikely to occur. While accidents and malfunctions are predicted to be unlikely for the Project, the potential consequences are evaluated so that emergency response and contingency planning can be identified to ensure the risk is further mitigated.

7.9.1 Assessment Indicators and Measurement Endpoints

Indicators considered in the assessment of accidents and malfunctions include those indicators previously described for the socio-economic elements in Sections 7.2 to 7.7. The measurement endpoints for accidents and malfunctions consist of qualitative assessment of potential residual effects of accidents and malfunctions.

7.9.2 Spatial Boundaries

The spatial boundaries used in the effects assessment of accidents and malfunctions considered the applicable socio-economic element LSAs and RSAs as described in Sections 7.2 to 7.7. In general, the LSA is the ZOI in which socio-economic indicators are most likely to be affected by the construction and operations of the Project. The RSA is considered the area where the direct and indirect influence of other land uses and activities could overlap with Project effects and cause cumulative effects on the socio-economic indicator.

7.9.3 Potential Effects and Mitigation Measures

Identified Potential Effects

As stated in the NEB *Filing Manual* (NEB 2013a), an ESA must identify and assess the effects on workers, the public and biophysical and socio-economic elements of all potential accidents and malfunctions. Events causing accidents and malfunctions could include pipeline and equipment failure; human error; natural perils such as tornadoes, floods, hurricanes or earthquakes, and terrorism or other criminal activities.

Trans Mountain is committed to keeping their pipelines safe, and protecting their employees, the public and the environment. Trans Mountain strives to safeguard their facilities and to meet or exceed all applicable federal, provincial and local safety legislation.

Pipelines are a safe and efficient method of transporting large volumes of liquid products over long distances (Canadian Energy Pipeline Association 2013). However, incidents such as damage to the pipeline, operator error and vandalism could occur. To ensure the continued safe and reliable operation of its pipelines, Trans Mountain uses a multi-layered approach to pipeline safety that encompasses integrity management, damage prevention and emergency response programs.

The potential effects associated with accidents and malfunctions on biophysical elements are provided in Volume 5A. The potential effects associated with accidents and malfunctions during marine transportation are provided in Volume 8A. The potential direct and indirect effects of an operational pipeline or marine spill are evaluated in Volumes 7 and 8A, respectively, including the risk of a spill, the anticipated spill response and the potential effects for various spill scenarios. Events causing accidents and malfunctions from natural perils such as tornadoes, floods, hurricanes and earthquakes are discussed in Section 7.10 Changes to the Project Caused by the Environment in Volume 5A. The potential effects associated with a small spill during loading as well as a large spill scenario at Westridge Marine Terminal are provided in Volume 7.

Potential effects associated with the construction and operations of the proposed pipeline and facilities on the socio-economic indicators are listed in Table 7.9-2. These interactions are based on the results of the literature review, desktop analysis, engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public (Section 3.0), and the professional experience of the assessment team.

A summary of mitigation measures provided in Table 7.9-2 was principally developed in accordance with Trans Mountain standards as well as industry and provincial regulatory authority guidelines including AENV (1988, 1994b), BC OGC (2010), CAPP (1999, 2001) and NEB (2011). In addition, these measures have been considered acceptable by the NEB for past pipeline projects for Spectra Energy (NEB 2008), Terasen Pipelines (NEB 2006) and NOVA Gas Transmission Ltd. (NEB 2010a-f).

Industry best practice technology, safety measures and contingency plans will also be used to reduce the probability and magnitude of accidents occurring and having substantial adverse effects. However, if an accident or malfunction does occur, an effective response plan will reduce the effects and associated risks. Trans Mountain adopts KMC's plans and policies for the purposes of the Project. Management systems and programs required under the *National Energy Board Onshore Pipeline Regulations* (*NEB OPR)* are listed in Table 7.9-1.

TABLE 7.9-1

MANAGEMENT SYSTEMS AND PROGRAMS REQUIRED UNDER THE *NEB OPR*

Program	*NEB OPR* Section	Purpose of Program	Equivalent Trans Mountain Document
Emergency Management Program	Section 32	To ensure appropriate emergency preparedness and response.	• KMC Emergency Response Plan (on file with the NEB) • KMC Incident Command System (ICS) Guide • KMC Terminal Emergency Response Plan • KMC Westridge Marine Terminal Emergency Response Plan

TABLE 7.9-1 Cont'd

Program	*NEB OPR* Section	Purpose of Program	Equivalent Trans Mountain Document
Integrity Management Program	Section 40	To ensure the pipeline system continually operates within its design parameters.	• KMC Canadian Integrity Management Program (on file with the NEB) • KMC Facility Integrity Management Program (on file with the NEB)
Safety Management Program	Section 47	To protect workers and the public from occupational and process standards.	• KMC Contractor (Environmental/Safety) Manual (on file with the NEB) • KMC Health and Safety Standards Manual (on file with the NEB) • KMC Knowledge and Experience Enhancement Program (KEEP Canada Practice) (on file with the NEB)
Security Management Program	Section 47.1	To protect people, property and the environment from malicious damage.	• KMC has in place a Kinder Morgan Canadian Operations Facilities Security Plan that will be implemented for the Project (as per the NEB *Filing Manual*, companies are not to file their security documents electronically, although they need to be available for examination by the NEB during audits, inspections or other NEB regulatory activities) • KMC has in place site specific security plans for each district and terminal • KMC Emergency Response Program (on file with the NEB)
Environmental Protection Program	Section 48	To avoid or reduce adverse effects on the environment.	• Pipeline EPP (Volume 6B) • Facilities EPP (Volume 6C) • Westridge Marine Terminal EPP (Volume 6D) • KMC Contractor (Environmental/Safety) Manual (on file with the NEB) • KMC *Environmental Standards and Guidelines*

TABLE 7.9-2

POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF ACCIDENTS AND MALFUNCTIONS DURING PIPELINE AND FACILITIES CONSTRUCTION AND OPERATIONS

Potential Effect	Project Component	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
1. Spill of hazardous materials during construction and maintenance activities	All	HORU LSA	Spill Prevention • Follow spill prevention measures provided in Section 43: Environmental Requirements – General and Section 45: Environmental – Spill Prevention and Control of the KMC Contractor (Environmental/Safety) Manual, on file with the NEB. • Do not store fuel, oil or hazardous material within 300 m of a watercourse/wetland/lake [Section 7.0]. • Maintain all appropriate spill equipment at all work sites. Assess the risk of resource-specific spills to determine the appropriate type and quantity of spill response equipment and materials to be stored onsite and a suitable location for storage (see Emergency Response Plan in Section 3.5 of Volume 4B) [Section 7.0]. • Store all hazardous substances and fuels in proper containment systems to prevent release to the environment. Handle all hazardous materials in accordance with applicable WHMIS protocols [Section 7.0]. • Ensure that during construction no fuel, lubricating fluids, hydraulic fluids, methanol, antifreeze, herbicides, biocides, or other chemicals are dumped on the ground or into watercourses/wetlands/lakes. In the event of a spill, implement the Spill Contingency Plan [Section 7.0]. • Place an impervious tarp or drip tray underneath equipment/vehicles when servicing equipment/vehicles with the potential for accidental spills (*e.g.,* oil changes, servicing of hydraulic systems) [Section 7.0].	• Contamination or alteration of surface or groundwater during construction which may affect human health.

TABLE 7.9-2 Cont'd

Potential Effect	Project Component	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)

1. Spill of hazardous materials during construction and maintenance activities (cont'd)	See above	HORU LSA	• Ensure that bulk fuel trucks, service vehicles and pick-up trucks equipped with box-mounted fuel tanks carry spill prevention, containment and clean-up materials that are suitable for the volume of fuels or oils carried. Carry spill response supplies on bulk fuel and service vehicles that are suitable for use on land and water (*i.e.,* sorbent pads, sorbent boom and rope) [Section 7.0].
			• Ensure that operators and onsite construction foremen are trained to contain spills or leakage from equipment [Section 7.0]. The KMC Knowledge and Experience Enhancement Program (KEEP Canada Practice), on file with the NEB, is designed to ensure Trans Mountain employees are competent in their work and can work safely to protect themselves, the public and the environment.
			• Employ the following measures to limit the risk of fuel spills in water. Where equipment refuelling is necessary within 100 m of a watercourse/wetland/lake [Section 7.0]:
			  • all containers, hoses, nozzles are free of leaks;
			  • all fuel nozzles are equipped with automatic shut-offs;
			  • operators are stationed at both ends of the hose during fuelling unless the ends are visible and readily accessible by one operator; and
			  • fuel remaining in the hose is returned to the storage facility.
			• Do not wash equipment or machinery in watercourses/wetlands/lakes. Control wastewater from construction activities, such as equipment washing or concrete mixing, to avoid discharge directly into any body of water [Section 7.0].
			<u>In the Event of a Spill</u>
			• Implement the Contamination Discovery Contingency Plan in the event contaminated soils are encountered during construction [Appendix B].
			• In the event of a spill, implement the Spill Contingency Plan [Appendix B].
			• Report spills immediately to the Inspector(s) who will, if warranted, notify Trans Mountain for reporting to the appropriate regulatory authorities in accordance with the Spill Contingency Plan [Section 7.0 and Appendix B].
			• Clean-up and document spill in accordance with the NEB Remediation Process Guide (NEB 2011).
				• See above

TABLE 7.9-2 Cont'd

Potential Effect	Project Component	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
2. Fire during construction and operations	All	HORU LSA	Fire Prevention • An environmental education program (Level II and III training) will be developed and implemented by the Trans Mountain Environmental Team to ensure that all Trans Mountain staff and contractors will be informed of the environmental and socio-economic requirements and sensitivities regarding the Project prior to arrival on the pipeline construction right-of-way, ancillary sites or associated component sites [Section 3.0]. • Apply the KEEP Canada Practice to ensure Trans Mountain employees are competent in their work and can work safely to protect themselves, the public and the environment. • Notify the appropriate regulatory authority prior to commencement of burning slash. When the fire risk is varying and when required, obtain and record the fire ratings daily to determine whether it is safe to burn. During slash disposal activities, maintain communication on a daily basis regarding time of ignition, location, extent and anticipated duration of burning activities [Section 8.1]. Slash burning will not be conducted in the Lower Mainland or at the Westridge Marine Terminal. • Comply with local government bylaws, the *Forest and Prairie Protection Act* (Alberta), the *Open Burning Smoke Control Regulation* (BC) and the *Forest Fire Prevention and Suppression Regulation* (BC) when burning slash [Section 7.0]. • Avoid locating burn piles on peat-rich soils in order to limit the risk of residual fires after construction. Locate burn piles on exposed soils (*i.e.,* where topsoil/root zone material salvage has occurred) [Section 8.1]. • Burn only when the fire hazard is low. No burning is to be conducted during high winds [Section 8.1]. • Monitor burning at all times and prevent fire from spreading off the construction right-of-way. Extinguish burning embers before leaving the site and monitor burn sites to ensure no smouldering debris remains. Push unburned stumps along the edge of the construction right-of-way after attempting to burn them [Section 8.1]. • Firefighting equipment and a Fire Watch must be supplied by the contractor and must be present while performing any hot work (Section 13: Fire Prevention and Protection of the KMC Contractor [Environmental/Safety] Manual). • Implement the fire prevention measures in Section 6.1.1 of KMC's Emergency Response Plan, on file with the NEB. • Ensure that slash burning crews have firefighting equipment on hand that is capable of controlling any fire that may occur as a result of their activities [Section 8.1]. • Burn piles must be spread and mixed with water or snow to ensure they are properly extinguished [Section 8.1]. • Conduct infrared scanning of burn piles to locate any hot spots [Section 8.1]. • Smoking is allowed in designated areas only. Designated smoking areas will be identified during the pre-job construction meeting or work permitting process (Section 13: Fire Prevention and Protection of the KMC Contractor [Environmental/Safety] Manual).	• Despite vigilance, fires may adversely affect adjacent property.

TABLE 7.9-2 Cont'd

Potential Effect	Project Component	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
2. Fire during construction and operations (cont'd)	All	HORU LSA	• All activity inspectors and contractors' vehicles will carry firefighting equipment such as pulaskis, shovels, backpack pumps or components of a water delivery system (pump and hose) in sufficient quantities so that each worker has access to at minimum, one hand tool with which to carry out fire suppression work. In addition, all motorized equipment must carry a fully charged fire extinguisher. The Safety Manager or Safety Coordinator will ensure that fire extinguishers are present and fully charged [Appendix B]. <u>Fire During Construction</u> • Follow the fire suppression measures of the Fire Contingency Plan [Appendix B]. • Implement the Emergency Response Plan and Fire Contingency Plan in Section 3.5 of Volume 4B, as well as KMC's Emergency Response Plan. <u>Fire During Operations</u> • Implement the above procedures, as applicable, to operations and maintenance activities.	• See Above
3. Damage to foreign utilities during construction and operations	All	Socio-economic RSA	• Notify applicable companies for road, power line and foreign pipeline crossings, if required, by crossing and road use agreements [Section 4.0]. • Locate and flag all existing buried utility lines and cables to be crossed by the pipeline prior to the commencement of ground disturbance activities by using "one call" services or direct contact with utility owners [Section 7.0]. • Ensure construction personnel are properly trained in ground disturbance techniques. Apply the KEEP Canada Practice to ensure Trans Mountain employees are competent in their work and can work safely to protect themselves, the public and the environment. • Use flagging and signage at overhead line crossings to alert equipment operators of hazards. • Conduct construction activities near adjacent pipelines in compliance with all requirements of CSA Z662-11 and the *NEB OPR* for work close to an operating pipeline. • Prior to any equipment working on, or crossing over, an adjacent pipeline, first obtain a crossing permit from the operator for each specific location, detailing the conditions and limitations for each crossing. • During Project construction, maintain minimum separations between the pipe trench and adjacent pipes needed to protect the existing pipeline during construction of the Project, and allow for future remedial excavation work on either pipeline without affecting the other pipeline.	• Damage to utility lines could lead to interruption of services and fires in the case of gas.

TABLE 7.9-2 Cont'd

Potential Effect	Project Component	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
4. Transportation accidents	All	Socio-economic RSA	• Establish speed limits, approved by Trans Mountain, on the construction right-of-way and access roads. Post signs stating the applicable speed limits for construction traffic to avoid wildlife injury and mortality, maintain soil structure and reduce dust [Section 7.0]. • An environmental education program (Level II and III training) will be developed and implemented by the Trans Mountain Environmental Team to ensure that all Trans Mountain staff and contractors will be informed of the environmental and socio-economic requirements and sensitivities regarding the Project prior to arrival on the pipeline construction right-of-way, ancillary sites or associated component sites [Section 3.0]. • Use multi-passenger vehicles for the transportation of crews to and from the job sites, where feasible [Section 7.0]. • Follow recommendations in the Traffic and Access Control Management Plan [Appendix C], the Traffic Control Plan referred to in Section 3.5 of Volume 4B and Section 8.4.3 of the SEMP.	• A transportation accident may cause injury to people or may result in fire depending on the location and severity of the accident.
5. Use of explosives	New pipeline	Socio-economic RSA	• Review safety protocols and procedures with construction workers working in the fly rock zone prior to commencement of blasting activity. Reduce the potential for injury from flying rock, by using sound warning calls and visually scan for wildlife in the blasting area [Section 8.0]. • Apply the KEEP Canada Practice to ensure Trans Mountain employees are competent in their work and can work safely to protect themselves, the public and the environment. • Implement measures in the Blasting Management Plan in Section 3.5 of Volume 4B. • Transport explosives in accordance with the *Transport of Dangerous Goods Act* and other applicable provincial or federal legislation. • Store explosives onsite in compliance with permits and provincial or federal legislation. Ensure that explosives are stored in a secured container to minimize accessibility to wildlife and the public. • Handle the explosives in accordance with permits, certificates and provincial and federal legislation. • Use blast mats to minimize the risk of damage to property within the fly rock zone.	• Injury from fly rock or unintentional detonation of explosives.

TABLE 7.9-2 Cont'd

Potential Effect	Project Component	Spatial Boundary	Key Recommendations/Mitigation Measures [EPP Reference][1]	Potential Residual Effect(s)
6. Security risk	All	Socio-economic RSA	Construction • Install locked gates at locations noted on the Environmental Alignment Sheets (Volume 6E) to block unauthorized travel along the construction right-of-way following clearing. Keep gates locked and assign security personnel, if warranted, to block access [Section 8.1]. • Install temporary fencing around construction camps and borrow sites to provide security for the site [Sections 10.0 and 11.0]. • During construction, Trans Mountain will implement the Security Program in Section 3.5 of Volume 4B. During operations, follow Section 10.0 Pipeline Security of Volume 4C. • In the event of a bomb threat, follow the Bomb Threat Action Checklist in Section 6.6 of KMC's Emergency Response Plan. • For any other breach of security, Trans Mountain will follow the Breach of Security Action Checklist in Section 6.7 of KMC's Emergency Response Plan. Operations • Right-of-way surveillance is conducted in the form of aerial patrols and ground patrols to monitor for visible threats to pipeline integrity. Aerial patrol can prevent incidents by reporting unauthorized ground disturbance activities, as discussed in the KMC Canadian Integrity Management Program, on file with the NEB. • Ensure all facility sites are secured with locked fencing and are equipped with signage warning of the hazards related to the products on the site. Ensure all valves in remote facilities are locked or mechanically plugged and the local push buttons on motor operated valves are rendered inactive unless activated by secured switches (Section 6 of the KMC Facility Integrity Management Program, on file with the NEB). • During construction, Trans Mountain will implement the Security Program in Section 3.5 of Volume 4B. During operations, follow Section 10.0 Pipeline Security of Volume 4C. • In the event of a bomb threat, Trans Mountain will follow the Bomb Threat Action Checklist in Section 6.6 of KMC's Emergency Response Plan. • For any other breach of security, Trans Mountain will follow the Breach of Security Action Checklist in Section 6.7 of KMC's Emergency Response Plan.	• Damage from criminal activity.

Note: 1 Detailed mitigation measures are outlined in the Pipeline EPP (Volume 6B) as well as in the Facilities EPP (Volume 6C) and Westridge Marine Terminal EPP (Volume 6D).

7.9.4 Potential Residual Effects

The potential residual socio-economic effects that could occur as a result of accidents and malfunctions during construction and operations of the pipeline and facilities (Table 7.9-2) are:

- contamination or alteration of surface or groundwater due to spills during construction which may affect human health;
- despite vigilance, fires may adversely affect adjacent property;
- damage to utility lines could lead to interruption of services and fires in the case of gas;
- a transportation accident may cause injury to people or may result in fire depending on the location and severity of the accident;

- injury from fly rock or unintentional detonation of explosives; and
- damage from criminal activity.

7.9.5 Significance Evaluation of Potential Residual Effects

Where there are no standards, guidelines, objectives or other established and accepted ecological thresholds to define quantitative rating criteria or where quantitative thresholds are not appropriate, the qualitative method that is considered to be the appropriate method. Consequently, a qualitative assessment for accidents and malfunctions was determined to be the most appropriate method with the evaluation of significance of each of the potential residual effects relying on the professional judgment of the assessment team.

Table 7.9-3 provides a summary of the significance evaluation of the potential residual socio-economic effects associated with accidents and malfunctions during the construction and operations of the Project. The rationale used to evaluate the significance of each of the residual socio-economic effects is provided below.

TABLE 7.9-3

SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF ACCIDENTS AND MALFUNCTIONS DURING PROJECT CONSTRUCTION AND OPERATIONS

Potential Residual Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
(a) Contamination or alteration of surface or groundwater due to spills during construction which may affect human health.	Negative	HORU LSA	Immediate	Accidental	Short to medium-term	Low to high	Low	Moderate	Not significant
(b) Despite vigilance, fires may adversely affect adjacent property.	Negative	HORU LSA	Immediate	Accidental	Medium to long-term	Low to high	Low	Moderate	Not significant
(c) Damage to utility lines could lead to interruption of services and fires in the case of gas.	Negative	Socio-economic RSA	Immediate	Accidental	Immediate to short-term	Low to high	Low	Moderate	Not significant
(d) A transportation accident may cause injury to people or may result in fire depending on the location and severity of the accident.	Negative	Socio-economic RSA	Immediate	Accidental	Immediate to permanent	Low to high	Low	Moderate	Not significant
(e) Injury from fly rock or unintentional detonation of explosives.	Negative	Socio-economic RSA	Immediate	Accidental	Immediate to permanent	Low to high	Low	Moderate	Not significant
(f) Damage from criminal activity.	Negative	HORU LSA	Immediate	Accidental	Short-term to permanent	Low to high	Low	Moderate	Not significant

Notes: 1 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

Spills During Construction

Concerns regarding spills were raised during Aboriginal engagement and during most of the public information sessions, ESA Workshops and Community Workshops during public consultation. Many people engaged noted that the potential impacts of spills, spill prevention and spill response were top concerns. While the effects of large spills during operations are discussed in Volume 7, this discussion focuses on small spills during construction and the potential impact on human health. For the purposes of this assessment, a small spill is defined by KMC's North American Standard as a spill under 5 gallons (18.9 L) which would not cause a significant environmental effect (*i.e.*, not into a watercourse). It should be noted that spills of all sizes and commodities are logged.

Surface water or groundwater quality could be impacted from a spill during construction. The severity of the effect would depend on the size and location of the spill. However, pipeline spill statistics demonstrate that the probability of a significant adverse residual effect is low. Contamination of an aquifer may result if the spilled material migrates through the developed soil near the surface through the surficial materials into the first water-bearing unit. The rate of migration is dependent upon the permeability of the materials, presence or absence of fractures, the properties of the spilled contaminant (density, viscosity) and the vertical hydraulic gradients. A spill during the construction phase of the Project is likely to be noted quickly and be of small volume, and evidence suggests that the effects of most minor spills are localized (see also Water Quality and Quantity element in Volume 5A). With the implementation of the spill prevention (*i.e.*, not storing fuel, oil or other hazardous materials within 300 m of a watercourse or waterbody) and response measures (*e.g.*, Spill Contingency Plan in Appendix B of the Pipeline EPP in Volume 6B) in Table 7.9-2 and clean up and remediation measures, a spill potentially affecting surface or groundwater are considered to be of low to high magnitude and reversible in the short-term. The probability of a spill during construction contaminating groundwater or surface water is low (Table 7.9-3, point [a]).

Companies regulated by the NEB are required to report on spills that could have a significant adverse effect on the environment regardless of size. An example of this is would be any release of hydrocarbons into a water body. Of all reportable liquid spill incidents recorded by industry between 2008 and 2013, less than one incident per year was a liquid release into a waterway, illustrating that spills potentially altering surface or groundwater are rare but not exceptionally uncommon (NEB 2013b).

This adverse residual effect relates to several socio-economic indicators previously discussed in Sections 7.2 through 7.7, including:

- emergency, protective and social services under the element infrastructure and services in Section 7.2.5, particularly the measurement endpoint of emergency, protective and social services capacity and demand; and

- environmental health effects and public safety under the element community health in Section 7.2.8, particularly the measurement endpoints of stress and anxiety related to the perception of contamination, and demand on and capacity of emergency medical response.

A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – contaminants released into surface water or groundwater resulting from an accidental spill during construction can be transported before the contaminants are either diluted to a safe level or remediated.

- Duration: immediate – the event causing contamination of surface or groundwater is a spill, the period of which is less than one day.

- Frequency: accidental – a spill causing contamination of surface or groundwater is rare during construction.

- Reversibility: short to medium-term – depending on the size of the spill.

- Magnitude: low to high – depending on the volume, location and contaminants released.

- Probability: low – due to mitigation measures in place to reduce the potential for spills and the emergency response measures to contain and clean up product.

- Confidence: moderate – based on the professional experience of the assessment team.

Fire During Construction

Restricting burning in areas with high fire hazard will be especially important during summer construction in the interior BC area, particularly if it is a dry year. Participants at the Blue River Community Workshop noted that a forest fire in the area could potentially shut down construction work, even if exemptions to burning restrictions are obtained. Participants at the Blue River Community Workshop also advised that emergency response capacity may be limited in the event of an accident such as a fire since there are

currently only two people employed with the Blue River Fire Department. This may be the case with other small communities along the proposed pipeline corridor; however, Trans Mountain will work with emergency services to ensure that there is sufficient capacity to respond to a fire during construction and operations.

The significance of a fire will depend to a large extent on the location (*e.g.*, forest versus agricultural fields), size and what it consumes. Since small fires within the Footprint and off of the Footprint are of minor and moderate concern respectively, and can be extinguished quickly, they are not likely to cause a significant adverse residual effect. Large fires that spread off the Footprint and result in loss of resources and property are likely to be considered of high magnitude. With the implementation of mitigation measures (*e.g.*, construction crews having firefighting equipment and training) and the development of a Fire Contingency Plan (Appendix B of the Pipeline EPP in Volume 6B), the probability of large fires developing during pipeline construction is low (Table 7.9-3, point [b]).

This adverse residual effect relates to the indicator of emergency, protective and social services under Section 7.2.5 Infrastructure and Services, particularly the measurement endpoint of emergency, protective and social services capacity and demand. Some of the indicators associated with HORU in Section 7.2.4 and traditional land and resource use in Section 7.2.2 are also relevant to this adverse residual effect, depending on the land use disturbed by a fire. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – accidental fires could vary in size depending on the circumstances (*e.g.*, location, weather, level of preparation).
- Duration: immediate – the event causing effects on adjacent property is a fire, the period of which is generally less than or equal to two days.
- Frequency: accidental – fires resulting from construction or operations activities are rare.
- Reversibility: medium to long-term – forested or agricultural land may take up to or longer than 10 years to recover from a fire, and replacing a structure damaged by fire may take longer than 10 years.
- Magnitude: low to high – depending on the size and location of the fire, and the damage it causes.
- Probability: low – it is unlikely that a fire will occur.
- Confidence: moderate – based on the professional experience of the assessment team.

Damage to Utility Lines Could Lead to Interruption of Services and Fires in the Case of Gas

Damage to a water line, buried cable or telephone line may be inconvenient but the adverse residual effect would likely be of low magnitude and reversible in the immediate to short-term since repair would be relatively easy. Mitigation measures in Table 7.9-2 will reduce the risk of damaging utility lines during construction. This adverse residual effect relates to the indicator of linear infrastructure and power supply under Section 7.2.5 Infrastructure and Services, specifically to the measurement endpoint of linear infrastructure (*e.g.*, power lines, pipelines) disturbance.

In the event of a rupture of a high-pressure gas line, the risk of explosion and risk to human health could be considered of high magnitude. Since high-pressure pipelines are easily located (as opposed to some low-pressure plastic distribution lines) and are of sufficient size and strength that rupture is extremely unlikely, the probability of an explosion of existing gas pipelines is low. As such, the potential for an explosion of existing gas pipelines is low.

Rupture of the existing Trans Mountain pipeline or another foreign pipeline during construction resulting in severe contamination to air or water, or loss of property (in the event of explosion or fire) could be considered a significant adverse effect. Trans Mountain will adhere to industry standards, legislation (*e.g.*, CSA Z662-11 and the *NEB OPR*) and company protocols and, therefore, the probability of a rupture of the existing Trans Mountain pipeline or another foreign pipeline is unlikely and, therefore, the potential for a significant adverse effect resulting from working in the vicinity of foreign pipelines is low. In addition, all workers onsite will be trained in safe procedures for working near foreign lines. Consequently, the

probability of a significant effect to a foreign pipeline is unlikely and the potential for adverse effects resulting from working in the vicinity of foreign pipelines is low (Table 7.9-3, point [c]). The potential effects of a large rupture resulting in severe contamination to air or water, or loss of property, are discussed further in Volume 7. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – effects resulting from damages to utility lines (*e.g.*, cables and telephone lines), which could result in an interruption of services, extend to the Socio-economic RSA. The effects resulting from accidental ruptures of water lines or foreign pipelines range from small terrestrial spills (Footprint), contamination of surface or groundwater (HHRA LSA) to large fires (Socio-economic RSA), depending on the product in the line.

- Duration: immediate – the event causing a rupture or damage to utility lines is an accident, the period of which is less than or equal to two days.

- Frequency: accidental – rupture of or damage to utility lines during construction is rare.

- Reversibility: immediate to short-term – depending on the length of time needed for clean up and reclamation of the residual effect caused by damage to or rupture of a utility line.

- Magnitude: low to high – depending on the type, location and damages caused by the ruptured utility line.

- Probability: low – it is unlikely that a rupture or damage to a utility line will occur.

- Confidence: moderate – based on the professional experience of the assessment team.

Transportation Accident During Construction

Public safety during construction was brought up as a concern during the Chilliwack Community Workshop. Increased traffic congestion during construction that may lead to an increased risk of traffic accidents was also brought up during the Valemount Community Workshop. Transportation accidents arising from increased traffic on major roads associated with Project construction will be mitigated by implementing the measures in Table 7.9-2, including the use of a Traffic and Access Control Management Plan (Appendix C of the Pipeline EPP in Volume 6B) and Section 4.3 of the SEMP. The availability and capacity of emergency services (*e.g.*, fire, ground and air ambulance) in the Socio-economic RSA are described in Section 5.5.6 and Section 5.8.6.3.

This adverse residual effect relates to the indicator of transportation infrastructure under Section 7.2.5 Infrastructure and Services, specifically to the measurement endpoint of traffic volumes. The indicators of public safety and health care service provision under Section 7.2.8 Community Health are also relevant, specifically the measurement endpoints of traffic-related injury and mortality, and demand on and capacity of emergency medical response.

A transportation accident arising from increased traffic on major roads associated with Project construction activities would likely be considered of high magnitude if the accident resulted in serious injury to humans or damage to property. However, the probability of a vehicle accident having a significant effect is low (Table 7.9-3, point [d]). A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – transportation accidents during construction activities may result from commuting to and from the work site.

- Duration: immediate – the event causing serious injury to humans or damage to property is a transportation accident, the period of which is less than two days.

- Frequency: accidental – transportation accidents during construction and any associated residual effects are rare.

- Reversibility: immediate to permanent – some accidents may result in minor injuries to people (immediate) while others could cause permanent injury or death to people (permanent).
- Magnitude: low to high – depending on the type and severity of effects associated with the outcome of a transportation accident.
- Probability: low – it is unlikely that a transportation accident will occur.
- Confidence: moderate – based on the professional experience of the assessment team.

Blasting During Construction

Blasting will be required at certain places along the proposed pipeline corridor to install the new pipe. Mitigation measures in Table 7.9-2 will reduce the risk of injury from fly rock or accidental detonation. Emergency response plans will be implemented in the unlikely event of an injury. The availability and capacity of emergency services (*e.g.*, fire, ground and air ambulance) in the Socio-economic RSA are described in Section 5.5.6 and Section 5.8.6.3. This adverse residual effect is relevant to the indicator public safety under Section 7.2.8 Community Health, specifically to the measurement endpoint of demand on and capacity of emergency medical response.

Typically, fly rock from the detonation of explosives during blasting will not result in a significant adverse residual effect if safety measures and protocols are adhered to, including the use of blasting mats to reduce or eliminate fly rock. If required for public safety, traffic will be controlled within the fly rock zone where blasting is conducted. Safety procedures will be reviewed with all construction workers working in the vicinity of the blasting area so that within the fly rock zone, the risk to human health is negligible within the fly rock zone. While a serious injury or loss of life resulting from fly rock during blasting are likely to be considered of high magnitude, the probability of such occurrences is low.

The significance of an unintentional detonation of explosives will depend on the location of the detonation and its proximity to people. An accidental detonation of explosives involving severe injury, loss of human life or damage to property from a fire would be considered a significant adverse residual effect. Given the proper implementation of mitigation measures during the transport, storage and handling of explosives, the probability of an unintentional detonation is low (Table 7.9-3, point [e]).

The use of explosives during blasting along the proposed pipeline corridor will not affect the operations or integrity of the existing Trans Mountain pipeline or other infrastructure. Small scale test blasts will be conducted to demonstrate the blast performed as per plan and complies with allowable vibration levels measured at the infrastructure of concern. Additional detail on blasting is provided in Volume 4A. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: Socio-economic RSA – fly rock or unintentional detonation could cause injury or damage to property from a fire beyond the Footprint.
- Duration: immediate – the event causing injury to people from fly rock from blasting or an unintentional detonation is an accident, the period of which is less than two days.
- Frequency: accidental – injury from blasting fly rock or an unintentional detonation of explosives is rare.
- Reversibility: immediate to permanent – an accident from fly rock or unintentional detonation may result in minor injuries to people (immediate) or could cause permanent injury or death (permanent).
- Magnitude: low to high – depending on the type and severity of effects associated with the outcome of an accident associated with explosives.
- Probability: low – it is unlikely that an accident associated with explosives will occur.
- Confidence: moderate – based on the professional experience of the assessment team.

Damage from Criminal Activity

The issue of security risks related to criminal activity was raised during consultation at the Burnaby, Chilliwack, Edmonton West and Edson Community Workshops. Participants in these workshops were concerned that opponents of the Project may pose a security risk to the existing TMPL system and/or the Project.

KMC has in place a Security Management Plan as required by Section 47.1 "Security Management Program" of the *NEB OPR* and in compliance with CSA Z246.1-09 which will be supplemented with a TMEP-specific Security Program. Additional mitigation measures (*e.g.*, the Traffic and Access Control Management Plan in Appendix C of the Pipeline EPP [Volume 6B]) are provided in Table 7.9-2 to prevent vandalism, theft and damage to the existing and proposed infrastructure.

Despite security measures currently in place and proposed for the Project, it is possible that a security incident could still occur during construction or operations. A security incident such as a bomb threat which could cause a rupture of the pipeline and a product release, injury to a person, death, or a fire causing damage to adjacent property, could potentially be considered a significant adverse residual effect. The probability of such an incident occurring is low (Table 7.9-3, point [f]). The potential effects of a product release during operations are discussed further in Volume 7. Other security incidents such as theft or minor vandalism, while illegal, would likely be of low magnitude and reversible in the immediate to short-term if repair or replacement is relatively easy.

Engagement with communities along the proposed pipeline corridor will be ongoing, including discussions about how Trans Mountain addresses pipeline safety and how the community may assist, such as reporting suspicious behaviour around the pipeline or facilities, if observed. Trans Mountain will work with emergency services (*e.g.*, fire and police) to ensure that there are resources available to respond to a major security incident such as a bombing or fire, should it occur during construction or over the lifetime of the Project.

This adverse residual effect is relevant to the indicator emergency and protective services under Section 7.2.5 Infrastructure and Services, particularly the measurement endpoint of emergency, protective and social services capacity and demand. The indicator of health care service provision under Section 7.2.8 Community Health is also relevant, specifically the measurement endpoint of demand on and capacity of emergency medical response. A summary of the rationale for all of the significance criteria is provided below.

- Spatial Boundary: HORU LSA – the effects of a security incident could be confined to the Footprint or extend into the HORU LSA.

- Duration: immediate – acts of criminal activity would likely be conducted as quickly as possible in order to avoid being seen by a worker or the general public (*i.e.*, less than or equal to two days).

- Frequency: accidental – although the act of a security incident such as vandalism, theft, damage to the proposed or existing pipeline and facilities, or fire would be deliberate, it is expected to occur rarely, if at all.

- Reversibility: short-term to permanent – items stolen or a minor act of vandalism could be replaced or repaired during the construction phase or within any one year during the operations phase (short-term), while damage to structures from a fire would be reversible in the long-term and a bombing could cause permanent injury or death (permanent).

- Magnitude: low to high – depending on the type and severity of effects caused by the security incident.

- Probability: low – the probability of a security incident occurring is based on actual location.

- Confidence: moderate – based on the professional experience of the assessment team.

7.9.6 Combined Effects Resulting from Accidents and Malfunctions

An evaluation of the combined effects considers those residual effects that are likely to occur. Since the probability of an accident or malfunction is low, an evaluation of combined effects of the construction and operations of the Project arising from accidents and malfunctions is not warranted.

7.9.7 Summary

As identified in Table 7.9-3, the probability of a significant residual socio-economic effect arising from accidents and malfunctions as a result of the construction and operations of the Project is low.

7.10 Summary of Socio-economic Effects Assessment

This subsection provides an evaluation of combined adverse residual effects, or combined positive residual effects, and is conducted for those indicators where more than one identified potential adverse residual effect or positive residual effect may occur. A discussion of combined effects is included to clarify the overall effect of the Project on the socio-economic indicator in question and the overall effect of the Project on the socio-economic element. In addition, the overall effects of the Project on the element are evaluated in consideration of the objectives or goals of applicable land and resource use management plans, MDPs and government policies. A summary of objectives or goals of applicable land and resource use management plans, MDPs and government policies the plans considered are provided in Table 7.10-1.

TABLE 7.10-1

SUMMARY OF LAND AND RESOURCE USE MANAGEMENT PLANS, MUNICIPAL DEVELOPMENT PLANS AND GOVERNMENT POLICIES CONSIDERED IN THE SOCIO-ECONOMIC EFFECTS ASSESSMENT

Name of Plan	Summary of Plan
ALBERTA	
Strathcona County Municipal Development Plan Bylaw 1-2007 (Strathcona County 2007)	• The purpose of this plan is to aid in making decisions pertaining to growth and development in an orderly manner over the next 20 years and beyond, and presents the means by which the long-term goals of the county can be achieved. The approach to sustainability focuses on the social, economic and environmental elements of the community. • The proposed pipeline corridor crosses the following land use zones of this plan: heavy industrial and light/medium industrial. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The county encourages that future industry be conducted in a way that creates minimal impact on the environment and residents. It also supports development of pipeline/utility corridors in consultation with interested and affected parties.
The Way We Grow: Municipal Development Plan, Bylaw 15100 (City of Edmonton 2010)	• The objectives of this plan are to: support sustainable urban form; integrate land use and transportation; design complete, healthy and livable communities; encourage urban design; support prosperity; protect, preserve and enhance the natural environment; support working within our region; manage land and resources; and maintain food and urban agriculture. • The proposed pipeline corridor crosses the following land use zones of this plan: developing, planned and future neighborhoods and future commercial node. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The MDP outlines municipal policies related to pipeline corridors, such as: develop a risk management approach; collaborate with EAPUOC & ERCB; ensure development setbacks from pipelines; and, if possible, plan pipelines within other utility corridors.
Your Bright Future: Municipal Development Plan 2010-2020 (City of Spruce Grove 2010)	• The overarching objective of this plan is to provide a framework to direct growth and change in Spruce Grove to 2020 in a way that conforms to the City's interpretation of community sustainability. The concepts of balance and adaptability underlie this framework. • The proposed pipeline corridor crosses the following land use zones of this plan: open space (5 areas), residential use, industrial/business parks, vehicle oriented commercial, institutional. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The MDP plans for pipeline corridors within the context of the Capital Regional Growth Plan, and supports the protection of these corridors from incompatible development.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Town of Stony Plain Municipal Development Plan 2005-2020 (Town of Stony Plain 2005)	• This plan provides directions to manage growth and development within the Town of Stony Plain over the next 15 years to accommodate an estimated population of over 21,000 by the year 2020. Some of the guiding principles of the plan are to: preserve and enhance the quality of life for residents of Stony Plain; pursue mutually beneficial regional partnerships and alliances; maintain a small town atmosphere; and promote environmental stewardship by protecting and preserving natural areas. • The proposed pipeline corridor crosses the following land use zones of this plan: Parks/open spaces, urban residential use, future trail routes, industrial use, and commercial use. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The MDP recognizes the requirement of setbacks from pipeline and utility rights-of-way, in accordance with the Alberta Energy and Utility Boards legislation. The MDP also states that Area Structure Plans are required for new development and must address the environmental impacts and mitigation measures for incompatible land uses such as pipelines. Finally, the MDP encourages the joint use utility and transportation corridors in order to minimize impacts and fragmentation of other land uses. • In relation to heritage resources, the Town of Stony Plain should work with Alberta Community Development in identifying heritage and archaeological resources, recognizing heritage properties through its legislative powers and developing policies and incentives to encourage owners to conserve properties with heritage value.
Village of Wabamun Municipal Development Plan (Village of Wabamun 2010)	• This plan seeks to harness the ideas and creativity of the Village of Wabamun's Council and residents, and articulate these ideas as goals and objectives for future development. The plan facilitates multi-faceted growth and development, encourages the maintenance of a physical separation between incompatible land uses, and encourages the preservation and maintenance of the quality of life, among other goals. • The proposed pipeline corridor crosses the following land use zones of this plan: Vehicle-oriented commercial and industrial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Entwistle Area Structure Plan Bylaw No. 23-2012 (Parkland County 2012)	• The purpose of this plan is to provide direction for balanced and sustainable development of the Hamlet of Entwistle and its surrounding. The plan will guide future development by supporting and directing growth that will be capable of meeting the residential, service, commercial and community needs of the area's residents. • The proposed pipeline corridor crosses the following land use zones of this plan: Agricultural Restricted District. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Parkland County Municipal Development Plan, Bylaw No. 37-2007 (Parkland County 2007)	• The guiding principles of the plan are to achieve sustainability while still protecting existing lifestyles and established land use patterns by: supporting environmental sustainability; supporting fiscal sustainability; supporting social sustainability; emphasizing economic development; respecting community character; and maintaining a reasonable degree of land use certainty. • The proposed pipeline corridor crosses the following land use zones of this plan: environmentally significant areas, country residential core, agricultural use, and industrial/commercial. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The MDP states that AEUB subdivision and setback regulations respecting pipelines and other oil & gas facilities will be adhered to when considering further development.
Parkland County Land Use Bylaw No. 20-2009 (Parkland County 2009)	• The purpose of this bylaw is to facilitate the orderly, economical and beneficial development and use of land and buildings within Parkland County. • The proposed pipeline corridor does not cross land use zones of this plan. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Hamlet of Evansburg Area Structure Plan Bylaw No. 12.03 (Yellowhead County 2003)	• The objectives of this plan are to: identify and encourage new residential and non-residential development in Evansburg and its periphery; identify opportunities to enhance existing commercial and public spaces; and improve the quality of life for community landowners, residents and visitors. • The proposed pipeline corridor does not cross land use zones of this plan. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Hamlet of Wildwood Area Structure Plan (Yellowhead County 2005)	• The objectives of this plan are to: provide lifestyle options and development opportunities for Wildwood and area residents; protect the integrity of existing developments by building upon what exists; create a Hamlet General District that allows for a mix of potentially compatible uses; and to optimize the use of existing infrastructure and facilities. • The proposed pipeline corridor does not cross land use zones of this plan. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Town of Edson Municipal Development Plan (Town of Edson 2006)	• This plan is a statement of how the Council and residents of the Town of Edson wish to see the community evolve over the next fifteen to twenty years. The plan provides the broad policies which serve as a basis for all other local planning controls and set the parameters needed to evaluate future development and subdivision proposals. Some of the objectives of the plan are to maximize the quality of life of town residents, provide for growth to occur in an orderly and efficient manner, and to preserve and enhance important local heritage features. • The proposed pipeline corridor crosses the following land use zones of this plan: existing schools, parks and public open spaces, residential, residential low density, commercial/light industrial and industrial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Edson Urban Fringe Intermunicipal Development Plan (Yellowhead County 2007)	• This plan provides a framework for the long-term growth and development of the lands located within the Edson Fringe Plan Area that includes lands in Yellowhead County and the Town of Edson. The objectives of the plan include joint municipal plan objectives, objectives for lands within the town of Edson, and objectives for lands within Yellowhead County. • The proposed pipeline corridor crosses the following land use zones of this plan: vacant urban reserve and mixed use agriculture/country residential. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. However, it does state that pipeline rights-of-way, wells and facilities that extract, carry or process oil or natural gas are regulated by the Energy Utilities Board (EUB) by Directive. Subdivision and development adjacent to these developments are also subject to regulation, particularly with regard to setbacks from non-compatible land uses, such as residences and institutions or commercial establishments that include over-night accommodation.
Town of Hinton Municipal Development Plan (Town of Hinton 1998)	• This plan provides guidance for public and private development decisions within the town. It provides a means of coordinating the thinking and actions of the town and directing it towards achieving immediate and long term land use goals and aspirations. The Plan is a guide for future development – a framework for decision making. • The proposed pipeline corridor crosses the following land use zones of this plan: open space – passive recreation/environment and future growth areas. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. Hinton supports resource-based industries but states that further industrial development must be done in a way that is sustainable and attractive. The MDP requires that future development be of high visual quality, that existing vegetation should be used to screen development and that municipal bylaws be enforced to minimize nuisance and unsightly premises. • In relation to heritage resources, this plan aims to ensure the availability of suitable lands for alternative or advanced educational purposes which integrate a range of educational and cultural facilities and services.
Town of Hinton Community Development and Enhancement Plan (Town of Hinton 2003)	• This plan integrates the Town of Hinton Parks Master Plan, Visitor Attractions Plan and Urban form Plan. The underlying objective of this three-part plan is to provide a practical and effective framework for community development and enhancement within the Town of Hinton. • The proposed pipeline corridor crosses the following land use zones of this plan: neighbourhood and district open space. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Yellowhead County Municipal Development Plan Bylaw No. 1.06 (Yellowhead County 2006a)	• The purpose of this plan is to provide Yellowhead County residents and Council with a framework to guide decision-making that is necessary to achieve the county's 20 year vision for the future. The plan has been developed to guide future policy, land use and infrastructure investment decisions, and strike a balance between economic, social, physical development and environmental considerations, among other goals. • The proposed pipeline corridor crosses the following areas of this plan: agricultural policy area, rural policy area, foothills policy area, Edson urban fringe intermunicipal area, Hinton urban fringe intermunicipal area, Mountain View policy area, hamlet growth area. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The plan mentions the need to apply AEUB *Setback Regulations and Guidelines* concerning pipelines when considering subdivision and development applications.
Yellowhead County Land Use Bylaw No. 2.06 (Yellowhead County 2006b)	• The purpose of this Bylaw is to regulate and control the use and development of land and buildings within Yellowhead County to achieve the orderly and economic development of land. • The proposed pipeline corridor does not cross land use zones of this plan. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Coal Branch Sub-Regional Integrated Resource Plan (Government of Alberta 1990)	• The purpose of this plan is to effectively mitigate conflicts between resource use objectives by determining resource priorities and allocating land uses for specific portions of the Coal Branch planning area on public lands. • The proposed pipeline corridor crosses the following land use zones of this plan: multiple use, agriculture. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan aims to protect and/or preserves historic resources (archaeological, palaeontological, historical and natural), as defined in the *Historical Resources Act*, from potential or actual impact related to future resource developments, and to conserve these resources for future generations. The plan also aims to manage historical resources sites for scientific, educational and interpretive purposes.
The Northern East Slopes Sustainable Resource and Environmental Management Strategy (Government of Alberta 2003)	• This plan guides the Northern East Slopes of Alberta region toward sustainable development while balancing economic, environmental and community values. Addressing current and emerging issues, the strategy provides clear, long-term direction for managing resources and activities on Crown lands while considering cumulative effects. • The proposed pipeline corridor crosses Forest Management Agreement Areas identified in this plan, including Weyerhaeuser Canada Limited (Edson) and Weldwood of Canada Limited. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan aims to ensure that historical resources are identified and respected in the decision-making process and to ensure that our history is understood and respected in the decision-making process.
Jasper National Park of Canada Management Plan (Parks Canada 2010)	• Jasper National Park Management Plan provides direction and strategies for the park's mandate of resource protection, enhanced visitor experience, strengthening cultural resource management and public appreciation. • The existing pipeline segment to be reactivated crosses the following land use zones of this plan: Natural Environment zone, Park Services zone and Montane Ecoregion zone. • This plan does specify considerations pertaining to pipeline construction within the land use zones crossed by the Project. The plan states that development in the park typically occurs in valleys, which are the most productive areas in the park. As such, to ensure that ecological integrity is maintained, Parks Canada limits development in these areas and defines the physical footprint, types and intensity of developments permitted in the park. The plan also states the importance of stewardship and restoration along pipeline corridors.
BC	
Robson Valley-Canoe Upstream Official Community Plan (RDFFG 2006)	• The purpose of this plan is to state the broad land use objectives and policies of the Regional Board to guide decisions on planning and land use management for the Robson Valley-Canoe Upstream area within the RDFFG, as set out in the *Local Government Act*. • The existing pipeline segment to be reactivated crosses the following land use zones of this plan: public development/institutional, rural residential, rural holdings, agriculture/resource and resort commercial. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Village of Valemount Official Community Plan (Village of Valemount 2006)	• This plan gives direction and guidelines for the future of Valemount. It provides a framework for future growth through statements of objectives and policies as well as providing a degree of certainty about the future form and character of the municipality. It provides Village Council and the public with the basis to evaluate development proposals and to ensure that these proposals are consistent with the vision of the Plan. The OCP also establishes the basis for more specific bylaws and programs such as a Zoning Bylaw or Downtown Revitalization Program. In essence, the Plan is the village's central land use management policy document. • The proposed pipeline corridor does not cross land use zones in this plan. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Blue River Official Community Plan (TNRD 2011a)	• The purpose of this plan is to provide direction for future development and land uses within the identified Plan Boundary, which surrounds the community of Blue River. The plan contains objectives, policies and future land use designations adopted by the Board of Directors of the TNRD. • The proposed pipeline corridor crosses the following land use zones of this plan: residential, future residential, mining for gravel deposits, future commercial development and industrial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, it is the objective of the Board of Directors to recognize, preserve and enhance buildings and sites of significant cultural, historical and archaeological value.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Valemount to Blue River Winter Recreation SRMP (Village of Valemount 2005)	• This plan aims to sustain a wide range of recreation activities in the area and the economic benefits from these activities will support local businesses and communities. These activities will coexist with each other and not endanger the local environment and wildlife populations. • The proposed pipeline corridor crosses the following land use zones of this plan: winter recreation. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, the plan considers First Nations information and knowledge to strengthen land and resource management and to consider the heritage values of First Nations during development planning.
Robson Valley Land and Resource Management Plan-Summary (BC MFLNRO 1999)	• This plan provides broad direction for the sustainable use of Crown land and resources in the Robson Valley area. The plan balances economic, ecological, spiritual, recreational and cultural interests. It will help to provide greater land use certainty, preserve natural areas for future generations, maintain resource-sector jobs for local workers and increase opportunities for tourism and recreation. • The proposed pipeline corridor crosses the following Resource Management Zones of this plan: Settlement/Agriculture – Special (Rocky Mountain Trench). • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan aims to preserve the special, natural, cultural heritage and recreational features in the Robson Valley, in the natural state, for the sake of maintaining their intrinsic, scientific, holistic and spiritual values, and for the enjoyment and education of present and future generations.
Eight Peaks Sustainable Resource Management Plan (BC Ministry of Sustainable Resource Management 2003)	• The goal of this plan is to establish resource management objectives that create conditions that support forestry, heli-skiing and other winter recreation activities while incorporating the principles of sustainability and stewardship. • The proposed pipeline corridor crosses the following land use zones of this plan: winter recreation management units. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
District of Clearwater Official Community Plan (District of Clearwater 2012)	• The District of Clearwater's OCP is intended to provide clear objectives and policies designed to implement community goals, which are based on sustainability principles. Objectives outlined in the OCP are grouped together under respective principles which include: environmental sustainability; social sustainability; cultural sustainability; and economic sustainability. • The proposed pipeline corridor crosses the following land use zones of this plan: park use, future park, urban residential, suburban residential, country residential, recreational, managed community forest and woodlot, institutional and rural resource use. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Nicola Valley Official Community Plan (TNRD 2011b)	• The Nicola Valley OCP is intended to provide a policy framework in which decision and actions pertaining to the use and development of land in the planning area are based upon. The broad objectives and policies outlined in the plan are designed to address the patterns of existing and future land use in order to promote growth and opportunities for land use, sustain the resource base, and preserve the natural environmental characteristics of the area. • The proposed pipeline corridor crosses the following land use zones of this plan: country residential, agricultural use, rural resource use. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. However, the OCP states that in order to maintain the functionality of the existing Trans Mountain pipeline, only compatible land uses will be designated along the corridor to minimize conflict.
Avola Official Community Plan (TNRD 2011c)	• The purpose of the Avola OCP is to provide direction for future development and land uses with the plan boundary. The plan outlines objectives, policies and future land use designations for the area. • The proposed pipeline corridor crosses the following land use zones of this plan: park/public use, residential, agricultural use, highway commercial use, retail commercial use and industrial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Kamloops Airport Area Land Use & Development Plan (Urban Systems Ltd. 2000)	• The focus of this plan is to lay the ground work to be used to promote the development of the Kamloops Airport area from a land use planning perspective. • The proposed pipeline corridor crosses the following land use zones of this plan: future residential use, industrial, commercial and airport. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The proposed pipeline corridor crosses existing industrial and commercial zones. The Kamloops Airport Land Use Plan recognizes development restrictions to industrial and commercial activities due to the existing Trans-Mountain pipeline right-of-way.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Kamloops Land and Resource Management Plan (City of Kamloops 1995)	• The goal of this plan is a balanced use of the land and resources which respects and accommodates all interests; protection and security of the land and resources for future generations; sustainable resource management practices which recognize the biological and physical limitations of the land and resources, and provide the highest and best values from these resources; compatibility with natural watershed processes and respect for the intrinsic value of nature; social and economic stability and vitality of local communities; and communication, education, and awareness of all values, including those of Aboriginal peoples. • The proposed pipeline corridor crosses the following land use zones of this plan: protected resource management zones. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan aims to protect archaeological sites within the LRMP area.
KAMPLAN-Official Community Plan (City of Kamloops 2004)	• The goal of this plan is to provide the best quality of life for all residents by: building strong and diverse neighborhoods; providing a variety of housing types; encouraging healthy and active lifestyles; supporting cultural and athletic pursuits; diversifying economic and educational opportunities; and maintaining sustainable environmental stewardship. • The proposed pipeline corridor crosses the following land use zones of this plan: special residential development areas, parks, future parks and trails, agricultural use, heavy industrial and minerals and petroleum products storage and processing. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan aims to preserve, enhance and promote the community's cultural heritage for the benefit of residents and visitors alike.
Kamloops North Official Community Plan (City of Kamloops 2011)	• The purpose of this plan is to provide direction for future development and land uses within the area north of the City of Kamloops including: Mclure, Vinsulla, Black Pines, Heffley Lake, and Sullivan (Knouff) Lake. The plan contains objectives, policies, and future land use designations adopted by the board of directors of the TNRD. • The proposed pipeline corridor crosses the following land use zones of this plan: Rural residential, agricultural use and general commercial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Thompson-Nicola Regional District Zoning Bylaw No. 2400, 2012 (TNRD 2012a)	• The purpose of this bylaw is to establish zoning and associated regulations for electoral areas in the TNRD. • The proposed pipeline corridor crosses the following land use zones of this plan: country residential, manufacture home park zone, agricultural/forestry, recreational, highway commercial, rural service commercial and land use contract. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
City of Merritt Official Community Plan (City of Merritt 2011)	• This plan provides an updated vision for the future of Merritt and a framework for carrying that vision forward to the year 2030. The OCP provides Council and the public with direction for development and the basis to evaluate proposals to ensure these proposals are consistent with the vision. The intent of this OCP is to provide an appropriate amount of planning direction while also providing flexibility to customize development to suit specific and unique circumstances within the city as well as facilitating creative and unusual development proposals. • The proposed pipeline corridor crosses the following land use zones of this plan: residential, agriculture use, airport commercial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan encourages conservation of areas and structures that have cultural and heritage value. The plan also encourages continuing partnership and work with First Nations to celebrate culture and history in the Nicola Valley.
City of Merritt Zoning Bylaw No. 1894, 2004 (City of Merritt 2005)	• The purpose of this bylaw is to regulate land use and density within the City of Merritt. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The Zoning Bylaw notes that no development of any kind shall be permitted between the eastern end of the airport and the City boundary in order to preserve take off approach surface. The proposed pipeline corridor crosses this area at approximately RK 927.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Chilliwack Forest District Sustainable Resource Management Plan (BC ILMB 2004)	• The SRMP for the Chilliwack Forest District is used to effectively manage old growth management areas (OGMA) and Wildlife Tree Parch of Landscape Units (LU). Implementation of the plan is intended to sustain certain biodiversity values that are high priority for the province. The plan recognizes that managing biodiversity through the management of old growth forest can have benefits for ecosystems, water quality and preservation of other natural resources. • The proposed pipeline corridor crosses the following Landscape Units of this plan: Fraser Valley South, Silverhope and Coquihalla. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
District of Hope Official Community Plan (District of Hope 2004)	• This OCP is a municipal bylaw that sets the broad framework for managing development in the District of Hope by providing objectives for different land uses anticipated to meet future needs for a 5 to 10 year period. Additionally, the plan sets objectives for community services and facilities. • The proposed pipeline corridor crosses the following land use zones of this plan: country residential, single family residential, multiple family residential, mobile home park, institutional, agricultural, highway commercial, general and heavy industrial, campground and holiday park. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan explores opportunities to further public awareness of the area's rich First Nations history and anthropological exploration through the display of the natural history and cultural development of the Hope area, and through working with Sto:lo and other First Nations to protect and enhance the anthropological heritage of the region. The plan also supports the retention of the small but important legacy of heritage buildings and other historic resources and encourage conservation under the BC *Heritage Conservation Act*.
City of Chilliwack Official Community Plan (City of Chilliwack 1998)	• The purpose of this plan is to provide direction for future development, environmental protection, parks, transportation, recreation and service infrastructure. In addition, the plan will act as a policy guide to Council for short and long-term land use and development decisions, including associated social, economic, environmental and physical development. • The proposed pipeline corridor crosses the following land use zones of this plan: low density residential, agricultural use, outdoor recreational use, institutional and civic use. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plans acknowledges historical heritage, a legacy of native, pioneer, settlement and agricultural cultures found in our buildings and sites, transportation routes, archaeological sites, cemeteries and other cultural resources.
City of Chilliwack Zoning Bylaw 2001 (City of Chilliwack 2001)	• The purpose of this bylaw is the promotion of health, safety, convenience, and welfare of the public through due regard to those considerations cited in the *Local Government Act*. • The proposed pipeline corridor crosses the following land use zones of this plan: public use reserve, limited use reserve, one-family residential, low density multi-family residential, rural residential, agricultural lowland, agriculture small lot, agriculture food processing, outdoor recreation, civic assembly, special institutional and public service. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
City of Abbotsford Official Community Plan (City of Abbotsford 2005)	• This plan is built on five major planning strategies intended to realize the vision of the city, including: creating a complete community; protecting our natural environment; building a healthy, inclusive community; making better connections; and strengthening the city centre. • The proposed pipeline corridor crosses the following land use zones of this plan: City parks and open spaces, urban residential, city residential, Mckee Peak planning study area, agricultural use. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Fraser Valley Regional District Official Community Plan for Popkum-Bridal Falls part of Electoral Area "D" (FVRD 1997)	• This is the background report to the OCP for Popkum-Bridal Falls, of the FVRD. The plan serves as a statement of the broad objectives and policies of the Regional board regarding the form and character of existing and future land use and servicing in the plan area. The plan has a number of purposes related to growth and development; land use and the provision of public services, protection of the environment, and implementing zoning and other bylaws. • The proposed pipeline corridor crosses the following land use zones of this plan: natural resource areas, agricultural areas large holdings, highway tourist recreation commercial areas, agricultural areas small holdings and suburban residential areas. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Fraser Valley Regional District Official Community Plan for Portions of Electoral Area "B" Yale, Emory Creek, Dogwood Valley and Choate Bylaw No. 150, 1998 (FVRD 1998)	• This plan outlines objectives and policies of the Regional District Board. Specific concerns were identified through public meetings, open houses and advisory planning commission meetings and include economic stability, land use, road improvements, railway operations, heritage conservation, tourism development and commercial area improvements. • The proposed pipeline corridor does not cross the area encompassed by this plan. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Fraser Valley Regional District Official Community Plan for Electoral Area "E" Bylaw No. 1115, 2011 (FVRD 2011b)	• The purpose of this plan is to provide objectives and policies relating to: the development of residential areas to meet anticipated housing needs; proposed commercial, industrial, institutional, agricultural, recreational and public utility land uses; restrictions on use of land that are subject to hazardous conditions or sensitive areas; development of major roads, sewer and water infrastructure, as well as public facilities. • The proposed pipeline corridor does not cross the area covered under this plan. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The plan does, however, state that development permits are not required for Federal and Provincial regulated utilities including pipelines.
Township of Langley Official Community Plan (Township of Langley 1979)	• The goals of this plan are to: attractively service urban areas providing diverse opportunities, suitable to the varied lifestyles in the municipality; maintain the rural character outside designated urban growth areas; preserve good quality air, water and land environments; rational development of agricultural, industrial and commercial enterprises to provide a balance between residential and other uses; provide adequate physical and social services within the means of the municipality; and to preserve and enhance the unique and character-defining aspects of Langley's historic sites, communities and cultural resources. • The proposed pipeline corridor crosses the following land use zones of this plan: residential use, green zone, industrial growth zone and water system expansion zone. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan encourages the preservation and enhancement of the unique and character-defining aspects of Langley's historic sites, communities and cultural resources.
City of Surrey Official Community Plan (City of Surrey 2012)	• This plan was adopted by the City of Surrey City Council to guide land use and development over the next 5 to 20 years. It is Council's intention to achieve orderly growth for complete sustainable communities with sensitivity to the environment. This growth includes residential growth as well as a growing business base for Surrey. • The proposed pipeline corridor crosses the following land use zones of this plan: City park land, green space corridor and industrial use. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
City of Coquitlam Citywide Official Community Plan (City of Coquitlam 2001a)	• The purpose of this plan is to guide future land use and servicing provisions in ways that sustain its citizens' values. The plan provides a broader framework for considering and managing future change, including policies to implement the framework and address related needs for amenities, services and infrastructure support. • The proposed pipeline corridor crosses the following land use zones of this plan: parks/open space/natural areas, extensive recreation, industrial, commercial, civic and major institutional. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. • In relation to heritage resources, this plan guides the retention and enhancement of Coquitlam's distinct and valued heritage for the enlightened enjoyment of future generations.
Coquitlam Lougheed Neighbourhood Plan (City of Coquitlam 2001b)	• The purpose of the plan is to guide future land use and servicing decisions in ways that enhance the Lougheed Neighbourhood and to provide City Council with a plan to manage change in an efficient and effective manner. The plan is a comprehensive land use and servicing plan for lands within the City of Coquitlam that lie within an approximate 1,000 m radius of the Lougheed SkyTrain Station. • The proposed pipeline corridor crosses the following land use zones of this plan: urban quarter, high and medium density apartments, compact one-family residential, neighbourhood attached residential, transit village commercial and service commercial. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.

TABLE 7.10-1 Cont'd

Name of Plan	Summary of Plan
Burnaby Official Community Plan (City of Burnaby 1998)	• The purpose of this plan is to provide direction for the growth management role that the city should play over the next 10 years and beyond. The goal of the plan is to create a more complete and livable community that reflects local needs, aspirations and values, and at the same time define Burnaby's contribution to helping shape a livable region for the next decade and beyond. • The proposed pipeline corridor crosses the following land use zones of this plan: green zone land, single family suburban, single and two family urban, urban village, town centre, business centres and petro chemical. • This plan does specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project. The OCP outlines the following goals for the petro-chemical industrial sector: improve the quality of air emissions and water run-offs; ensure that contemporary safety and emergency response standards are met; ensure that improvements are made to increase "neighbourliness" with surrounding uses, particularly residential; be partners with the City and the community in undertaking environmental stewardship initiatives involving key environmental features (*e.g.*, creeks, ravines and foreshore areas) within their lands; strive for public access provisions, either for trail continuity or focal point purposes, involving these lands without compromising safety or operational considerations; and reduce operational noise and spills (City of Burnaby 1998). • In relation to heritage resources, this plan provides opportunities for increased awareness and the conservation of the city's unique natural, cultural, archaeological and built heritage.
Metro Vancouver 2040 – Shaping our Future (Metro Vancouver 2011)	• This plan focuses on land use policies to guide the future development of the region and support the efficient provision of transportation, regional infrastructure and community services. In combination with other management plans, Metro Vancouver's RGS can help meet the region's priorities and mandates and support the long-term commitment to sustainability. • The proposed pipeline corridor crosses the following land use zones of this plan: agricultural use, municipal town centre, mixed employment and industrial.
Port Metro Vancouver Consolidated Land Use Plan 2010 (PMV 2010b)	• This plan contains a comprehensive set of policies that will shape the way the PMV meets its objectives and fulfills its mandate under the *Canada Marine Act*. It facilitates the Port's obligation to manage the land and water within its jurisdiction in a manner that supports port activity while respecting the environment as well as the needs and interests of its neighbours. This plan also provides a tool for the Port to communicate land use policies and coordinate land use initiatives with neighbouring communities and external agencies. • The proposed pipeline corridor crosses the following land use zones of this plan: conservation, urban villages, single family suburban, single/two family urban, suburban, industrial transition area, petro chemical, industrial, port marine land, port marine water, log storage and moorage, undetermined and recreation/park. • This plan does not specify any restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.
Vancouver Fraser Port Authority Land Use Plan (PMV 2008)	• This land use plan will serve as a guiding document for the ongoing development and utilization of PMV lands. • The proposed pipeline corridor crosses the following land use zones of this plan: open space and parks, recreation/parks, residential, industrial, commercial, institutional and transport. • This plan does not specify restrictions or considerations pertaining to pipeline construction within the land use zones crossed by the Project.

7.10.1 Heritage Resources

Overall, the Project has the potential to affect previously identified and newly discovered heritage resources as a result of ground disturbance activities; however, with the implementation of industry standard and provincially regulated mitigation measures during the pre-construction and construction phases of the Project, there are no residual effects of the Project on heritage resources.

Through the implementation of the mitigation measures for the heritage resources indicators and adherence to governmental legislation, it is believed that the Project meets the objectives of several land and resource use management plans, MDPs and government policies (Table 7.10-1), namely giving communities the opportunity to promote their heritage.

7.10.2 Traditional Land and Resource Use

This subsection provides a summary discussion of the overall combined effects of the Project, both terrestrial and marine, on TLRU.

Combined Effects on Traditional Land and Resource Use

The evaluation of the combined effects of the Project on the TLRU indicators considers collectively the assessment of the following indicators: subsistence activities and sites; cultural sites and traditional marine resource use. The combined residual effects considered to be likely are noted in Table 7.10.2-1. Where two indicators had different criterion conclusions, the more conservative assessment was carried forward to the combined effects assessment.

The overall combined Project effects (terrestrial and marine combined) on TLRU are primarily related to the disturbance of TLRU features (*e.g.*, habitation sites, gathering places, sacred areas), the disruption of subsistence activities and alteration of subsistence resources during construction of the pipeline as well as site-specific maintenance; changes in access and use patterns on land and in marine waters; and sensory disturbance to land and marine users. The impact balance of the overall combined Project effect is negative. For the pipeline and facilities, the frequency of the overall effect is periodic as it will extend into the operations phase and occur intermittently but repeatedly. Reversibility is considered short-term to long-term since the effects will be largely limited to the construction phase or site-specific maintenance that would occur within any one year period during operations while the effects of disturbance to traditionally harvested resources will be dependent on each target species' sensitivities. For the effects associated with the Westridge Marine Terminal, the combined residual effect is considered to be reversible in the long-term (*i.e.,* it will continue through the operations phase due to the extension of the dock and presence of moored tankers). The magnitude of the overall Project effect is considered medium; given the predicted residual effects on traditionally harvested resources with consideration for mitigation measures that are in place in the event any unidentified subsistence activities and land users are discovered. In addition, the effects assessment results for terrestrially subsistence resources demonstrate that equivalent land use capability will be maintained by the application of the mitigation strategies described in this ESA and in the EPPs for the Project. The results of the TLRU assessment do not contradict any management objectives or goals of applicable land and resource use management plans, MDPs and government policies (Table 7.10-1). A summary of the rationale for all of the significance criteria of combined effects of the Project on TLRU is provided below.

- Spatial Boundary: TLRU RSA – combined socio-economic effects on TLRU could occur at any point in the TLRU RSA.

- Duration: short to long-term – events causing combined effects on TLRU will be construction activity or site-specific maintenance that would occur within any one year period during operations and also considers combined effects on marine resources will be initiated during construction and extend throughout operations for the operational life of the Westridge Marine Terminal potentially affecting Aboriginal communities with both marine and terrestrial interests.

- Frequency: isolated to periodic – the events causing the combined effects on TLRU include pipeline and facility construction as well as site-specific maintenance activities and the presence of moored tankers at Westridge Marine Terminal which would occur intermittently but repeatedly throughout the assessment period.

- Reversibility: short to long-term – overall, the reversibility is long-term as the combined effects may occur for the duration of the operations phase.

- Magnitude: medium – the combined residual effects will be detectable by traditional resource users. The effects to traditionally harvested resources range from negligible to detectable and are dependent on each target species' sensitivities.

- Probability: high – the occurrence of combined residual effects on TLRU is considered to be likely.

- Confidence: high – based on Project information and the professional experience of the assessment team.

Summary

As identified in Table 7.10.2-1, there are no situations for TLRU that would result in a significant adverse residual socio-economic effect. Consequently, it is concluded that the socio-economic effects of the pipeline and facilities component of the Project on TLRU indicators will be not significant.

TABLE 7.10.2-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON TRADITIONAL LAND AND RESOURCE USE

Potential Combined Effect	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Traditional Land and Resource Use Indicator – Subsistence Activities and Sites									
1(a) Combined effects on subsistence activities and sites indicator.	Negative	RSA	Short-term	Periodic	Long-term	Medium	High	High	Not significant
2 Traditional Land and Resource Use Indicator – Cultural Sites									
2(a) Combined effects on cultural sites indicator.	Negative	RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
3. Traditional Land and Resource Use Indicator – Traditional Marine Resource Use									
3(a) Combined effects on the traditional marine resource use indicator (1[a] to 1[e]).	Negative	Marine TLRU RSA	Long-term	Isolated to periodic	Long-term	Low to Medium	High	High	Not significant
4. Combined Effects of the Project on Traditional Land and Resource Use									
4(a) Combined effects of the Project on traditional land and resource use indicators (1[a], 2[a] and 3[a]).	Negative	RSA	Short to long-term	Isolated to periodic	Short to long-term	Medium	High	High	Not significant

Notes: 1 RSA = TLRU RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.10.3 Social and Cultural Well-Being

This subsection provides a summary discussion of the potential effects of the Project related to social and cultural well-being. While social and cultural well-being measurement endpoints are not additive to a particular place and time, the summary discusses how qualitatively different issues may interact to create an overall effect on each indicator, even when there are both positive and negative influences occurring at the same time and issues that may be experienced differently by different people and communities.

Combined Effects – Population and Demographics

The combined effects of the Project on the population and demographics indicator are noted in Table 7.10.3-1 (point 1[a]). Table 7.2.3-3 and the accompanying discussion in Section 7.2.3.6 provide the evaluation of significance of the combined effects on the population and demographics indicator.

Combined Effects – Income Levels and Distribution

The combined effects of the Project on the income levels and distribution indicator are noted in Table 7.10.3-1 (point 2[a]). Table 7.2.3-3 and the accompanying discussion in Section 7.2.3.6 provide the evaluation of significance of the combined effects on the income levels and distribution indicator.

Combined Effects – Community Way-of-Life

The combined effects of the Project on the community way-of-life indicator are noted in Table 7.10.3-1 (point 3[a]). Table 7.2.3-3 and the accompanying discussion in Section 7.2.3.6 provide the evaluation of significance of the combined effects on the community way-of-life indicator.

Combined Effects – Aboriginal Culture

The combined effects of the Project on the Aboriginal culture indicator are noted in Table 7.10.3-1 (point 4[a]). Table 7.2.3-3 and the accompanying discussion in Section 7.2.3.6 provide the evaluation of significance of the combined effects on the Aboriginal culture indicator.

Combined Effects of the Project on Social and Cultural Well-Being

The evaluation of the combined effects of the Project on the social and cultural well-being element considers collectively the assessment of the combined effects of the Project on the following indicators: population and demographics; income levels and distribution; community way of life; and Aboriginal culture. It also considers any objectives pertaining to social and cultural well-being indicators in the land use and development plans relevant to the Project.

Most of the land use and development plans have high level objectives pertaining to the enhancement of community quality-of-life, achieving population growth goals or addressing population forecasts. To a lesser extent, some municipal, regional and land use plans support aboriginal culture development and integrate aboriginal culture in their respective community. Very few, if any, plans address income levels or wealth distribution of community members. Some communities have various plans and policies dedicated to address particular objectives based on broad principles including sustainability and community well-being, such as City of Burnaby's Social Sustainability Strategy and the City of Kamloops' Social Plan. It is anticipated that the Project would not inhibit individual community's goals pertaining to social and cultural well-being indicators. The Project will support short-term population growth associated with the Project workers and will try to offset potential negative interactions of Project workers with communities with the suite of mitigation including code of conduct policies, development of worker accommodation strategies, traffic management measures, ongoing consultation and engagement, construction scheduling to avoid key community events where practical, and tracking of socio-economic issues during construction and reclamation.

The combined effects of the project on social and cultural well-being indicators is considered to have a negative to positive impact balance. Through the implementation of the mitigation measures described in the Pipeline, Facilities and Westridge Marine Terminal EPPs (Volumes 6B to 6D) and SEMP (Volume 6B), the risk of adverse effects will be reduced; however, there are no regulatory standards for threshold social and cultural well-being effects that can be used as a standard comparison. The combined effects of the Project on social and cultural well-being indicators are characterized as not significant due to the overall low to medium magnitude and short-term nature of predicted adverse effects and the positive or neutral nature of most anticipated combined residual effects (Table 7.10.3-1, point 5[a]). A summary of the rationale for all of the significance criteria of combined effects on social and cultural well-being is provided below.

- Spatial Boundary: Socio-economic RSA – combined effects of the Project on social and cultural well-being may appear anywhere throughout the Socio-economic RSA but especially in areas used as construction hubs.

- Duration: short to long-term – most of the events causing combined effects of the Project on social and cultural well-being are limited to the construction phase of the Project; however, effects related to income levels and Aboriginal culture may extend into the operations phase.

- Frequency: isolated to continuous – most of the precipitating events are associated with the construction phase, although some effects would be expected to extend into the operations phase of the Project.

- Reversibility: short to long-term – the combined effects of the Project on social and cultural well-being would for the most part be reversible with the end of construction activities; however, opportunities related to income generation may continue into the operations phase of the Project.

- Magnitude: low to medium – the combined effects of the Project on social and cultural well-being will differ depending on the size of construction hubs, worker accommodation strategies in each community, and the results of Aboriginal and community benefit agreements. Effects are anticipated to be medium in smaller communities and low in larger communities where the temporary workforce will be easily absorbed.

- Probability: high – there is a high degree of probability that at least some of the predicted effects will manifest.

- Confidence: moderate – combined effects of the Project on social and cultural well-being are supported by Project workforce information, feedback from stakeholders and Aboriginal communities, information on regional population and labour force, and the professional experience of the assessment team. Particular effects, however, will depend greatly on individual behaviour and perceptions and outcomes of ongoing community and Aboriginal engagement.

Summary

As identified in Table 7.10.3-1, there are no situations for social and cultural well-being that would result in a significant adverse residual socio-economic effect. Consequently, it is concluded that the socio-economic effects of the Project on social and cultural well-being indicators will be not significant.

TABLE 7.10.3-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON SOCIAL AND CULTURAL WELL-BEING

Potential Combined Effect		Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
				Duration	Frequency	Reversibility				
1.	Social and Cultural Well-Being Indicator – Population and Demographics									
1(a)	Combined effects of the Project on population and demographics indicator.	Neutral to positive	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
2.	Social and Cultural Well-Being Indicator – Income Levels and Distribution									
2(a)	Combined effects of the Project on income levels and distribution indicator.	Positive	RSA	Long-term	Continuous	Long-term	Medium	High	High	Not significant
3.	Social and Cultural Well-Being Indicator – Community Way-of-Life									
3(a)	Combined effects of the Project on community way-of-life indicator.	Negative to positive	RSA	Short-term	Isolated	Short-term	Medium	High or low	Moderate	Not significant
4.	Social and Cultural Well-Being Indicator – Aboriginal Culture									
4(a)	Combined effects of the Project on Aboriginal culture indicator.	Neutral	RSA	Short-term	Isolated to periodic	Short to long-term	Low to medium	High	Moderate	Not significant
5.	Combined effects of the Project on Social and Cultural Well-Being									
5(a)	Combined effects of the Project on social and cultural well-being indicators (1[a], 2[a], 3[a] and 4[a]).	Negative to positive	RSA	Short to long-term	Isolated to continuous	Short to long-term	Low to medium	High	Moderate	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.10.4 Human Occupancy and Resource Use

This subsection provides a summary discussion of the overall combined effects of the Project, both terrestrial and marine, on HORU. While HORU measurement endpoints are not additive to a particular place and time, the summary discusses how different Project-related issues may interact to create an overall effect on each indicator. There may be instances when issues are experienced differently by users and communities.

Combined Effects on the Parks and Protected Areas Indicator

The combined effects of the terrestrial components of the Project (*i.e.,* pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities) on the parks and protected areas indicator are noted in Table 7.10.4-1 (point 1[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provide the evaluation of significance of the combined effects of the terrestrial components of the Project on the parks and protected areas indicator.

The combined effects of the marine component of the Project (*i.e.,* marine component of the Westridge Marine Terminal) on the parks and protected areas indicator are noted in Table 7.10.4-1 (point 1[b]). Table 7.6.4-3 and the accompanying discussion in Section 7.6.4.6 provide the evaluation of significance of the combined effects of the marine component of the Project on the parks and protected areas indicator.

The overall combined Project effect (terrestrial and marine combined) on parks and protected areas are primarily related to the physical disturbance to parks and protected areas during construction of the pipeline as well as site-specific maintenance; changes in access and use patterns on land and in marine waters; and sensory disturbance to land and marine users of parks and protected areas. The impact balance of the overall combined Project effect is negative. For the pipeline and facilities, the frequency of the overall effect is periodic as it will extend into the operations phase and occur intermittently but repeatedly. Reversibility is considered short-term since the effects will be largely limited to the construction phase or site-specific maintenance that would occur within any one year period during operations. For the effects associated with the Westridge Marine Terminal, the combined residual effect is considered to be reversible in the long-term (*i.e.,* it will continue through the operations phase due to the extension of the dock and presence of moored tankers). Consequently, the overall reversibility of the combined effects of the Project on the parks and protected areas indicator is considered short to long-term. The magnitude of the overall Project effect is considered low; change may be detectable, but over the long-term would not extend beyond that of an inconvenience or nuisance (Table 7.10.4-1, point 1[c]). A summary of the rationale for all of the significance criteria of combined effects of the Project on parks and protected areas is provided below.

- Spatial Boundary: HORU RSA and Marine HORU RSA – effects associated with disruption to access and sensory disturbance for parks and protected areas users may extend beyond the HORU LSA and Marine HORU LSA.

- Duration: short to long-term – the events causing the combined effects associated with disruption to access and sensory disturbance for parks and protected areas users include pipeline and facility construction and site-specific maintenance activities that will be completed within any one year during operations (short-term); and ongoing operations of the Westridge Marine Terminal (long-term).

- Frequency: isolated to periodic – the events causing the combined effects associated with disruption to access and sensory disturbance for parks and protected areas users include pipeline and facility construction (isolated) as well as site-specific maintenance activities and the presence of moored tankers at Westridge Marine Terminal which would occur intermittently but repeatedly throughout the assessment period (periodic).

- Reversibility: short to long-term – effects associated with disruption to access and sensory disturbance for parks and protected areas users from the construction and site-specific maintenance of the pipeline and facilities will be reversible in the short-term (*i.e.,* will cease after construction and site-specific maintenance) while effects from operation of the Westridge Marine Terminal will be reversible in the long-term.

- Magnitude: low – some change may be detectable for parks and protected areas users, but it will primarily be that of a nuisance or inconvenience.

- Probability: high – the effects are considered likely to occur.

- Confidence: high – based on Project information, location of parks and protected areas, and the professional experience of the assessment team.

Combined Effects on Indian Reserves, Métis Settlements and Asserted Traditional Territories

The combined effects of the terrestrial components of the Project (*i.e.,* pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities) on the Indian Reserves, Métis Settlements and asserted traditional territories indicator are noted in Table 7.10.4-1 (point 2[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provide the evaluation of significance of the combined effects of the terrestrial components of the Project on the Indian Reserves, Métis Settlements and asserted traditional territories indicator.

The combined effects of the marine component of the Project (*i.e.,* Westridge Marine Terminal) on the Indian Reserves, Métis Settlements and asserted traditional territories indicator are noted in Table 7.10.4-1 (point 2[b]). Table 7.6.4-3 and the accompanying discussion in Section 7.6.4.6 provide the evaluation of significance of the combined effects of the marine component of the Project on the Indian Reserves, Métis Settlements and asserted traditional territories indicator.

The overall combined effect (terrestrial and marine combined) on IRs and asserted traditional territories are primarily related to the physical disturbance to IRs and asserted traditional territories during construction of the pipeline and facilities, changes in access and use patterns on land and in marine waters, and sensory disturbance to resource users. The impact balance of the overall combined Project effect is negative. While some sensory disturbance for marine traditional and recreational users may continue into the operations phase associated with the increased marine footprint of the dock complex at the Westridge Marine Terminal, dock lighting and the increased presence of moored tankers, effects will be primarily experienced during the construction phase. During construction, disturbance to areas of terrestrial and marine traditional use will detectable and may cause disruptions in access and use pattern that could affect traditional livelihood practices. Consequently, the overall reversibility of the effect of the Project on IRs and asserted traditional territories is considered short-term, while the magnitude of the overall effect is considered medium since it may have implications for livelihood practices for some traditional resource users (*i.e.,* be more than a nuisance or inconvenience) (Table 7.10.4-1, point 2[c]). A summary of the rationale for all of the significance criteria of combined effects of the Project on IRs and asserted traditional territories is provided below.

- Spatial Boundary: HORU RSA and Marine HORU RSA – changes to access and use patterns in traditional areas may extend beyond the Footprint and HORU LSA and Marine HORU LSA.

- Duration: short-term – the overall effects are caused primarily by construction phase activities and site specific maintenance that would occur within any one year during operations.

- Frequency: isolated to periodic – some effects are caused by construction activity (isolated); some effects are caused by site-specific maintenance which will occur intermittently but repeatedly throughout operations (periodic).

- Reversibility: short-term – the overall effect would be focused the construction phase or site-specific maintenance that would occur within any given year of operations.

- Magnitude: medium – disturbance to IRs and traditional use areas, as well as change to access and use patterns, could have traditional livelihood implications (*i.e.,* could be more than a nuisance or inconvenience).

- Probability: high – the Project crosses IRs and asserted traditional territories.

- Confidence: high – based on Project information, feedback from Aboriginal engagement and the professional experience of the assessment team.

Combined Effects on Residential Use

The combined effects of the Project on the residential use indicator are noted in Table 7.10.4-1 (point 3[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provides the evaluation of significance of the combined effects on the residential use indicator. No distinct effects on residential use were identified associated with the marine component of the Westridge Marine Terminal.

Combined Effects on the Agricultural Use Indicator

The combined effects of the Project on the agricultural land use indicator are noted in Table 7.10.4-1 (point 4[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provide the evaluation of significance of the combined effects on the agricultural use indicator. No effects on agricultural land are associated with the Westridge Marine Terminal.

Combined Effects on the Outdoor Recreation Use Indicator

The combined effects of the Project on the outdoor recreation use indicator are noted in Table 7.10.4-1 (point 5[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provide the evaluation of significance of the combined effects on the outdoor recreation use indicator. No distinct effects on non-marine outdoor recreation use were identified associated with the Westridge Marine Terminal.

Combined Effects on the Other Land and Resource Use Indicator

The combined effects of the Project on the other land and resource use indicator (*i.e.,* outfitting/hunting/trapping/fishing, managed forest areas, sub-surface activities, commercial/industrial use) are noted in Table 7.10.4-1 (point 6[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provide the evaluation significance of the combined effects on the other land and resource use indicator. No distinct effects on other land and resource use were identified associated with the marine component of the Westridge Marine Terminal.

Combined Effects on the Water Supply and Use Indicator

The combined effects of the Project on the water quality and quantity are discussed in Section 7.10. 3 of Volume 5A. Effects on use of navigation and navigation safety are discussed in Section 7.2.6. Effects on marine water use are discussed under the MCRTU indicator in this subsection. Effects on municipal water infrastructure are discussed in Section 7.2.5.

Combined Effects on the Aesthetic Attributes Indicator

The combined effects of the terrestrial components of the Project (*i.e.,* pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities) on the aesthetics attributes indicator are noted in Table 7.10.4-1 (point 8[a]). Table 7.2.4-3 and the accompanying discussion in Section 7.2.4.6 provides the evaluation of significance of the combined effects of the terrestrial components of the Project on the aesthetics attributes indicator.

The combined effects of the marine component of the Project (*i.e.,* Westridge Marine Terminal) on the aesthetics attributes indicator are noted in Table 7.10.4-1 (point 8[b]). Table 7.6.4-3 and the accompanying discussion in Section 7.6.4.6 provide the evaluation of significance of the combined effects of the marine component of the Project on the aesthetics attributes indicator.

The overall combined effect (terrestrial and marine combined) on aesthetics attributes are primarily related to changes in viewsheds associated with the presence of new above ground facilities during operations and sensory disturbance associated with construction activities, site-specific maintenance of the pipeline, and ongoing operations of (including the increased presence of moored tankers) of the Westridge Marine Terminal. Overall, the Project is anticipated to have the most concentrated aesthetic effects through nuisance noise, dust and light-related sensory disturbance during construction. Nuisance sensory disturbance will occur during the construction of the Project and will affect all land and resource users living, working or recreating in the vicinity of the pipeline and facilities during select construction windows in each location. The implementation of the proposed mitigation measures will effectively reduce the sensory effects on land and resource users, including residents in populated areas. Noise and air emission levels will adhere to municipal bylaws and stay within regulated levels.

In most instances, substantial changes in viewshed are not anticipated. Though the Project will result in one new pump station (Black Pines Pump Station) that will be visible to some residences and highway users in a rural area of the TNRD, it will be largely concealed by existing flora from many vantage points and viewshed modelling results indicate that post-construction visual resources will remain consistent with the existing VQO. All expanded pump stations will be designed to be visually compatible with the existing industrial infrastructure at the site thus not changing the visual look of each particular area. The expansion of the dock at Westridge will result in a permanent change to select viewsheds both in Burnaby and across Burrard Inlet on the North Shore, however, the dock has been designed specifically to reduce visual effects for residential communities in proximate locations in Burnaby. However, there are instances when the presence of moored tankers at the expanded dock complex may result is substantial alternation of viewsheds from select observation viewpoints.

The spatial boundary of overall Project effects on aesthetic attributes is regional as Project facilities will be visible from beyond the Footprint and HORU LSA/Marine HORU LSA, and sensory disturbance from construction may be perceptible into the HORU RSA and Marine HORU RSA. The impact balance is considered negative, as changes in aesthetic attributes may be considered a nuisance or inconvenience to nearby land and resource users. The duration of the overall effect is short to long-term. Most nuisance sensory disturbance will occur during construction. However, as mentioned, some longer term changes in viewsheds and operating noise are anticipated in relation to the expanded Westridge Marine Terminal. The frequency of the overall effect is considered isolated to periodic; while effects will be most prominent and consistent during construction, some effects will be caused by intermittent but repeated site-specific-maintenance and the presence of moored tankers at the Westridge Marine Terminal during operations. Reversibility is short to long-term; short-term in all areas other than those areas with a view and audible range of the Westridge Marine Terminal. The magnitude of the overall effect is low, as it is associated with nuisance and inconvenience to users and given that all facilities will operate within the standards of applicable noise standards. Further, the Westridge Marine Terminal has been operating in its present location for many years and is anticipated to remain an acceptable part of the shoreline industrial landscape of Burrard Inlet. A summary of the rationale for all of the significance criteria of combined effects of the Project on aesthetic attributes is provided below (Table 7.10.4-1, point 8[c]).

- Spatial Boundary: HORU RSA and Marine HORU RSA – facilities will be visible from, and some sensory disturbance may occur, from beyond the Footprint and HORU LSA/Marine HORU LSA.

- Duration: short to long-term – most nuisance sensory disturbance will be caused by construction activity; some long-term changes in viewsheds and operating noise are anticipated in relation to the expanded Westridge Marine Terminal.

- Frequency: isolated to periodic – while most prominent effects will be be caused by construction activities (isolated), the events causing some sensory effects will occur intermittently but repeatedly during operations.

- Reversibility: short to long-term – nuisance sensory disturbance associated with the Project is primarily related to construction and is considered to be reversible in the short-term in all areas; however, long-term effects are anticipated throughout the Project life in areas with a view and within the audible range of the Westridge Marine Terminal.

- Magnitude: low – the effects will be detectable, but will mostly be that of an inconvenience or nuisance; all activities will take place within the standards of applicable noise bylaws.

- Probability: high – the Project will result in visible changes to facilities and there will be construction noise associated with heavy equipment and traffic.

- Confidence: high – based on Project information, viewshed modelling, results of the noise and air assessment, and the professional experience of the assessment team.

Combined Effects on the MCRTU Indicator

The combined effects of the Project on the MCRTU indicator are noted in Table 7.10.4-1 (point 9[a]). Table 7.6.4-3 and the accompanying discussion in Section 7.6.4.6 provide the evaluation of significance of the combined effects on the MCRTU indicator.

Combined Effects of the Project on HORU

The evaluation of the combined effects of the Project on the HORU element considers collectively the assessment of the combined effects of the Project on the following indicators: parks and protected areas; IRs and asserted traditional territories; residential use; agricultural use; outdoor recreation use; other land and resource use; water supply and use; and aesthetic attributes. It also considers any objectives pertaining to HORU indicators in the land use and development plans relevant to the Project.

Current and future land use in the vicinity of the proposed pipeline corridor is governed by a wide range of land use and development plans. Land use plan boundaries crossed by the proposed pipeline corridor in Alberta are primarily MDPs as well as transportation and parks plans. In BC, the Project is located in the boundaries of LRMPs, which are the result of collaborative planning processes with a myriad stakeholders and First Nations. The LRMPs provide strategic management planning for resources on Crown land. The proposed pipeline corridor also crosses SRMPs, OCPs and RGSs, as well as plans which provide direction for specific topics such as agriculture, transportation and water management. Many land use plans provide specific areas designated as residential and future residential, in addition to industrial, commercial and agricultural land use. Providing recreational amenities, such as parks, natural areas and recreational centers tends to be a high priority for many communities. Most municipal, regional and land use plans do not specify restrictions pertaining to pipeline construction within designated land use zones crossed by the Project. Some plans, such as the Nicola Valley OCP and the Yellowhead County Municipal Development Plan recognize that potential exists for conflict between pipeline rights-of-way and future land use, and that setbacks be applied or compatible land uses be designated along the pipeline corridor to minimize potential conflict. The Project is aware of current land use designations and development plans along the proposed route. It is anticipated that the Project will not disrupt land use designations of local, municipal or regional land use plans identified along the proposed route, and, when warranted, will work towards addressing considerations or restrictions set on pipeline construction through applicable land use zones.

Through the implementation of the mitigation measures described in the Pipeline, Facilities and Westridge Marine Terminal EPPs (Volumes 6B to 6D) and SEMP (Volume 6B), the magnitude of adverse effects will be reduced; however, there are few regulatory standards for threshold HORU effects that can be used as a standard comparison. There are municipal and regulatory thresholds pertaining to noise and air emissions standards (related to sensory disturbance), BC visual quality objectives, and municipal land use plans that act as guidance for certain HORU indicators.

The combined effects of the Project on HORU are characterized as not significant due to the overall low to medium magnitude of predicted effects (Table 7.10.4-1, point 10[a]). A summary of the rationale for all of the significance criteria of combined effects on HORU is provided below.

- Spatial Boundary: HORU RSA and Marine HORU RSA – combined effects of the Project on HORU may extend to land and resource users in the HORU RSA and Marine HORU RSA.

- Duration: short to long-term – most of the events causing combined effects of the Project on HORU are limited to the construction phase of the Project or periods of site-specific maintenance occurring within any one year during operations; however, effects on access to select surface and subsurface resources, and viewshed changes, and the presence of moored tankers at the Westridge Marine Terminal may extend over the life of the Project (long-term).

- Frequency: isolated to periodic – most of the precipitating events are associated with the construction phase (isolated) or site-specific maintenance or the presence of moored tankers at Westridge Marine Terminal that may occur intermittently but repeatedly over the assessment period (periodic).

- Reversibility: short to long-term – the combined effects of the Project on HORU are for the most part reversible with the end of construction activities or periods site-specific maintenance occurring within

any one year during operations; however, effects on access to select surface and subsurface resources, and viewshed changes, and the presence of moored tankers at the Westridge Marine Terminal may extend over the life of the Project (long-term).

- Magnitude: low to medium – land/resource use areas that are used for livelihood purposes may experience effects considered more than a nuisance or inconvenience (medium), though compensation will off-set any proven economic loss; effects on land/resource use areas used primarily for recreational purposes will mostly be that of an inconvenience or nuisance (low).

- Probability: high – there is a high degree of probability that at least some of the predicted effects will manifest.

- Confidence: high – combined effects of the Project on HORU are supported by Project information, feedback from stakeholders, information on regional land use patterns, and the professional experience of the assessment team. Particular effects will be influenced by right-of-way finalization.

Summary

As identified in Table 7.10.4-1, there are no situations for HORU that would result in a significant adverse residual socio-economic effect due to overall low to medium predicted magnitude. Consequently, it is concluded that the residual socio-economic effects of the Project on HORU indicators will be not significant.

TABLE 7.10.4-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON HUMAN OCCUPANCY AND RESOURCE USE

Potential Combined Effect	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
1. HORU Indicator – Parks and Protected Areas									
1(a) Combined effects from pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities.	Negative	HORU RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
1(b) Combined effects from Westridge Marine Terminal.	Negative	Marine HORU RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1. HORU Indicator – Parks and Protected Areas									
1(c) Combined effects of the Project on parks and protected areas indicator (1[a] and 1[b]).	Negative	HORU RSA Marine HORU RSA	Short to long-term	Isolated to periodic	Short to long-term	Low	High	High	Not significant
2. HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories									
2(a) Combined effects from pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities.	Negative	HORU RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant
2(b) Combined effects from Westridge Marine Terminal.	Negative	Marine HORU RSA	Short-term	Isolated to periodic	Short-term	Medium	High	High	Not significant
2(c) Combined effects of the Project on Indian Reserves, Métis Settlements and asserted traditional territories indicator (2[a] and 2[b]).	Negative	HORU RSA Marine HORU RSA	Short-term	Isolated to periodic	Short-tem	Medium	High	High	Not significant
3. HORU Indicator – Residential Use									
3(a) Combined effects of the Project on residential use indicator.	Negative	HORU RSA	Short-term	Periodic	Short-term	Medium	High	High	Not significant

TABLE 7.10.4-1 Cont'd

Potential Combined Effect	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
4. HORU Indicator – Agricultural Use									
4(a) Combined effects of the Project on agricultural use indicator.	Negative	HORU RSA	Short-term	Periodic	Short-term	Low to medium	High	High	Not significant
5. HORU Indicator – Outdoor Recreation Use									
5(a) Combined effects of the Project on outdoor recreation use indicator.	Negative	HORU RSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
6. HORU Indicator – Other Land and Resource Use									
6(a) Combined effects of the Project on other land and resource use indicator.	Negative	HORU RSA	Short to long-term	Periodic to continuous	Short to long-term	Medium	High	High	Not significant
7. HORU Indicator – Water Supply and Use									
7(a) Refer to Section 7.10.3 Water Quality and Quantity of Volume 5A.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
8. HORU Indicator – Aesthetic Attributes									
8(a) Combined effects from pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities.	Negative	HORU LSA to HORU RSA	Short-term	Isolated to periodic	Short to long-term	Low	High	High	Not significant
8(b) Combined effects from Westridge Marine Terminal.	Negative	Marine HORU RSA Socio-economic RSA	Long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
8(c) Combined effects of the Project on aesthetic attributes indicator (8[a] and 8[b]).	Negative	HORU RSA Marine HORU RSA	Short to long-term	Isolated to periodic	Short to long-term	Low	High	High	Not significant
9. HORU Indicator – MCRTU									
9(a) Combined effects of the Project on MCRTU indicator.	Negative	Marine HORU RSA	Short-term	Isolated	Short to medium-term	Low to medium	High	High	Not significant
10. Combined effects of the Project on HORU									
10(a) Combined effects of the Project on HORU indicators (1[c], 2[c], 3[a], 4[a], 5[a], 6[a], 7[a], 8[c] and 9[a]).	Negative	HORU RSA Marine HORU RSA	Short to long-term	Isolated to periodic	Short to long-term	Low to medium	High	High	Not significant

Note: 1 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.10.5 Infrastructure and Services

This subsection provides a summary discussion of the potential effects of the Project related to infrastructure and services. While infrastructure and services measurement endpoints are not additive to a particular place and time, the summary discusses how different Project-related issues may interact to create an overall effect on each indicator. There may be instances when both positive and negative influences could occur at the same time and when issues may be experienced differently by different people and communities.

Combined Effects – Transportation Infrastructure

The combined effects of the Project on the transportation infrastructure indicator are noted in Table 7.10.5-1 (point 1[a]). Table 7.2.5-3 and the accompanying discussion in Section 7.2.5.6 provide the evaluation of significance of the combined effects on the transportation infrastructure indicator.

Combined Effects – Linear Infrastructure and Power Supply

The combined effects of the Project on the linear infrastructure and power supply indicator are noted in Table 7.10.5-1 (point 2[a]). Table 7.2.5-3 and the accompanying discussion in Section 7.2.5.6 provide the evaluation of significance of the combined effects on the linear infrastructure and power supply indicator.

Combined Effects – Waste and Water Infrastructure

The combined effects of the Project on the waste and water infrastructure indicator are noted in Table 7.10.5-1 (point 3[a]). Table 7.2.5-3 and the accompanying discussion in Section 7.2.5.6 provide the evaluation of significance of the combined effects on the waste and water infrastructure indicator.

Combined Effects – Housing

The combined effects of the Project on the housing indicator are noted in Table 7.10.5-1 (point 4[a]). Table 7.2.5-3 and the accompanying discussion in Section 7.2.5.6 provide the evaluation of significance of the combined effects on the housing infrastructure indicator.

Combined Effects – Education Services

No potential residual effects were identified related to the use of educational services indicator. Potential residual effects associated with school property disturbance during construction are assessed in Section 7.2.4 HORU, under the residential use discussion.

Combined Effects – Emergency, Protective and Social Services

The combined effects of the Project on the emergency, protective and social services indicator are noted in Table 7.10.5-1 (point 6[a]). Table 7.2.5-3 and the accompanying discussion in Section 7.2.5.6 provide the evaluation of significance of the combined effects on the emergency, protective and social services indicator.

Combined Effects – Recreational Amenities

The combined effects of the Project on the recreational amenities indicator are noted in Table 7.10.5-1 (point 7[a]). Table 7.2.5-3 and the accompanying discussion in Section 7.2.5.6 provide the evaluation of significance of the combined effects on the recreational amenities indicator.

Combined Effects of the Project on Infrastructure and Services

The evaluation of the combined effects of the Project on the infrastructure and services element considers collectively the assessment of the combined effects of the Project on the following indicators: transportation infrastructure; linear infrastructure and power supply; water and waste infrastructure; housing; emergency, protective and social services; and recreational amenities. It also considers objectives pertaining to infrastructure indicators in the land use and development plans relevant to the Project.

Most land use and development plans have specific objectives pertaining to the improvement of transportation infrastructure and addressing community needs for waste and water infrastructure. Many land use plans address affordable housing for members of the community. Municipal plans from larger communities such as Burnaby and the Fraser Valley address educational services broadly. Emergency, protective and social services topics are addressed less frequently, and more often in larger communities such as Kamloops, Merritt and the Fraser Valley. Linear infrastructure and power supply is only noted in a limited number of municipal and regional plans. It is anticipated that the Project will not inhibit individual communities' goals pertaining to infrastructure and services indicators. The Project will try to offset potential negative interactions of the Project, either disturbance or disruption, with the suite of mitigation measures related to traffic reduction and management, water and waste supply, working with provincial

electrical system operators to support Project-specific transmission/distribution enhancement, developing a worker accommodation strategy (including construction camps in select locations with recreational amenities for workers), code of conduct policies for workers, and tracking of socio-economic issues during construction and reclamation.

Through the implementation of the mitigation measures described in the Pipeline, Facilities and Westridge Marine Terminal EPPs (Volumes 6B to 6D) and SEMP (Volume 6B), the magnitude of adverse effects will be reduced; however, there are no regulatory standards for threshold infrastructure and services effects that can be used as a standard comparison. The most notable threshold would be the future population thresholds against which municipal and regional authorities make infrastructure and services planning decisions. The combined effects of the Project on infrastructure and services are characterized as not significant due to the overall low to medium magnitude of predicted effects (Table 7.10.5-1, point 8[a]). A summary of the rationale for all of the significance criteria of combined effects on infrastructure and services is provided below.

- Spatial Boundary: Socio-economic RSA – combined effects of the Project on infrastructure and services may appear anywhere throughout the Socio-economic RSA but especially in areas used as construction hubs.

- Duration: short to long-term – most of the events causing combined effects of the Project on infrastructure and services are limited to the construction phase of the Project (short-term); however, effects on linear infrastructure and power supply may extend over the life of the Project (long-term).

- Frequency: isolated to continuous – most of the precipitating events are associated with the construction phase (isolated), although some effects are expected to extend over the life of the Project (continuous).

- Reversibility: short to long-term – the combined effects of the Project on infrastructure and services are for the most part reversible with the end of construction activities; however, some effects may persist until the decommissioning, abandonment and remediation of the pipeline.

- Magnitude: low to medium – the combined effects of the Project on infrastructure and services will differ depending on the size and community infrastructure and services capacity of construction hubs. Effects are anticipated to be of low magnitude in larger communities and of medium magnitude in smaller communities where the temporary workforce will be less easily absorbed.

- Probability: high – there is a high degree of probability that at least some of the predicted effects will manifest.

- Confidence: moderate – combined effects of the Project on infrastructure and services are supported by Project information, feedback from stakeholders, information on infrastructure and services capacity, and the professional experience of the assessment team. Particular effects will be influenced by right-of-way finalization and advancement of Project details in terms of traffic estimates and logistical plans.

Summary

As identified in Table 7.10.5-1, there are no situations for infrastructure and services that would result in a significant adverse residual socio-economic effect due to overall low to medium predicted magnitude. Consequently, it is concluded that the residual socio-economic effects of the Project on infrastructure and services indicators will be not significant.

TABLE 7.10.5-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON INFRASTRUCTURE AND SERVICES

Potential Combined Effect	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Infrastructure and Services Indicator – Transportation Infrastructure									
1(a) Combined effects of the Project on transportation infrastructure indicator.	Negative	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
2. Infrastructure and Services Indicator – Linear Infrastructure and Power Supply									
2(a) Combined effects of the Project on linear infrastructure and power supply indicator.	Neutral to negative	Footprint to RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
3. Infrastructure and Services Indicator – Waste and Water Infrastructure									
3(a) Combined effects of the Project on waste and water infrastructure indicator.	Negative	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
4. Infrastructure and Services Indicator – Housing									
4(a) Combined effects of the Project on housing indicator.	Negative and positive	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
5. Infrastructure and Services Indicator – Educational Services									
No residual effects anticipated.									
6. Infrastructure and Services Indicator – Emergency, Protective and Social Services									
6(a) Combined effects of the Project on emergency, protective and social services indicator.	Negative	RSA	Short-term	Isolated	Short-term	Medium	High	High	Not significant
7. Infrastructure and Services Indicator – Recreational Amenities									
7(a) Combined effects of the Project on recreational amenities indicator.	Neutral	RSA	Short-term	Isolated	Short-term	Low	High	High	Not significant
8. Combined Effects of the Project on Infrastructure and Services									
8[a] Combined Effects of the Project on infrastructure and services indicators (1[a], 2[a], 3[a], 4[a], 6[a] and 7[a]).	Positive to negative	RSA	Short to long-term	Isolated to continuous	Short to long-term	Low to medium	High	Moderate	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.10.6 Navigation and Navigation Safety

This subsection provides a summary discussion of the potential effects of the Project related to navigation and navigation safety.

Combined Effects – Navigable Watercourses

The combined effects of the terrestrial components of the Project (*i.e.,* pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities) on the navigable watercourses indicator are noted in Table 7.10.6-1 (point 1[a]). Table 7.2.6-3 and the accompanying discussion in Section 7.2.6.6 provide the evaluation of significance of the combined effects of the terrestrial components of the Project on the navigable watercourses indicator. In this instance, there was only one likely potential residual effect (impediments to watercourse users) which is the de facto combined effect.

The combined effects of the marine component of the Project (*i.e.,* marine component of the Westridge Marine Terminal) on the navigable watercourses indicator are noted in Table 7.10.6-1 (point 1[b]).

Table 7.6.6-1 and the accompanying discussion in Section 7.6.6.6 provide the evaluation of significance of the combined effects of the marine component of the Project on the navigable watercourses indicator.

The overall combined Project effect (terrestrial and marine combined) on navigable watercourses is primarily related to the pipeline construction activities crossing navigable watercourses and navigable wetlands, and the construction and operations of the Westridge Marine Terminal, which extends into Burrard Inlet. It also considers any objectives pertaining to navigation and navigation safety in land use and development plans reviewed by the Project.

With the exception of the Vancouver Fraser Port Authority Land Use Plan and the Port Metro Vancouver Consolidated Land Use, navigation and navigation safety is not addressed in municipal and regional land use and developments plans relevant to the Project. The Vancouver Fraser Port Authority has the jurisdiction to manage land use of the Port, policy direction, user demands and potential conflicts in Port waterways to ensure safe and efficient navigational channels. The Project will try to offset potential negative interactions of the Project with the suite of mitigation measures including notification with water users, warning signs in the vicinity of navigable watercourse construction, and establishing a communication process with marine users in Burrard Inlet.

The impact balance of the overall combined Project effect on navigation and navigation safety is negative, as the Project will cause disruption in navigable watercourses at times, primarily related to pipeline construction. Preliminary dock design of the Westridge Marine Terminal has explicitly aimed to not affect existing anchorages, minimize the footprint on Burrard Inlet, and to allow the safe passage of other marine vessels. However, the construction and operations of the Westridge Marine Terminal may require some alteration of use patterns for small craft (*e.g.,* kayaks, canoes, small boats) that navigate close to the shoreline around the terminal. The frequency of the overall effect is periodic, as it is caused by construction activities as well as pipeline-related site-specific maintenance activities and the presence of moored tankers at the Westridge Marine Terminal that will occur intermittently but repeatedly over the assessment period. Reversibility is considered short to long-term; although effects will be largely limited to the construction activity and pipeline-related site-specific maintenance activities that would occur within any one year during operations (short-term), navigation of smaller vessels on Burrard Inlet may be affected by the expanded Westridge Marine Terminal dock complex and the presence of moored tankers during operations (long-term). The magnitude of the overall Project effect is considered low; change is likely to be detectable particularly during pipeline construction and site-specific maintenance, but the implementation of proposed mitigation related to pipeline construction is expected to effectively reduce the magnitude of the residual effects. Also, the construction and operation of the Westridge Marine Terminal is not anticipated to constrict marine passage in Burrard Inlet. The combined effects of the Project on navigable watercourses are characterized as not significant due to the overall low magnitude of predicted effects (Table 7.10.6-1, point 1[c]). A summary of the rationale for all of the significance criteria of combined effects on navigation and navigation safety is provided below.

- Spatial Boundary: HORU LSA and Marine HORU RSA – effects associated with disruption to navigable watercourses due to pipeline construction may extend to the HORU LSA; effects associated with the marine navigation in Burrard Inlet may extend to areas in the Marine HORU RSA.

- Duration: short to long-term – the events causing the combined effects include pipeline and Westridge Marine Terminal construction and site-specific maintenance that would occur within any one year of operations (short-term); some minor long-term effects associated with smaller craft on Burrard Inlet may be associated with the operations of the Westridge Marine Terminal.

- Frequency: periodic – the events causing the combined effects on navigable watercourses are construction activities as well as pipeline-related site-specific maintenance activities and the presence of moored tankers at the Westridge Marine Terminal that will occur intermittently but repeatedly over the assessment period.

- Reversibility: short to long-term – effects will be largely limited to the construction phase, but some minor long-term effects may be associated with the operation of the Westridge Marine Terminal .

- Magnitude: low - the implementation of the proposed mitigation measures is expected to effectively reduce the magnitude of the residual effect of pipeline construction and operations on navigation of

navigable watercourses; the construction and operation of the Westridge Marine Terminal is not anticipate to constrict marine passage in Burrard Inlet.

- Probability: high – the potential effects as characterized are considered likely to occur.
- Confidence: high – based on Project information, the location of navigable watercourses, and the professional experience of the assessment team.

Combined Effect of the Project on Navigation and Navigation Safety

As there is only one indicator for the navigation and navigation safety element (*i.e.*, navigable watercourses), the combined effect of the Project on navigation and navigation safety is presented above in the discussion of Combined Effects – Navigable Watercourses.

Summary

As identified in Table 7.10.6-1, there are no situations for the navigation and navigation safety element that would result in a significant adverse residual socio-economic effect due to overall low predicted magnitude, and due to the unlikely probability of accidents that may lead to safety concerns for navigable watercourse users occurring. Consequently, it is concluded that the residual socio-economic effects of the Project on navigation and navigation safety indicators will be not significant.

TABLE 7.10.6-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON NAVIGATION AND NAVIGATION SAFETY

Potential Combined Effect	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
1. Navigation and Navigation Safety Indicator – Navigable Watercourses									
1(a) Combined effects from pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities.	Negative	HORU LSA	Short-term	Periodic	Short-term	Low	High	High	Not significant
1(b) Combined effects from Westridge Marine Terminal.	Neutral to negative	Marine HORU RSA	Short to long-term	Isolated to periodic	Long-term	Low	High	High	Not significant
1(c) Combined effects of the Project on navigable waterways indicator (1[a] and 1[b]).	Negative	HORU LSA Marine HORU RSA	Short to long-term	Periodic	Short to long-term	Low	High	High	Not significant

Note: 1 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.10.7 Employment and Economy

This subsection provides a summary discussion of the potential effects of the Project related to employment and economy. While employment and economy measurement endpoints are not additive to a particular place and time, the summary discusses how different issues may interact to create an overall effect on each indicator. There may be instances when both positive and negative influences could occur at the same time and when issues may be experienced differently by different people and communities.

Combined Effects – National and Provincial Economies

The combined effects of the Project on the national and provincial economies indicator are noted in Table 7.10.7.-1 (point 1[a]). Table 7.2.7-3 and the accompanying discussion in Section 7.2.7.6 provide the evaluation of significance of the combined effects of the Project on the national and provincial economies indicator.

Combined Effect – Regional Employment

The combined effects of the Project on the regional employment indicator are noted in Table 7.10.7-1 (point 2[a]). Table 7.2.7-3 and the accompanying discussion in Section 7.2.7.6 provide the evaluation of significance of the combined effects of the Project on the regional employment indicator.

Combined Effect – Municipal Economies

The combined effects of the Project on the municipal economies indicator are noted in Table 7.10.7-1 (point 3[a]). Table 7.2.7-3 and the accompanying discussion in Section 7.2.7.6 provide the evaluation of significance of the combined effects of the Project on the municipal economies indicator.

Combined Effect – Contracting and Procurement

The combined effects of the Project on the contracting and procurement indicator are noted in Table 7.10.7-1 (point 4[a]). Table 7.2.7-3 and the accompanying discussion in Section 7.2.7.6 provide the evaluation of significance of the combined effects of the Project on the contracting and procurement indicator.

Combined Effect – Training and Capacity Development

The combined effects of the Project on the training and capacity development indicator are noted in Table 7.10.7-1 (point 5[a]). Table 7.2.7-3 and the accompanying discussion in Section 7.2.7.6 provide the evaluation of significance of the combined effects of the Project on the training and capacity development indicator.

Combined Effect – Business Livelihood and Disruption

An evaluation of the combined effects considers those residual socio-economic effects that are likely to occur. None of the potential residual effects associated with business and livelihood disruption were considered high in probability (Table 7.2.7-7, points 6[a] and 6[b]). As such no combined effects on business and livelihood disruption are anticipated.

Combined Effects of the Project on Employment and Economy

The evaluation of the combined effects of the Project on the employment and economy element considers collectively the assessment of the combined effects of the Project on the following indicators: national and provincial economies; regional employment; municipal economies; contracting and procurement; training and capacity development; and business and livelihood disruption. It also considers any objectives pertaining to employment and economy indicators in the land use and development plans relevant to the Project.

Most municipal and regional land use and development plans do not state specific objectives and policies pertaining to employment and economy indicators, but they generally support developing economies and employment potential. Most land use and development plans have high level objectives pertaining specifically to local, municipal economies, however, few plans have economic objectives from a regional, provincial and national perspective. Regional employment is mostly addressed in plans that are specifically dedicated to land use from a regional context such as the Chilliwack Forest District Sustainable Resource Management Plan and the Northern East Slopes Sustainable Resource and Environmental Management Strategy. Contracting, procurement and training and capacity development are not mentioned in the municipal, regional and land use plans identified. Business and livelihood disruption is also not addressed in the identified plans. Some communities have various plans and policies dedicated to address particular economic objectives, such as the District of Hope's Economic Development Plan and the Township of Langley's Economic Development Strategy. The Project will support short-term and long-term economic benefits through employment, procurement/contracting,

training and capacity development, worker spending during the construction phase, and substantial increases in municipal taxes. Trans Mountain will try to offset any negative business disruptions with the suite of mitigation measures including avoiding key business/commercial/livelihood areas during route finalization and negotiating compensation agreements for directly disturbed land/property owners. It is anticipated that the Project will not interfere with individual community's goals pertaining to employment and economy indicators.

Overall, the Project effects on employment and economy are anticipated to be positive, due to anticipated opportunities related to regional employment, contracting/procurement, municipal economic benefits, training/capacity development, as well as the substantial benefits anticipated at the provincial and national level. While there may be some short-term negative implications for business and livelihoods due to construction-phase land disturbance in select areas, compensation will be negotiated for any land/property owners and tenure holders with proven economic loss and effects in terms of reduced business income are not considered likely. On balance the many positive effects are considered to outweigh any short-term negative implications. Through the implementation of the mitigation and enhancement measures described in the Pipeline, Facilities and Westridge Marine Terminal EPPs (Volumes 6B to 6D) and SEMP (Volume 6B), the magnitude of adverse effects will be reduced and economic opportunities will be increased. The combined effects of the Project on employment and economy are characterized as not significant due to the medium magnitude of the anticipated combined effect (acknowledging, however, that effects on municipal, provincial and national economies may be of high magnitude and will be significant and effects of training and capacity development may be of low magnitude) (Table 7.10.7-1, point 7[a]). A summary of the rationale for all of the significance criteria of combined effects on employment and economy is provided below.

- Spatial Boundary: Socio-economic RSA to Provincial and National – combined effects of the Project on employment and economy may appear anywhere throughout the Socio-economic RSA but especially in areas used as construction hubs. Substantial benefits are also anticipated at the provincial and national level.

- Duration: short to long-term – direct employment opportunities within the Socio-economic RSA will be focused during construction (short-term), but most combined effects related to employment and economy are related to both construction and operations activities.

- Frequency: isolated to continuous – certain precipitating events are associated with the construction phase, although many economic benefits are expected to extend over the life of the Project.

- Reversibility: short to long-term – some of the combined effects of the Project on employment and economy would be reversible with the end of construction activities; however, many opportunities will continue over the life of the Project.

- Magnitude: medium to high – the combined effects of the Project on employment and economy will differ depending on right-of-way finalization and the extent of business/labour force capacities and interests within each socio-economic region at the time of construction and operations, but on balance effects are anticipated to result in a moderate to substantial positive modification to the socio-economic environment.

- Probability: high – there is a high degree of probability that at least some of the predicted effects will manifest.

- Confidence: high – combined effects of the Project on employment and economy are supported by Project information, feedback from stakeholders, information on regional labour force and industrial capacity, economic modelling, and the professional experience of the assessment team. Particular effects will be influenced by right-of-way finalization and individual decisions of labour force and business participants.

Summary

As identified in Table 7.10.7-1, there are no situations for employment and economy that would result in a significant adverse residual effect due to overall short-term duration and medium predicted magnitude of

the identified residual effect. There are also multiple positive economic effects, including significant positive economic effects on municipal, provincial and national economies. Consequently, it is concluded that the residual socio-economic effects of Project construction and operation on employment and economy indicators will be not significant.

TABLE 7.10.7-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON EMPLOYMENT AND ECONOMY

Potential Combined Effect	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Employment and Economy Indicator – National and Provincial Economies									
1(a) Combined effects of the Project on national and provincial economies indicator.	Positive	Provincial National	Long-term	Continuous	Long-term	High	High	High	Significant
2. Employment and Economy Indicator – Regional Employment									
2(a) Combined effects of the Project on regional employment indicator.	Positive	RSA	Long-term	Continuous	Long-term	Medium	High	High	Not significant
3. Employment and Economy Indicator – Municipal Economies									
3(a) Combined effects of the Project on municipal economies indicator.	Positive	RSA	Long-term	Continuous	Long-term	High	High	High	Significant
4. Employment and Economy Indicator – Contracting and Procurement									
4(a) Combined effects of the Project on contracting and procurement indicator.	Positive	RSA	Long-term	Periodic	Long-term	Medium	High	High	Not significant
5. Employment and Economy Indicator – Training and Capacity Development									
5(a) Combined effects of the Project on training and capacity development indicator.	Positive	RSA	Long-term	Occasional	Long-term to permanent	Low	High	Moderate	Not significant
6. Employment and Economy Indicator – Business and Livelihood Disruption									
6(a) Combined effects of the Project on business and livelihood disruption indicator.	Although residual effects were identified, none were considered to be likely, therefore, an evaluation of combined effects was not deemed necessary.								
7. Combined Effects of the Project on Employment and Economy									
7(a) Combined effects of the Project on employment and economy indicators (1[a], 2[a], 3[a], 4[a]and 5[a]).	Positive	RSA to Provincial and National	Short to long-term	Isolated to continuous	Short to long-term	Medium to high	High	High	Not significant or Significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.10.8 Community Health

The evaluation of the effects of the Project on the community health element considers the combined effect of applicable Project components on each of the following community health indicators: socio-economic health effects; infectious disease; environmental health effects; public safety; health care service provision and Aboriginal health.

Combined Effects on the Socio-economic Health Effects Indicator

The combined effects of the Project on socio-economic health effects indicator are noted in Table 7.10.8-1 (point 1[a]). Table 7.2.8-4 and the accompanying discussion in Section 7.2.8.6 provide the

evaluation of significance of the combined effects of the Project on the socio-economic health effects indicator.

Combined Effects on the Infectious Disease Indicator

The combined effects of the Project on infectious disease indicator are noted in Table 7.10.8-1 (point 2[a]). Table 7.2.8-4 and the accompanying discussion in Section 7.2.8.6 provide the evaluation of significance of the combined effects of the Project on the infectious disease indicator.

Combined Effects on the Environmental Health Effects Indicator

The combined effects from the terrestrial components of the Project (*i.e.,* pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities) on the environmental health effects indicator are noted in Table 7.10.8-1 (point 3[a]). Table 7.2.8-4 and the accompanying discussion in Section 7.2.8.6 provide the evaluation of significance of the combined effects of the terrestrial components of the Project on the environmental health effects indicator.

The combined effects of the Westridge Marine Terminal component of the Project on the environmental health effects indicator are noted in Table 7.10.8-1 (point 3[b]). Table 7.6.8-3 and the accompanying discussion in Section 7.6.8.6 provide the evaluation of significance of the combined effects from the Westridge Marine Terminal on the environmental health effects indicator.

In addition to the effects of the Project on environmental media (*e.g.,* air, water), there is the potential for these changes to cause stress and anxiety in a proportion of the population specifically related to the possibility of human exposure to environmental contamination. This residual effect is applicable to the operation of the pipeline as well as the Westridge Marine Terminal. A summary of the rationale for all of the significance criteria of combined effects of the Project on environmental health effects is provided below and in Table 7.10.8-1 (point 3[c]).

- Spatial Boundary: Socio-economic RSA – the combined effects could occur anywhere within the Socio-economic RSA.
- Duration: long-term – the combined effects will extend throughout the lifetime of the Project.
- Frequency: continuous – the combined effects will extend throughout the lifetime of the Project.
- Reversibility: long-term – the combined effects extend over the lifetime of the Project.
- Magnitude: low to medium – no regulatory standards exist; concerns will likely continue to be voiced by affected residents but the extent to which the stress and anxiety will be experienced by the population at large is not known.
- Probability: high – the combined effect has been observed with development projects in BC, Alberta, elsewhere in Canada and internationally.
- Confidence: high – there is a good understanding of this relationship with supporting literature as well as from stakeholders in the Project area.

Combined Effects on the Public Safety Indicator

The combined effects of the Project on public safety indicator are noted in Table 7.10.8-1 (point 4[a]). Table 7.2.8-4 and the accompanying discussion in Section 7.2.8.6 provide the evaluation of significance of the combined effects of the Project on the public safety indicator.

Combined Effects on the Health Care Service Provision Indicator

The combined effects from the terrestrial components of the Project (*i.e.,* pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities) on the health care service provision indicator are noted in Table 7.10.8-1 (point 5[a]). Table 7.2.8-4 and the accompanying discussion in Section 7.2.8.6 provide the evaluation of significance of the combined effects of the terrestrial components of the Project on the health care service provision indicator.

The combined effects of the Westridge Marine Terminal component on the health care service provision indicator are noted in Table 7.10.8-1 (point 5[b]). Table 7.6.8-3 and the accompanying discussion in Section 7.6.8.6 provide the evaluation of significance of the combined effects from the Westridge Marine Terminal on the health care service provision indicator.

The evaluation of the combined effects of the Project on health care service provision reflects the assessment of the combined effects on this indicator from the construction and operations of the proposed pipeline (Table 7.10.8-1, point 5[a]) including all associated activities and facilities, and activities associated with the expansion of the Westridge Marine Terminal (Table 7.10.8-1, point 5[b]). The Project has the potential to negatively impact various facets of health care service provision, most notably health care delivered through hospitals and health centres; capacity of emergency medical response; and capacity of mental health and addictions services (discussed under socio-economic health effects). The impacts would primarily be experienced during the construction phase, although effects on emergency medical response would last as long as the Project was in place (Table 7.10.8-1, point 5[c]). A summary of the rationale for all of the significance criteria of combined effects of the Project on health care service provision is provided below.

- Spatial Boundary: Socio-economic RSA – the combined effects would extend throughout the Socio-economic RSA but would primarily manifest in those communities that act as construction hubs and have limited health care access.

- Duration: short to long-term – most of the events causing combined effects of the Project on health care service provision are limited to the construction phase of the Project; however, some may extend over the life of the Project.

- Frequency: occasional – the events that will cause the combined effects will occur intermittently and sporadically, and span both construction and operations.

- Reversibility: short to long-term – the combined effects of increased demand on health care services would manifest during the construction phase for pipeline construction and operations; and for the duration of operations of the Westridge Marine Terminal.

- Magnitude: negligible to medium – the magnitude of the effect varies depending on the size of the workforce and the capabilities of the particular health care facilities; in a very large community such as Edmonton or the Greater Vancouver area, the residual effect is likely to be negligible, whereas in smaller communities such as Valemount and Clearwater, the effect may be of medium magnitude, straining the capacity and resources of local health care systems.

- Probability: high – research literature has clearly documented these types of impacts with development projects.

- Confidence: high – stakeholder interviews and open house meetings have expressed concern, and research literature has demonstrated that projects of this size and nature can influence health care service capacity.

Combined Effects on the Aboriginal Health Effects Indicator

The combined effects of the Project on Aboriginal health effects indicator are noted in Table 7.10.8-1 (point 6[a]). Table 7.2.8-4 and the accompanying discussion in Section 7.2.8.6 provide the evaluation of significance of the combined effects of the Project on the Aboriginal health effects indicator.

Combined Effects of the Project on Community Health

The evaluation of the combined effects of the Project on the community health element considers collectively the assessment of the combined effects of the Project on the following community health indicators: socio-economic health effects; infectious disease; environmental health effects; public safety; health care service provision; and Aboriginal health. Through the implementation of the mitigation measures described in the EPPs (Volumes 6B to 6D) and SEMP (Volume 6B), the magnitude of adverse effects will be reduced; however, there are no regulatory standards for threshold community health effects that can be used as a standard comparison. The local and regional management plans listed in

Table 7.10-1 were determined to have no specific goals or objectives related to community health. The combined effects of the Project on community health are characterized as not significant due to the overall low magnitude of predicted effects (Table 7.10.8-1, point 7[a]). A summary of the rationale for all of the significance criteria of combined effects on community health is provided below.

- Spatial Boundary: Socio-economic RSA – combined effects of the Project on community health may appear anywhere throughout the Socio-economic RSA but especially in areas used as construction hubs.

- Duration: short to long-term – most of the events causing combined effects of the Project on community health are limited to the construction phase of the Project; however, some may extend over the life of the Project.

- Frequency: isolated to continuous – most of the precipitating events are associated with the construction phase, although some effects would be expected to extend over the life of the Project.

- Reversibility: short to long-term – the combined effects of the Project on community health would for the most part be reversible with the withdrawal of the mobile Project workforce at the end of the construction period; however, some effects may persist until the decommissioning, abandonment and remediation of the pipeline.

- Magnitude: low – the combined effects of the Project on community health are anticipated to result in an overall low magnitude of effect. While health effects experienced by individuals may substantially impact that individual's quality of life, at a population level the effects are likely to be detectable but within the capacity of existing systems. However, there are several measurement outcomes for which the magnitude will be higher.

- Probability: high – there is a high degree of probability that at least some of the predicted effects will manifest.

- Confidence: moderate – combined effects of the Project on community health are supported in many instances by both research and local qualitative evidence; however, the strength of evidence varies among indicators.

Summary

As identified in Table 7.10.8-1, there are no situations for community health that would result in a significant adverse residual socio-economic effect due to overall low predicted magnitude. Consequently, it is concluded that the residual socio-economic effects of the Project on community health indicators will be not significant.

TABLE 7.10.8-1

SIGNIFICANCE EVALUATION OF THE PROJECT ON COMMUNITY HEALTH

Potential Effect		Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
				Duration	Frequency	Reversibility				
1.	Community Health Indicator – Socio-economic Health Effects									
1(a)	Combined effects of the Project on socio-economic health effects indicator.	Negative to positive	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	Moderate	Not significant
2.	Community Health Indicator – Infectious Disease									
2(a)	Combined effects of the Project on infectious disease indicator.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	High	Not significant

TABLE 7.10.8-1 Cont'd

Potential Effect	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
3. Community Health Indicator – Environmental Health Effects									
3(a) Combined effects from pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities.	Negative	RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
3(b) Combined effects from Westridge Marine Terminal.	Negative	RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
3(c) Combined effects of the Project on environmental health effects indicator (3[a] and 3[b]).	Negative	RSA	Long-term	Continuous	Long-term	Low to medium	High	High	Not significant
4. Community Health Indicator – Public Safety									
4(a) Combined effects of the Project on public safety indicator.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	Low	High	Not significant
5. Community Health Indicator – Health Care Service Provision									
5(a) Combined effects from pipeline, temporary facilities, pump stations, storage tanks and pipeline reactivation activities.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	High	Not significant
5(b) Combined effects from Westridge Marine Terminal.	Negative	RSA	Long-term	Occasional	Long-term	Negligible to low	High	Moderate	Not significant
5(c) Combined effects of the Project on health care service provision indicator (5[a] and 5[b]).	Negative	RSA	Short to long-term	Occasional	Short to long-term	Negligible to medium	High	High	Not significant
6. Community Health Indicator – Aboriginal Health									
6(a) Combined effects of the Project on Aboriginal health indicator.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to low	Low	Moderate	Not significant
7. Combined Effects of the Project on Community Health									
7(a) Combined effects of the Project on community health indicators (1[a], 2[a], 3[c], 4[a], 5[c], 6[a]).	Negative	RSA	Short to long-term	Isolated to continuous	Short to long-term	Low	High	Moderate	Not significant

Notes: 1 RSA = Socio-economic RSA.

2 Significant Residual Socio-economic Effect: A residual socio-economic effect is considered significant if the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

7.11 References

7.11.1 Personal Communications

TERA wishes to acknowledge those people identified in the Personal Communications for their assistance in supplying information and comments incorporated into this report.

Atfield, S. Manager, West Central Alberta Real Estate Board. Hinton, AB.

Atkins, B. District Manager, Transportation, British Columbia Ministry of Transportation and Infrastructure. Coquitlam, BC.

Baron, C. Drainage and Environment Manager, City of Surrey. Surrey, BC.

Blain, D. Director of Engineering, City of Chilliwack. Chilliwack, BC.

Burleigh, D. Superintendent, Officer in Charge, Upper Fraser Valley Regional Detachment Chilliwack, Royal Canadian Mounted Police. Chilliwack, BC.

Clause, M. Manager of Planning, Town of Stony Plain. Stony Plain, AB.

Daly, P. Chief Medical Health Officer, Vancouver Coastal Health. Vancouver, BC.

Dawson, L. Communications Coordinator, Fraser Valley Real Estate Board. Fraser Valley, BC.

Fortoloczky, J. Chief Administrative Officer, District of Hope. Hope, BC.

Fretz, J. Sustainability and Environmental Services Manager, City of Kamloops. Kamloops, BC.

Frostad, L. Director, Finance and Administration, Town of Stony Plain. Stony Plain, AB.

Gill, S. Chief Administration Officer, Thompson-Nicola Regional District. Kamloops, BC.

Groulx, L. Chief Administration Officer, District of Clearwater. Clearwater, BC.

Hanlan, P. Manager of Planning and Development, Parkland County. Parkland County, AB.

Hannah, L. Chief Administration Officer, Village of Wabamun. Wabamun, AB.

Humphreys, B. Mayor, District of Barriere. Barriere, BC.

Irving, D. Director Planning & Development, City of Spruce Grove. Spruce Grove, AB.

Johnston, S. Mayor, District of Hope. Hope, BC.

Knight, Cpl. D. R. Supervisor, Hinton RCMP Detachment. Hinton, AB.

Kreiner, B. Town Manager, Town of Hinton. Hinton, AB.

Kwaitkowski, M. Development and Engineering Services Director, City of Kamloops. Kamloops, BC.

LaBoucane, V. Public Works Superintendent, Village of Valemount. Valemount, BC.

Lambright, L. Planning and Development Manager, City of Kamloops. Kamloops, BC.

Latimer, C. Councillor. Village of Valemount. Valemount, BC.

Lemieux, B. Assistant Chief Administration Officer, Town of Edson. Edson, AB.

Lerigny, S. Executive Office, Chilliwack and District Real Estate Board. Chilliwack, BC.

Lishman, P. Director, Resource Operations, Ministry of Forests, Lands and Natural Resource Operations. Kamloops, BC.

Lodder, M. Acute Care Nurse Manager, Hinton Healthcare Centre/Alberta Health Services. Hinton, AB.

Lukasiewich, C. Development Officer, Town of Hinton. Hinton, AB.

Lyons, B. Director of Corporate and Planning Services, Yellowhead County. Edson, AB.

Macdonald, W. Director, Electoral Area B (Thompson Headwaters), Thompson-Nicola Regional District. Blue River, BC.

Madden, S. Services Coordinator, Thompson-Nicola Regional District. Clearwater, BC.

Mattheis, T. Executive Director, Advantage Hope. Hope, BC.

McCracken, A. Mayor, Village of Valemount. Valemount, BC.

McDonagh, T. Broker/Owner, Royal LePage Merritt Real Estate Services, Brokerage. Merritt, BC.

McEachen, T. General Manager of Development Services, Regional District of Fraser-Fort George. Prince George, BC.

McQueen, J. First Nations Relations Manager, Ministry of Forests, Lands and Natural Resource Operations. Kamloops, BC.

Mills, L. Energy Exploration Liaison, Planning and Development Services, Strathcona County. Strathcona County, AB.

Misumi, S. Director of Community Development, District of Hope. Hope, BC.

Mitchell, T. Environmental Assessment Specialist, Parks Canada. Jasper, AB.

Moller, R. 2013. Supervisor – Mid and Lower Terminals, Suncor Energy. Port Moody, BC.

Morris, L. Chief Executive Officer, Tourism Kamloops. Kamloops, BC.

Nicol, A. Sustainability Planner, City of Spruce Grove. Spruce Grove, AB.

Noble, M. Chief Administrative Officer, City of Merritt. Merritt, BC.

Pagely, P. Hinton Chamber of Commerce. Hinton, AB.

Perog, J. Chair, Governance and Board Development, Community Futures Nicola Valley. Merritt, BC.

Ramme, J. Chief Administration Officer, Yellowhead County. Edson, AB.

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8.0 CUMULATIVE EFFECTS ASSESSMENT

Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and future human actions (Hegmann *et al.* 1999). A cumulative effects assessment is conducted to identify how impacts from a proposed project could interact with impacts from other developments occurring in the same ecosystem or region. A cumulative effects assessment expands the scope of traditional environmental assessment to evaluate how multiple activities may cause cumulative effects at both the local and regional scales (Finley and Revel 2002). In addition, a cumulative effects assessment differs from conventional project-specific environmental effects assessments by considering larger geographic study areas, longer timeframes and unrelated projects or activities (Antoniuk 2002).

The scope of this cumulative effects assessment is a project-specific cumulative effects assessment as required under the *CEA Act*, *2012* which is appropriate for the scale of the Project. Project-specific cumulative effects assessments must determine if that particular project is incrementally responsible for adversely affecting a given element (Hegmann *et al.* 1999). They may also assist municipal, provincial and federal authorities by identifying requirements for additional planning, monitoring or mitigation that are beyond the direct control of the proponent and need to be implemented or led by others. Therefore, the total cumulative effect on a given environmental or socio-economic indicator must be identified, however, the cumulative effects assessment must also make clear to what degree the project under review is contributing to that total effect.

According to the *CEA Act, 2012,* a project-specific cumulative effects assessment need only focus on regional concerns where the principal project's activities may incrementally contribute to these concerns. Only those resources that are likely to be directly affected by the project under review, as well as other likely projects or activities, need to be included in the project-specific cumulative effects assessment.

The cumulative effects assessment evaluates the residual socio-economic effects directly associated with the Project (as identified in Section 7.0) in combination with reasonably foreseeable residual effects arising from other projects and activities that have been or will be carried out in the element-specific LSA or RSA of the Project. Future projects considered in the assessment do not include proposed or hypothetical projects where formal plans have not been disclosed.

8.1 Methodology

The Project cumulative effects assessment applies the following steps.

1. Identify potential residual effects of the Project (Section 8.1.1).
2. Determine spatial and temporal boundaries for each socio-economic indicator where residual effects have been identified for the Project (Section 8.1.2).
3. Identify existing activities and reasonably foreseeable developments with residual effects that may act in combination with the residual effects of the Project (Sections 8.1.3 and 8.1.4).
4. Identify potential cumulative effects (Section 8.1.5).
5. Develop technically and economically feasible mitigation measures (Section 8.1.6).
6. Determine the significance of the Project's contribution to cumulative effects (Section 8.1.7).

Each of the above steps is described below in the applicable methodology subsection. This cumulative effects assessment methodology has been developed primarily based on the CEA Agency's Cumulative Effects Assessment Practitioners Guide (Hegmann *et al*. 1999), the CEA Agency's Addressing Cumulative Environmental Effects under the *CEA Act, 2012* (CEA Agency 2013a), the *CEA Act, 2012* and the NEB *Filing Manual* (NEB 2013a). Additional guidance was also obtained from FEARO's The Authority's Guide to the *CEA Act*: Part II: The Practitioner's Guide (FEARO 1994a), FEARO's A Reference Guide for the *CEA Act*: Addressing Cumulative Environmental Effects (FEARO 1994b) and FEARO's A Reference Guide for the *CEA Act*: Determining Whether a Project is Likely to Cause Significant Environmental Effects (FEARO 1994c).

8.1.1 Identify Residual Effects of the Project

Scoping of the potential residual effects to be included in the cumulative effects assessment helps focus the cumulative effects assessment on issues that are non-trivial. While Hegmann *et al.* (1999, 2002), Finley and Revel (2002) and Antoniuk (2000, 2002), among others, support the idea of narrowing the scope of issues to those of regional concern and a subset of Valued Ecosystem Components (VECs), Duinker and Greig (2006) recommend that project scale environmental assessment analyses should proceed on the assumption that all effects are cumulative. The latter statement reflects the expectations of the NEB, which are that each residual socio-economic effect is evaluated for potential cumulative effects (see Guide A.2.7 of the NEB *Filing Manual*). Nevertheless, Table A-3 of the NEB *Filing Manual* indicates that likely residual effects for the navigation and navigation safety element need not be subject to a cumulative effects assessment. Consequently, all other likely residual socio-economic effects identified in Section 7.0 are evaluated for potential cumulative effects, while those residual effects that are considered of regional concern are selected for more detailed analysis.

As per Guides A.2.6 and A.2.7 of the NEB *Filing Manual*, if a physical, biological or socio-economic element or indicator evaluated in the socio-economic effects assessment (Section 7.0) had no residual effects predicted or effects were not considered likely, then these elements or indicators were excluded from the cumulative effects assessment. Therefore, the cumulative effects assessment is limited to Project elements or indicators with residual effects that could act cumulatively with residual effects from other projects or activities.

8.1.2 Spatial and Temporal Boundaries

8.1.2.1 Spatial Boundaries

Defining appropriate spatial boundaries for potential cumulative effects is a critical step in the cumulative effects assessment. The selection of an excessively wide or large spatial boundary can cause any project-related cumulative effects to appear negligible compared to other actions (Hegmann *et al*. 1999) and increases the likelihood that an impact will be erroneously judged to be of no concern because it is relatively small in comparison (Antoniuk 2000, 2002, URS Corporation 2002).

Conversely, important regional and long-term effects may be overlooked if the spatial boundary is too small (Hegmann *et al.* 1999). An excessively small boundary may cause project-related cumulative effects to appear very significant compared to other activities within the study boundary, and potentially important issues outside the established boundary may be overlooked (Finley and Revel 2002). Antoniuk (2000, 2002) and URS Corporation (2002) note that the selection of a small study area prevents consideration of incremental and cumulative effects that are best evaluated over large areas. If boundaries are small, a more detailed or quantitative examination may be feasible; however, an understanding of the broad context may be sacrificed.

Spatial boundaries or zones of influence for pipeline-related effects are variable and may be based on a consideration of the local and regional environmental setting and any common connections or links that the pipeline project possesses with other activities or projects. As a result, different boundaries may be appropriate for different cumulative environmental effects (FEARO 1994b, Finley and Revel 2002). The spatial boundaries used in the Project cumulative effects assessment were areas where potential cumulative effects are non-trivial and have been identified. The spatial boundaries for each element as well as the rationale for the boundaries are presented in the respective subsection for each element in Section 7.0.

8.1.2.2 Temporal Boundaries

Current accepted practice for NEB applications is to use current conditions as the baseline for pipeline cumulative effects assessment (Antoniuk 2000, URS Corporation 2002). A general discussion of the historical developments and activities that have created the baseline is included as background information (Section 8.1.3).

The temporal boundaries used in the cumulative effects assessment include past development (up to the construction of the Project), the construction phase of the proposed development commencing in early 2016, and the operation phase that will commence following completion of construction and

extending to the expected life of the Project (*i.e.*, 50+ years). Temporal boundaries identified for each element are presented in Sections 8.2 to 8.8.

8.1.3 Existing Activities and Events

Existing activities in the Project area will vary depending on the spatial boundaries identified for each specific socio-economic element.

Historical Context of Alberta

Aboriginal communities settled in Alberta about 8,000 years ago. European explorers came to Alberta in the mid-eighteenth century; however, European settlement at that time was discouraged by the Hudson's Bay Company, which controlled the region for their fur trading activities. In 1870, the Hudson's Bay Company turned over control of the entire northwest region, including present-day Alberta, to Canada. The area was subsequently opened to European settlement in 1872. Following construction of the Canadian Pacific Railway in 1881, settlement of Alberta rapidly increased. Alberta's population rose from 73,022 in 1901 to 584,454 in 1921. Most of the early settlers were ranchers in the arid southern region of the province, although the fertile soils of the central parkland region were suitable for agriculture and many settlers established grain farms (Stamp 2012). Settlement in the central Alberta foothills was influenced by extraction and processing of natural resources. The Town of Hinton developed as a result of coal mining in the early twentieth century, as well as the opening of a pulp mill in 1957 (Holmgren 2012).

By 1910, most of the available agricultural land in Alberta had been settled; however, many of these settlements were abandoned during the Great Depression and not resettled until the 1940s and 1950s. Although a trend toward urbanization was underway, rapid acceleration in this trend began following World War II, brought on by a shift in the economic base from agriculture to petroleum. This shift was initiated by the discovery of oil at Leduc in February 1947. The resulting development of oil and natural gas resources transformed the cities of Edmonton and Calgary into prosperous metropolitan centres: in 1946, 27% of Alberta's population lived in Edmonton and Calgary; by 2001 this had increased to 80.9% (Stamp 2012).

Historical Context of British Columbia

Occupation of BC by Aboriginal communities has been confirmed at about 6,000 to 8,000 years ago by carbon dating. The coastal people concentrated along the lower reaches of the major salmon rivers. They were a semi-sedentary people and developed an elaborate culture distinguished by totem poles and potlatches. Interior inhabitants developed a generally nomadic hunting and fishing culture adapted to the forested mountains, dry central interior and the riverine resources of the area.

The first permanent European settlement came with the development of the fur trade in the early nineteenth century. At mid-nineteenth century, the only non-native settlements in what was to become BC were fur trade posts on the coast, such as Victoria, Nanaimo and Fort Langley, and in the interior, such as Kamloops, Fort George (later Prince George) and Fort St. James.

This relatively quiet period of history ended in 1858 following the discovery of gold along the lower and middle reaches of the Fraser River, which lead to an inland supply and transportation system along the Fraser River to the Cariboo Mountains. Thousands of prospectors journeyed to the region from California and other parts of the world. Mining became important in 1858 with the Fraser Gold Rush and later discoveries in the Cariboo region. Permanent mining towns began to establish along valleys of southeast BC by the 1880s, supported by local forestry, small farms and complex rail, road and water transport. In the early 1980s, mining in the area was highlighted by large, open-pit copper mines southwest of Kamloops. In contrast, settlement was more urban and commercial on the southwest coast.

Vancouver was selected as the site for the western terminal of the Canadian Pacific Railway in 1886, and it became the main port through which both coastal and interior products moved to world markets. Construction of the Grand Trunk Pacific Railway west from Edmonton through the upper Fraser, Bulkley and Skeena valleys from 1907 to 1914 was intended to give Canada a second gateway through the mountains to the Pacific coast.

Lumber mills were established in the southwest after the middle of the nineteenth century to supply the building needs of the growing settlements and to export to nearby Pacific settlements. The pulp and paper industry remained coastal until the mid-1960s, when mills were opened in several places across the interior. This interior expansion was part of the general spread of the forest industry into the interior of the province. Forestry was and continues to be an important economic pillar for the province, however, the industry has experienced considerable decline over recent years.

Farming began to supply the trading posts in BC in the mid-nineteenth century. The growing cities of Vancouver and Victoria stimulated agricultural expansion in the Fraser Valley and on Vancouver Island. In the 1890s, fruit and vegetable growing were established in the Okanagan and beef ranching in the Cariboo region. Agriculture brought settlers to the south-central interior. At the time of the Cariboo Gold Rush, ranching was established in the grassland valleys and rolling basins across the southern interior plateau. From 1966 to 1971, urban expansion was consuming over 6,000 ha per year of prime agricultural land. About 20% of the prime agricultural land of the Lower Fraser Valley and 30% of the Okanagan had already been converted when, in 1973, the *Land Commission Act* froze the disposition of agricultural land for non-agricultural use, despite competing demands for housing, industry, hobby farms and country estates.

Steep, rugged geography and high precipitation make many areas of BC suitable for hydroelectric power generation. Hydroelectric power was first produced at the close of the nineteenth century from small rivers in the southwest for urban consumers in Victoria and Vancouver. The largest single power site in the southwest prior to 1940 was developed on Bridge River, just east of the Coast Mountains.

Early in the nineteenth century, salmon canneries were dispersed all along the BC coast. However, the gradual introduction of improved boats with longer ranges and refrigeration resulted in the closing of most canneries on the central coast, and fish processing was concentrated into a few large plants near Prince Rupert and Vancouver.

Coastal BC was, and still is, served by an extensive ferry service which moves freight, cars and passengers across the Strait of Georgia. Small coastal boats, tugs and barges move natural resources, supplies and people along the sheltered "Inside Passage" between Vancouver Island and the mainland of BC, and northward to Prince Rupert, Haida Gwaii and the Alaska Panhandle.

By the mid to late twentieth century, thousands of Canadians migrated to BC, attracted by the mild climate and perceived economic opportunities, joining thousands of other immigrants from Asia. In the twenty-first century, BC is now one of Canada's most prosperous and fastest growing provinces in part due to its diverse natural resource industry and, in particular, the more recent growth and development of the natural gas sector in the northeast of the province. However, the population has always been primarily urban — in 2001, 84.7% was classified as urban, with most people residing in the southwest region (Robinson 2012).

8.1.3.1 Alberta (Edmonton to Hinton)

The Edmonton Region’s economic base is diverse and has expanded from a provincial government and regional commercial centre to include agriculture, biofuels, chemicals and petrochemicals, commercial/retail, residential, forestry and related industries, infrastructure, institutional, mining, oil and gas, oil sands, other industrial, pipelines, power, and tourism and recreation. In 2011, the most active industries in the City of Edmonton (by industrial classification) were: retail trade (employing approximately 12% of the labour force); health care and social assistance (11%); and construction (8%) (Statistics Canada 2013).

The Rural Alberta Region’s economy is more resource-based than the Edmonton Region. Key sectors include forestry, coal, oil and gas, agriculture and tourism. Forestry and coal mining are in flux, but the oil and gas industry is a steady contributor to the economy within Yellowhead County (Lyons pers. comm.). For the Rural Alberta Region overall within the Socio-Economic RSA, the most active industries (by industrial classification) in 2011 were: mining, quarrying, and oil and gas extraction (employing approximately 17% of the labour force); retail trade (11%); construction (8%); and accommodation and food services (8%) (Statistics Canada 2013).

Refer to Section 5.7 and the Socio-Economic Technical Report (Volume 5D) for additional information on employment and economy within the Socio-Economic RSA.

Natural Disturbance

Natural disturbance in various RSAs in Alberta commonly results from: forest fires; forest pests, particularly the mountain pine beetle west of the Town of Edson; and flooding, particularly along the North Saskatchewan, Pembina and McLeod rivers.

Settlement Patterns

In 2011, the total population of the Edmonton Region was 1,188,962; a 12% increase from 2006. The median age of people in the Edmonton Region was 37 and 5.5% of the population identified as Aboriginal (Statistics Canada 2012a).

In 2011, the total population of the Rural Alberta Region was 29,336; a 4% increase from 2006. The median age of people in the Rural Alberta Region was 43.5 and 11.5% of the population identified as Aboriginal (Statistics Canada 2012a).

Refer to Section 5.3 and the Socio-Economic Technical Report (Volume 5D) for additional census information on population and demographics within the Socio-Economic RSA.

Agriculture and Livestock Grazing

Agricultural production is the primary land use in the RSAs throughout Strathcona County, Parkland County and eastern regions of Yellowhead County (Parkland County 2007, Strathcona County 2007, Yellowhead County 2006), and continues to be supported by regional municipalities. For example: a policy of the Parkland County Municipal Development Plan (MDP) is to preserve the integrity of productive agricultural areas and the conservation of agricultural land (Parkland County 2007); a goal of the Yellowhead County MDP is to concentrate future development in areas that do not fragment existing agricultural land (Yellowhead County 2006); and an objective of the Strathcona County MDP is to maintain and enhance the viability of the existing agricultural community and agricultural industry (Strathcona County 2007).

The dominant type of agricultural activity in Strathcona County by number of reporting farms is other animal production, followed by other crop farming, hay farming and horse and other equine production (182 farms, 159 farms, 154 farms and 141 farms respectively) (Statistics Canada 2012b). Agricultural land use in Strathcona County is predominantly crops, followed by natural land for pasture and tame or seeded pasture (60,759 ha, 13,355 ha and 7,914 ha, respectively) (Statistics Canada 2012b).

The dominant type of agricultural activity in Parkland County by number of reporting farms is beef cattle ranching and farming, followed by hay farming, horse and other equine production, and other grain farming (219 farms, 148 farms, 140 farms, and 61 farms respectively) (Statistics Canada 2012c). Agricultural land use in Parkland County is predominantly crops, followed by tame or seeded pasture, and natural land for pasture (73,051 ha, 35,367 ha and 34,983 ha, respectively) (Statistics Canada 2012c).

The dominant type of agricultural activity in Yellowhead County by number of reporting farms is beef cattle ranching and farming, followed by hay farming, horse and other equine production and animal combination farming (205, 183, 135, and 43 farms respectively) (Statistics Canada 2012d). Agricultural land use in Yellowhead County is predominantly natural land for pasture, followed by crops, and tame or seeded pasture (65,379 ha, 62,913 ha, and 34,372 ha respectively) (Statistics Canada 2012d).

Crown-owned grazing leases also are present within the RSAs. These grazing leases are broadly managed by Alberta Environment and Sustainable Resource Development (AESRD), although individual land users are responsible for the day-to-day management of the land.

Forestry

The volume of timber harvested in Forest Management Agreements (FMAs) along the proposed pipeline corridor provide an indication of current forestry activity in the various RSAs.

Effective in 2007, the approved Annual Allowable Cut (AAC) for the Weyerhaeuser Company Ltd. (Edson) (Weyerhaeuser) FMA is 514,856 m^3 of coniferous wood and 328,663 m^3 of deciduous, up from an approved AAC in 2006 of 384,363 m^3 for coniferous and 317,440 m^3 for deciduous. As of 2007, no mountain pine beetle was detected in the Weyerhaueser FMA; however, the increase in AAC is part of Weyerhaeuser's 20-year plan to create a forest that is more resistant to such outbreaks by dramatically reducing the overall susceptibility of pine forests in the FMA (Weyerhaeuser 2008a).

The approved AAC for the West Fraser Mills Ltd. (Hinton) (West Fraser) FMA is 1,766,576 m^3 of coniferous wood and 249,832 m^3 of deciduous, up from an approved AAC of 1,535,000 m^3 for coniferous and 169,449 m^3 for deciduous from 2008 to 2010. The West Fraser FMA is in the leading edge zone for mountain pine beetle, where the increase in AAC for coniferous wood is part of the strategy to eradicate all mountain pine beetle infestations as they become known (West Fraser 2010).

Recreation

Outdoor recreational activities such as snowmobiling, cross-country skiing, all-terrain vehicle (ATV) use, mountain biking, hiking, camping, rafting, kayaking, canoeing and sight-seeing are expected to occur within various RSAs along the proposed pipeline segment. Recreational boating and fishing occurs on the larger watercourses (*e.g.*, North Saskatchewan, Pembina and McLeod rivers) and lakes (*e.g.*, Wabamun Lake).

Refer to Section 5.4 and the Socio-Economic Technical Report (Volume 5D) for additional information on recreation activities within the Human Occupancy and Resource Use (HORU) RSA.

Rural and Urban Residential and Commercial

The proposed pipeline corridor crosses urban and rural commercial and residential centres including the City of Edmonton, City of Spruce Grove, Town of Stony Plain, Town of Edson, Town of Hinton, as well as three Hamlet Growth Areas within Yellowhead County: Niton Junction (approximately RK 187); Wildwood (approximately RK 151); and Evansburg (approximately RK 137). The Yellowhead County MDP notes that these Hamlet Growth Areas have a 3 km radius around existing hamlets and provide space to accommodate new development (Yellowhead County 2006).

The Edmonton Region has experienced rapid population growth over the past 5 years (Section 6.1 of the Socio-Economic Technical Report of Volume 5D). As a result, residential development within the Edmonton Region has also increased. The residential housing market in the Edmonton Region is large in certain areas (City of Edmonton) and small in others (City of Spruce Grove).

The Rural Alberta Region experienced rapid growth in 2007/2008, during the last oil and gas boom. Since that time, growth has declined and, as a result, residential development within the Rural Alberta Region has also declined.

Refer to Section 5.5 and the Socio-Economic Technical Report (Volume 5D) for additional details on rural and urban residential development within the Socio-Economic RSA.

Transportation and Infrastructure

Current and ongoing transportation activities in the RSA for various elements may include regular and commercial vehicle traffic, as well as maintenance activities on roads, bridges, highways, railways and airports.

There are approximately five permanent traffic measurement sites located on Highway 16 within the Edmonton Region. Overall Monthly Average Daily Traffic (MADT) volumes have increased from 2009 to 2011, with larger volumes occurring close to the City of Edmonton. This is likely due to commuters driving to Edmonton from the City of Spruce Grove and the Town of Stony Plain (Alberta Transportation 2012).

There are four permanent traffic measurement sites located on Highway 16 within the Rural Alberta Region. Overall MADT volumes have increased from 2009 to 2011, with larger volumes occurring close to the Town of Edson and the Town of Hinton, likely due to commuters. Throughout the Rural Alberta Region, MADT volumes are highest during the summer months (Alberta Transportation 2012).

Refer to Section 5.5 and the Socio-Economic Technical Report (Volume 5D) for additional information on transportation and infrastructure, including traffic volume measurements at various locations within the Socio-Economic RSA.

Utility Activities

Current and ongoing utility activities in the RSA for various elements include maintenance on transmission line and gas distribution rights-of-way (*e.g.*, ATCO Gas and Pipelines Ltd. [ATCO Gas], EPCOR Distribution and Transmission Inc. [EPCOR]) as well as operational activities at thermal electric power generating plants, such as the TransAlta Corp. (TransAlta) Sundance and Keephills thermal electric power generating plants approximately 6 km southwest and 12 km south of Wabamun, respectively (TransAlta 2013a).

In addition, several major utility developments are currently under construction in the various RSAs, including the AltaLink Management Ltd. (AltaLink) Western Alberta Transmission Line Project, EPCOR and AltaLink Heartland Transmission Project, ATCO Electric Ltd. (ATCO Electric) Eastern Alberta Transmission Line Project and MAXIM Power Corp. (MAXIM) Deerland Gas-Fired Peaking Power Plant Project (refer to Section 8.1.4.1 for additional details).

Oil and Gas

As home to Canada's largest oil refining complex and North America's third largest petrochemical complex, Strathcona County's economic base is oil and gas. The county supports oil and gas exploration and development with the least possible impact on the environment, health, safety and quality of life for residents and the community (Strathcona County 2007). Likewise, one of the main industries in Parkland and Yellowhead counties is oil and gas exploration and development.

Oil and gas activity in the RSAs for various elements has been ongoing since the 1950s. Oil and gas exploration and development activities conducted over the years include seismic operations and the construction and operation/maintenance of pipelines, access roads and lease sites (*e.g.*, wells, gas plants, compressor stations).

Mineral Resources

Ongoing mining operations in the various RSAs include aggregate quarries and coal mines. The TransAlta Highvale Mine located approximately 10 km southwest of Wabamun delivers coal to TransAlta's Sundance and Keephills thermal generating plants (see Utility Activities above) (TransAlta 2013b). The Whitewood Mine, located approximately 8 km north of Wabamun Lake, was closed in 2010 and TransAlta is now focused on reclaiming the former coal mine (TransAlta 2013c). The Teck Resources Ltd. (Teck) Cardinal River Mine approximately 40 km south of Hinton produces mostly metallurgical coal (Teck 2013a), while the Sherritt International Corporation (Sherritt) Coal Valley Mine approximately 60 km south of Edson produces mostly thermal generating coal for international export (Sherritt 2013). Two other coal mines operated by Sherritt — Gregg River Mine and Obed Mountain Mine located south and northeast of Hinton, respectively — are currently inactive (Sherritt 2013).

8.1.3.2 British Columbia (Hargreaves to Westridge)

The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services. For the Fraser-Fort George/Thompson-Nicola Region overall within in the Socio-Economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 12% of the labour force); health care and social assistance (12%); accommodation and food services (8%); and construction (8%) (Statistics Canada 2013).

The economy of the Fraser Valley Region is based primarily on agriculture, manufacturing and construction. Historically, the predominant sectors have been agriculture and resource development, including forestry, however, the economy is diversifying based on growth in the manufacturing, services, aerospace and technology sectors (FVRD 2010). For the Fraser Valley Region overall within in the Socio-Economic RSA, the most active industries (by industrial classification) in 2011 were: retail trade (employing approximately 13% of the labour force); health care and social assistance (12%); construction (11%); and manufacturing (10%) (Statistics Canada 2013).

The Metro Vancouver Region's economic base is diverse and includes trade and commerce, manufacturing, goods distribution, professional services, tourism, education and agriculture. For the Metro Vancouver Region overall within in the Socio-Economic RSA, in 2011 the most active industries (by industrial classification) were: retail trade (employing approximately 10% of the labour force); health care and social assistance (10%); accommodation and food services (8%); and professional, scientific and technical services (9%) (Statistics Canada 2013).

Refer to Section 5.7 and the Socio-Economic Technical Report (Volume 5D) for additional information on employment and economy within the Socio-Economic RSA.

Natural Disturbance

Natural disturbance in various RSAs within BC commonly result from forest fires (mainly interior BC); forest pests (mainly interior BC), particularly the mountain pine beetle, but also the balsam bark beetle, Douglas-fir bark beetle, western spruce budworm and aspen leaf miner; debris slides and flows, particularly between the Village of Valemount and the District of Clearwater, as well as the City of Merritt and District of Hope; avalanches along the Coquihalla River valley; and flooding, particularly along the North Thompson, Thompson, Coldwater, Coquihalla and lower Fraser rivers.

Settlement Patterns

Key incorporated population centres in the Fraser-Fort George/Thompson-Nicola Region include the Village of Valemount, the District of Clearwater, the City of Kamloops, the City of Merritt and the District of Barriere, as well as many small, unincorporated communities such as Blue River, Vavenby, Avola and Little Fort. In 2011, the total population of the Fraser-Fort George/Thompson-Nicola Region was 128,978; a 5% increase from 2006. In 2011, the median age of the Fraser-Fort George/Thompson-Nicola Region population was 45 and 10.6% of the population identified as Aboriginal (Statistics Canada 2012).

The Fraser Valley Region is largely agricultural, and key incorporated municipalities include the District of Hope, the City of Chilliwack and the City of Abbotsford. In 2011, the total population of the Fraser Valley Region was 274,404; an 8% increase from 2006. In 2011, the median age of the Fraser Valley Region population was 42.6, and 6.4% of the population identified as Aboriginal (Statistics Canada 2012).

In 2011, the total population of the Metro Vancouver Region, which includes the cities of Surrey, Coquitlam, Burnaby and Vancouver, was 2,313,328; a 9.3% increase from 2006. In 2011, the median age of the population in the Metro Vancouver Region was 41 and 2.4% of the population identified as Aboriginal (Statistics Canada 2012).

Refer to Section 5.3 and the Socio-Economic Technical Report (Volume 5D) for additional census information on population and demographics within the Socio-Economic RSA.

Agriculture and Livestock Grazing

Limited agricultural activities in the various RSAs north of Kamloops consist predominantly of grazing areas and permanent pastures near the communities of Valemount, Blue River, Avola and Clearwater. Beyond Clearwater to the southwest, the river valley widens and the land use in the valley bottom is mainly pasture and forest grazing. Natural grazing lands are common along the Coquihalla Highway from the area south of Kamloops to south of Merritt, where forest begins to dominate from south of the Coquihalla Lakes to Hope.

The Agricultural Land Reserve (ALR) in the Thompson-Nicola Regional District (TNRD) accounts for less than 13% of the overall area of the regional district. The dominant types of agricultural activity in TNRD are classified as unmanaged pasture and managed pasture at 79% and 10%, respectively. Crops, mainly alfalfa and other fodder crops, account for 7% (BC Ministry of Agriculture and Lands 2008).

Two-thirds of the land base in the City of Chilliwack is reserved for agriculture, which is dominated by dairy, poultry, nurseries and greenhouses (City of Chilliwack 2012). Approximately 75% of the Township of Langley is classified as ALR, which is utilized for a variety of purposes, including greenhouses, nurseries, berry operations, equestrian farms, wineries, poultry farms and vegetable farms (Township of Langley 2013). The City of Abbotsford is one of the most intensively and diversely farmed areas in Canada, supporting a wide range of crop and livestock enterprises (City of Abbotsford 2011). Agriculture

is also a predominant land use activity in the City of Surrey, where approximately 8,692 ha of the city's total area is classified as ALR, of which approximately 5,864 ha is used for agriculture production (City of Surrey 2013a).

Further northwest into the cities of Coquitlam and Burnaby, agricultural land uses are almost entirely absent due to the presence of higher density urban development, mountainous terrain and protected areas.

Forestry

The volume of timber harvested in Timber Supply Areas (TSAs) along the proposed pipeline corridor provide an indication of current forestry activity in the various RSAs. Of an AAC of 536,000 m^3, only 146,179 m^3 was harvested in the Robson Valley TSA, up from a low of 50,086 m^3 in 2009. Due to recent closures of lumber mills in McBride and Valemount, the Robson Valley TSA is generally a source of timber for Carrier Lumber in Prince George and Canfor in Vavenby (BC Ministry of Forests, Lands and Natural Resource Operations [MFLNRO] 2012a). Of an AAC of 4 million m^3, only 2.87 million m^3 was harvested in the Kamloops TSA, up from a low of 1.7 million m^3 in 2009 (BC MFLNRO 2012b). Every year from 2007 to 2011, the Merritt TSA recorded harvest rates greater than AAC rates, at approximately 118% over the five-year period, due to pine beetle management activities. The greatest disparity was in 2011, when 3.38 million m^3 was harvested, compared to the AAC of 2.4 million m^3.

More recent AAC and harvest information for the Fraser TSA were not available; however, the current AAC of 1.27 million m^3 provides an indication that the Fraser TSA is experiencing some degree of active timber harvesting. The AAC is projected to stay at 1.27 million m^3 until the next AAC determination prior to August 1, 2014 (BC MFLNRO 2013a).

Active timber harvesting also occurs in several community forests within the various RSAs, including the Valemount Community Forest and McBride Community Forest.

Recreation

Outdoor recreational activities within various RSAs along the proposed pipeline corridor include snowmobiling, heli-skiing, cross-country skiing, ATV use, mountain biking, hiking, horseback riding, camping, golfing, rafting, kayaking, canoeing and sight-seeing. Recreational boating and fishing occurs on the larger watercourses (*e.g.*, Fraser, North Thompson, Thompson, Nicola, Coldwater and Coquihalla rivers) and lakes (*e.g.*, Kamloops, Jacko, Nicola and Coquihalla lakes).

Refer to Section 5.4 and the Socio-Economic Technical Report (Volume 5D) for additional information on recreation activities within the HORU RSA.

Rural and Urban Residential and Commercial

The proposed pipeline corridor crosses various types of residential land use, from rural parcels with residences to urban centres such as the City of Kamloops, City of Chilliwack, City of Abbotsford, Township of Langley, City of Coquitlam and the City of Burnaby.

The Fraser-Fort George/Thompson-Nicola Region has experienced average population growth from 2006 to 2011. As a result, residential development within the Fraser-Fort George/Thompson-Nicola Region has also remained consistent. In the Fraser Valley Region, the demand for housing has expanded with population and economic growth. Close proximity to Metro Vancouver is a factor in the region's increased demand for housing, although the Fraser Valley Region generally has more affordable housing than Metro Vancouver (FVRD 2011). The private housing market in the Greater Vancouver area has seen low sales activity in 2012; below historical averages (Real Estate Board of Greater Vancouver [REBGV] 2013). In the Metro Vancouver Region, home prices have declined 2.8% since January 2012 (REBGV 2013).

Refer to Section 5.5 and the Socio-Economic Technical Report (Volume 5D) for additional details on rural and urban residential development within the Socio-Economic RSA.

Transportation and Infrastructure

Current and ongoing transportation activities in the RSA for various elements may include regular and commercial vehicle traffic, as well as maintenance activities on roads, bridges, highways, railways and airports.

There are four permanent traffic measurement sites located on Highway 16 within the Fraser-Fort George/Thompson-Nicola Region. Traffic count data are available for 2010, 2011 and 2012 for these sites. Overall MADT volumes have slightly increased from 2010 to 2012, with larger volumes occurring close to the City of Kamloops (likely due to commuters from the region since Kamloops is the largest city in the Fraser-Fort George/Thompson-Nicola Region). Throughout the Fraser-Fort George/Thompson-Nicola Region, MADT volumes are highest during the summer months.

There is one permanent traffic measurement site located on Highway 5 within the Fraser-Fort George/Thompson-Nicola Region. Traffic count data are available for 2010, 2011 and 2012 for the site. Overall MADT volumes have remained consistent, with a slight decrease from 2010 to 2012. Increased traffic during summer months is likely due to travel associated with tourism, recreation and construction.

There is one permanent traffic measurement site located on Highway 5 within the Fraser Valley Region. Traffic count data are available for 2010, 2011 and 2012 for the site. Overall MADT volumes have remained consistent from 2010 to 2012. The permanent traffic measurement site is considered highly seasonal, as evidenced by the large difference in monthly average daily traffic between winter and summer months. Increased traffic during summer months is likely due to travel associated with tourism and recreation.

Three permanent traffic measurement sites are located on Highway 1 within the Fraser Valley Region. Traffic count data are available for 2012 as well as 2010 and 2011 for most sites. Overall MADT volumes have remained consistent from 2010 to 2012, with larger volumes occurring in the cities of Chilliwack and Abbotsford (likely due to commuters moving between communities in the Fraser Valley Region). The permanent traffic measurement sites on Highway 1 near Hope and in Chilliwack are considered seasonal, as evidenced by the difference in monthly average daily traffic between winter and summer months. Increased traffic during summer months is likely due to travel associated with tourism and recreation. The permanent traffic measurement site on Highway 1 in Abbotsford is considered consistent, without large variations in monthly average daily traffic between winter and summer months.

There are four permanent traffic measurement sites located on Highway 1 in vicinity to the proposed pipeline corridor within the Metro Vancouver Region. Traffic count data are available for 2010 for these sites and, in some cases, 2011 and 2012 as well. Overall MADT volumes have remained consistent from 2010 to 2012, with larger volumes occurring at the Port Mann Bridge crossing (likely due to commuters driving between communities in Metro Vancouver). The permanent traffic measurement sites on Highway 1 are considered consistent. There is little difference in monthly average daily traffic between winter and summer months.

Refer to Section 5.5 and the Socio-Economic Technical Report (Volume 5D) for additional information on transportation and infrastructure, including traffic volume measurements at various locations within the Socio-Economic RSA.

Utility Activities

Current and ongoing utility activities in the RSA for various elements include maintenance on transmission line, fibre optic line and gas distribution rights-of-way (*e.g.*, BC Hydro, Telus Communications Corp. [Telus], FortisBC Energy Inc. [FortisBC]) as well as operational activities at run-of-river hydroelectric plants, including Brookfield Renewable Power Inc. (Brookfield) East Twin Creek, located approximately 22 km northwest of McBride; Hauer Creek Power Ltd. Hauer Creek, located approximately 15 km northwest of Valemount; Brookfield Hystad Creek, located approximately 6 km west of Valemount; TransAlta Bone Creek, located approximately 20 km northeast of Blue River; and Boston Bar Hydro Scuzzy and Six Mile creeks, located approximately 55 km north of Hope (BC Hydro 2013a).

Other ongoing and current utility activities include operation and maintenance activities associated with public utilities and services (*e.g.*, water and sewer lines, landfills), electric substations and

waste-to-energy facilities, such as Metro Vancouver's Waste-to-Energy Facility located in the City of Burnaby, which is responsible for the environmentally safe disposal of over 25% the region's waste (Metro Vancouver 2013), and MAXIM's 7.4 MW electrical and 9.1 MW thermal landfill gas cogeneration project in Delta, BC (MAXIM 2013).

In addition, major utility developments currently under construction in the various RSAs include the BC Transmission Corporation Interior – Lower Mainland Transmission Project and the BC Hydro Merritt Area Transmission Project (see Section 8.1.4.2 for additional details).

Oil and Gas

There are currently no oil and gas exploration and development activities within any RSAs in BC. There are, however, existing oil and gas transportation and storage developments such as the existing TMPL system and associated facilities, the Suncor Energy Products Partnership Terminal at the Kamloops Airport and the FortisBC Kingsvale Compressor Station. The Kingsvale Compressor Station serves a Spectra Energy Corp. pipeline that originates in northern BC within the various RSAs and extends from Kingsvale area to the Lower Mainland via a route through Prince George, Cache Creek and the Coquihalla valley.

Mineral Resources

Ongoing mining operations in the various RSAs include aggregate quarries and metal mines. The New Gold Inc. (New Gold) New Afton Mine is an underground and open-pit copper-gold mine located approximately 10 km west of the City of Kamloops that began production in June 2012 (New Gold 2013). Located approximately 50 km southwest of Kamloops, the Teck Highland Valley Copper Mine produces copper and molybdenum concentrates, and is one of the largest open-pit mining operations in BC (Teck 2013b).

Exploration activities (*e.g.*, sample drilling) are currently underway in various RSAs along the proposed pipeline corridor. Mining activities identified in the various RSAs in the exploration phase include the proposed Imperial Metals Corp. Ruddock Creek Zinc-Lead Mine Development Project near Avola, the proposed Discover Corp. Enterprises Inc. Galaxy Mine near Kamloops, the proposed Strongbow Exploration Inc. Shovelnose Mine near the City of Merritt, the proposed Gold Mountain Mining Corp. Elk Gold Mine near Merritt and the proposed New Carolin Gold Corp. Ladner Gold Project near Hope.

Marine Commercial, Recreational and Tourism Use

Although regulation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in accordance with the NEB's direction from their List of Issues for the Project, released on July 29, 2013.

The City of Vancouver, which bounds most of the southern shore of Burrard Inlet, is Canada's third largest city and its busiest port (Port Metro Vancouver [PMV] 2013a). Fishing vessels use Burrard Inlet to berth, fuel, and to access fishing grounds. Commercial fishers in Burrard Inlet mainly target Dungeness crab, prawn and shrimp. A small commercial fishery for surf smelt takes place in Burrard Inlet, mostly off spawning beaches in English Bay (Fisheries and Oceans Canada [DFO] 2013).

Under the *Canada Marine Act*, the PMV is mandated as the port authority responsible for the safe and efficient movement of marine vessel traffic in Burrard Inlet. The PMV provides oversight for operations of 28 major cargo and container terminals, 23 of which are in Burrard Inlet (PMV 2013a). The Outer Harbour and eastern area of the harbour contain multiple commercial anchorages for large deep draft marine vessels. The Inner Harbour is heavily industrialized, containing several major marine cargo, container and cruise ship terminals (PMV 2010).

The SeaBus commuter ferry travels between Vancouver and North Vancouver in the Inner Harbour, from Coal Harbour to Lonsdale Quay. In 2011, an average of 23,020 passengers used the SeaBus weekly (TransLink 2013a). In addition, a seaplane base is located in Coal Harbour. The area has one of the highest levels of seaplane activity in the world and is rated as one of the busiest aerodromes in Canada, with a total of 8 destinations serviced by a fleet of 30 planes (Global Aviation Resource 2010).

The Central Harbour continues east of the Second Narrows and contains marine terminals including the Westridge Marine Terminal, as well as the Chevron Refinery (PMV 2013a). Marine terminals are also present in Port Moody Inlet, east of the Westridge Marine Terminal.

Log handling occurs in Burrard Inlet and along the Fraser River. Mill & Timber Products in Port Moody handles and stores logs in Port Moody Inlet (Natland pers. comm.). Logs are also stored in numerous locations along the Fraser River. A log pond area is active in nearshore areas south of Point Grey in Vancouver. Many of these logs stored on the river are processed at the remaining mill sites along the river (Natland pers. comm.).

Commercial anchorages are located in the central harbour around the Westridge Marine Terminal, in the Inner Harbour and the Outer Harbour. Some anchorages are designated for different purposes, such as short-term use, emergency use, or for outbound vessels only (PMV 2012).

Marine recreation in Burrard Inlet is both intense and diverse, including fishing, boating, kayaking, paddle boarding, windsurfing and kite boarding, swimming, and scuba diving. Recreational users also access major destinations through Burrard Inlet; notably Indian Arm, where provincial and regional parks cover much of the shoreline.

Vancouver is the home port for the Vancouver–Alaska cruise ship industry, with two cruise ship terminals in the Inner Harbour that provide berthing facilities for 14 cruise ship companies (PMV 2013a). Over 800,000 passengers are expected to pass through one of the two cruise terminals in Vancouver Inner Harbour in 2013 (Cruise Lines International Association 2013). Local charter companies based in the Vancouver area offer boat tours and corporate and private cruises on large yachts in Vancouver Harbour, including the Inner Harbour and Indian Arm (Destination BC 2013, Harbour Cruises 2013).

8.1.4 Reasonably Foreseeable Developments

Reasonably foreseeable developments that are likely to occur in the Project area will vary depending on the spatial boundaries identified for the specific socio-economic element.

The criteria used to determine projects that may act cumulatively with the Project are:

- certain – the physical activity will proceed or there is a high probability it will proceed (*i.e.*, the project is either under construction, has been approved or is in the process of obtaining approval); or

- reasonably foreseeable – the physical activity is expected to proceed (*i.e.*, the project proponent has publicly disclosed its intention to seek the necessary approvals to proceed).

Sources reviewed to identify any projects/activities that could have cumulative interactions with the Project include: Alberta Inventory of Major Projects (Alberta Enterprise and Advanced Education [AEAE] 2013); BC Major Projects Inventory (BC Ministry of Jobs, Tourism and Skills Training and Responsible for Labour [MJTST] 2012); Alberta Transportation (2013a,b); Alberta Energy Regulator (AER, formerly Alberta Energy Resources Conservation Board [ERCB]) (ERCB 2013a); Alberta Utilities Commission (AUC 2013a); BC Utilities Commission (BCUC 2013); BC Oil and Gas Commission (BC OGC 2013); BC Land Tenure Branch (BC MFLNRO 2013b); BC Environmental Assessment Office (EAO) (Province of BC 2013); PMV (2013b); CEA Registry (CEA Agency 2013b); NEB (2013b); Canada's Economic Action Plan (Government of Canada 2013a); Major Projects Management Office (Government of Canada 2013b); and county, regional district and municipality websites.

Other activities and reasonably foreseeable developments included in the assessment were identified as of May 31, 2013 and are summarized in the subsections below and in Appendix 8.1. Only those certain and reasonably foreseeable future developments with identified footprints outside of urban disturbed areas are mapped and included in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 and Figures 8.1-1a, 8.1-1b and 8.1-1c. Reasonably foreseeable developments summarized in Table 8A.1-5 (for Alberta) and Table 8A.1-6 (for BC) of Appendix 8.1 with the potential to act in combination with the Project were excluded from mapping since development details (*e.g.*, approval status, location) were either not available or the developments were located within urban municipal boundaries, such as the City of Edmonton and Lower Mainland Developed Area (LMDA) (Figure 8.1-1c). The LMDA encompasses Chilliwack and municipalities extending west (*e.g.*, Abbotsoford, Surrey, Coquitlam, Burnaby and

Vancouver). The LMDA was delineated in an effort to address the agglomeration of municipalities in the Lower Mainland, an area recognized as having a development and human use priority and that has already been transformed from natural conditions by extensive urban, commercial, industrial, and agricultural activity, but which contains areas of highly valued green space.

A concern expressed from a public perspective during ESA Workshops and Community Workshops was the continued protection of valued green space within the LMDA, therefore, future developments identified as encroaching into defined natural spaces that may also be impacted by the Project were identified. Only one such development was identified – a portion of the Golden Ears Connector development through a City of Surrey greenbelt, as shown in Figure 8.1-1c and described in Appendix 8.1.

8.1.4.1 Alberta (Edmonton to Alberta/British Columbia Border)

Agriculture and Livestock Grazing

Strathcona, Parkland and Yellowhead counties are working to support and maintain the agricultural sector in light of global demands on certain commodities and cost to invest in agriculture. For example, an objective of Parkland and Strathcona county MDPs is to encourage the growth and expansion of value-added agricultural or industrial agricultural uses such as food processing facilities (Parkland County 2007, Strathcona County 2007). Similarly, an objective of the Yellowhead County MDP is to maintain and support agriculture as an important industry and way of life in Yellowhead County and promote the growth and diversification of extensive and intensive agricultural operations (Yellowhead County 2006).

Agriculture activities within the RSAs of various elements are expected to continue into the future and will act cumulatively with the Project. However, no specific future developments such as feedlot proposals have been identified.

Forestry Activities

Future forestry activities within the RSAs are generally limited to timber harvesting within RSAs along the western portion of the Rural Alberta Region in the Weyerhaeuser and West Fraser FMAs.

Effective until 2024, the approved AAC for the Weyerhaeuser FMA is 514,856 m^3 of coniferous wood and 328,663 m^3 of deciduous. According to estimates provided in Weyerhaeuser's Detailed Forest Management Plan Mountain Pine Beetle Addendum, actual harvest volumes for coniferous and deciduous wood are predicted to gradually increase in the FMA over this time period (Weyerhaeuser 2008b). Although the AAC for coniferous wood in the West Fraser FMA is 1,766,576 m^3, estimated volumes provided in West Fraser's 2011 Annual Operating Plan increase gradually per year from 1,507,780 m^3 in 2011 to 1,676,000 m^3 in 2015. With the exception of a 2011 estimate of 130,000 m^3, estimated deciduous volumes remain at 125,000 m^3 over the same period (West Fraser 2011). Increases in AACs result from implementation of harvest strategy measures supported by provincial initiatives to combat the increasing threat to Alberta forests from mountain pine beetle infestations.

Public, Tourism, Arts and Recreation Development and Activities

The Alberta Inventory of Major Projects (AEAE 2013) provides an information source from which future public, tourism, arts and recreation-based developments were identified. Details are variable for any given development and, as such, it is difficult to determine how likely "proposed" developments are to proceed without confirmation through other publicly available information. Most public, tourism, arts and recreational-based future developments are located in the City of Edmonton and the immediate surrounding area.

Public, tourism, arts and recreational-based future developments currently under construction or proposed are provided in Table 8A.1-5 of Appendix 8.1 and include: new libraries; expansion of the Edmonton Valley Zoo; heath care facilities, including Edson Health Care Centre and Strathcona Hospital Phase 1; recreation and arts facilities, including the Entertainment District Development Project and Downtown Performing Arts Centre; park and historical site upgrades and restorations; and an Edmonton Police Service Northwest Campus.

Various elementary, secondary and post-secondary institution capital projects, including expansions, upgrades and new developments, are proposed in the City of Edmonton and surrounding communities (Government of Alberta 2013, Alberta Infrastructure n.d.). Notable developments for post-secondary institutions are provided in Table 8A.1-5 of Appendix 8.1 and include: University of Alberta Dentistry/Pharmacy Building Repurposing; University of Alberta Student Physical Activity and Wellness Centre; NorQuest College North Learning Centre (Downtown Campus) Development; and NAIT Centre for Applied Technologies.

Many of these developments will be in-service prior to 2016 and, therefore, will not occur concurrently with construction of the Project. A notable exception is the Downtown Performing Arts Centre in the City of Edmonton, which involves construction of an open-air arts galleria, a 1,600-seat theatre and 3 smaller spaces, an underground parking garage and an office tower. The current construction schedule of this development is from 2014 to 2017 (AEAE 2013). In addition, two large-scale developments — the Edmonton Area and Entertainment District Development Project, which includes a new arena to house the Edmonton Oilers, and the Royal Alberta Museum — are scheduled to be in service by 2016 (Alberta Infrastructure 2013, City of Edmonton 2013a).

Rural and Urban Residential and Commercial Development

Population of many communities in the Edmonton Region will continue growing into the immediate future, with particularly strong growth projected for the City of Edmonton. In general, however, much slower growth is projected for many communities in the Rural Alberta Region (refer to Section 5.3 and the Socio-Economic Technical Report [Volume 5D] for additional information).

Residential and commercial developments over $50 million in the RSAs that are either proposed or under construction in Alberta under the Alberta Inventory of Major Projects (AEAE 2013) include:

- Station Pointe Greens Residential Co-operative – Edmonton ($65 million) (proposed);
- The Corners I Condo Tower – Edmonton ($80 million) (proposed);
- Kelly Ramsey Building Redevelopment – Edmonton ($250 million) (proposed);
- Ultima Tower Luxury Condo Development – Edmonton ($65 million) (construction started [2012 to 2015]); and
- Century Crossing Commercial Development – Spruce Grove ($75 million) (construction started [2010 to 2013]).

Other proposed developments under $50 million in the RSAs include condominiums, apartments, housing complexes, retirement residences, retail outlets and other commercial and residential developments in the City of Edmonton and surrounding areas (AEAE 2013). The identified residential and commercial developments are anticipated to be in-service prior to 2016 and, therefore, will not occur concurrently with construction of the Project. Other proposed residential and commercial developments where schedule details are unavailable are assumed to be constructed concurrently with the Project.

Transportation and Infrastructure Development

Current and future transportation activities within the RSAs of various elements include regular and commercial vehicle traffic and rail traffic, as well as maintenance, reconstruction and upgrade activity on roads, bridges and highways, particularly within and near the City of Edmonton, where many transportation and infrastructure developments are currently under construction and in various planning and design phases (Alberta Enterprise and Advanced Education 2013, Alberta Transportation 2013a,b). Proposed future transportation developments currently under construction or proposed in the Edmonton area are provided in Appendix 8.1 and include: a new park and ride; light rail transit (LRT) upgrades; the Queen Elizabeth II Highway and 41 Avenue SW Interchange; a Northeast Transit Garage; and the Northeast Anthony Henday Project.

According to the growth forecast in the Capital Region Growth Plan, low-density residential use will continue to expand to Greenfield areas as the most common form of residential land use development in

the Capital Region (*i.e.*, an "out" not "up" approach), which encompasses, among other areas, the City of Edmonton and Strathcona and Parkland counties (Capital Region Board 2009). In an effort to discourage urban sprawl and support infill development, the Captial Region, particularly the City of Edmonton, places a high priority on development of alternate transportation modes, which includes considerable expansion of LRT services (Capital Region Board 2009, City of Edmonton 2011).

Five LRT extension projects are in various stages of development along the existing LRT system in Edmonton. Currently under construction, the North LRT to NAIT (Metro Line) is a 3.3 km extension from Churchill LRT Station in downtown Edmonton northwest to NAIT (Table 8A.1-5 of Appendix 8.1). The expected in-service date for the Metro Line is spring 2014 (City of Edmonton 2013b). The proposed Southeast to West LRT (Valley Line) is a priority project for the City of Edmonton, which has approved partial funding for the project (LRT Projects Information Centre pers. comm.). The proposed 27 km Valley Line will run from Mill Woods to Lewis Farms, crossing through downtown Edmonton (City of Edmonton 2013b) (Table 8A.1-5 of Appendix 8.1). Construction of the Valley Line is expected to begin in 2015, with an anticipated completion date of 2019 (LRT Projects Information Centre pers. comm.).

Concept plans have been developed for the Northeast LRT, Northwest LRT and South LRT extension projects, however, construction of these lines has not been prioritized by the City of Edmonton and funding is not currently in place for these developments. Construction timelines will depend on a number of factors including funding availability, projected ridership potentials, and current and future community growth. The City of Edmonton is committed to expanding the LRT network to five lines running to all sectors of the city by 2040 (LRT Projects Information Centre pers. comm.). These developments are, however, considered hypothetical and excluded from this cumulative effects assessment.

West of Edmonton, Highway 16 preservation and overlay activities are planned between 2013 and 2016 at selected sites between the towns of Hinton and Edson, resulting in approximately 80 km of upgrades (Alberta Transportation 2013a). Several other smaller preservation and overlay projects are planned along Highway 16 at locations between Edmonton and Hinton within the same period (Alberta Transportation 2013a), as well as Highway 22 bridge construction and highway realignment near Drayton Valley (refer to Table 8A.1-5 of Appendix 8.1 for additional details). In addition, the Parkland Airport is a proposed $35 million (Phase 1 only) development near Spruce Grove, with construction of Phase 1 conditionally planned for 2013 to 2014 and Phase 2 in 2015 or later (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a).

Utility Activities

The AltaLink Western Alberta Transmission Line Project will operate as a 500 kV high-voltage direct current overhead line extending from the Genesee area west of Edmonton to the Langdon area east of Calgary (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The transmission line is currently under construction, with an expected in-service date of spring 2015 (AltaLink 2013).

The EPCOR and AltaLink Heartland Transmission Project will operate as an overhead double circuit 500 kV transmission line, which will connect the Heartland Substation (northwest of Fort Saskatchewan) to the Ellerslie Substation in Sherwood Park (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The transmission line is currently under construction, with an expected in-service date of spring 2015 (AltaLink and EPCOR 2013).

The ATCO Electric Eastern Alberta Transmission Line Project will operate as a 500 kV high-voltage direct current overhead line extending 500 km from the Gibbons-Redwater area northeast of Edmonton to the Brooks area southeast of Calgary (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The transmission line is currently under construction, with an expected in-service date of late 2014 (ATCO Electric 2013).

The proposed ATCO Gas Urban Pipelines Replacement Project entails the construction of a new high-pressure natural gas pipeline network in the Transportation Utility/Corridor of Edmonton over a period of five years (ATCO Gas 2013). The application is currently under review by the AUC (AUC 2013b) and, pending project approval, construction of the Urban Pipelines Replacement Project is expected to be concurrent with Project construction (refer to Table 8A.1-5 of Appendix 8.1 for additional details).

Other ongoing utility activities within the RSAs include maintenance on transmission line rights-of-way and electrical facilities. http://www.auc.ab.ca/items-of-interest/Pages/default.aspx

Oil and Gas Exploration and Development Activities

Companies that have recently applied to federal and provincial authorities to construct and operate oil and gas developments within the RSAs for various elements are listed in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 and are shown on Figure 8.1-1a.

Major Developments

Enbridge Pipelines Inc. (Enbridge) is proposing to construct and operate the Edmonton to Hardisty Pipeline Project: a proposed 181 km new 914.4 mm (NPS 36) crude oil pipeline from the existing Enbridge Edmonton Terminal to the existing Enbridge Hardisty Terminal (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The proposed pipeline right-of-way will be alongside and contiguous to an existing Enbridge pipeline right-of-way and other linear disturbances for approximately 96.6% of its length. The application to the NEB is currently under review (submitted December 14, 2012) (NEB 2013c). Pending regulatory approval, the proposed pipeline is expected to be in service by early 2015 (NEB 2013c).

The proposed 38.2 km Enbridge Line 2 Replacement Project parallels the alignment of the Edmonton to Hardisty Pipeline Project (above) from the Enbridge Edmonton Terminal at NE 32-52-23 W4M to a valve located near Joseph Lake at SW 1-50-22 W4M (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). NEB approval was granted for the pipeline project on May 17, 2013 (Order XO-E101-013-2013) and construction commenced in August 2013 with an in-service date of late 2013 (NEB 2013d).

Enbridge is applying to the NEB to construct the Edmonton Terminal (South) Expansion Project (Table 8A.1-5 of Appendix 8.1). The project involves the construction and operation of several new tanks and associated facilities at the existing Enbridge Edmonton Terminal at NW 32-52-23 W4M, with transfer pipe via NE 32-52-23 W4M that integrates the new tanks to the existing terminal in SE 5-53-23 W4M. NEB approval was granted for the facility project on July 25, 2013 (Order XO-E101-017-2013) and pre-clearing activities commenced in fall 2013 with operations to begin in the first half of 2015 (NEB 2013e).

As Northern Gateway Pipelines Limited Partnership, Enbridge is also applying to the NEB to construct the Northern Gateway Project from Bruderheim, Alberta to Kitimat, BC (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). Key components of the project include: separate oil and condensate pipelines, each of about 1,172 km in length; ten pump stations; all-weather road access and electrical power infrastructure for the pump stations and the Kitimat Terminal; fourteen 78,860 m^3 (496,000 bbl) capacity tanks; a utility berth; and two marine loading and unloading berths. Pending regulatory approval, construction is anticipated to occur from 2014 to 2017 (NEB 2013f). Therefore, construction of the Northern Gateway Project is assumed to be concurrent with Project construction.

ACCESS Pipeline Inc. (ACCESS) is proposing to construct and operate the ACCESS Northeast Pipeline Expansion from the Conklin area to Redwater area (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The proposed 1,067 mm low vapour pressure bitumen blend pipeline is approximately 295 km long and will extend from a pump station near Conklin at 1-16-77-5 W4M to the existing ACCESS Sturgeon Terminal at 4-18-56-21 W4M. The application to the AER is currently under review (submitted June 15, 2012) (ERCB 2013b). Pending regulatory approval, the proposed pipeline is expected to be in-service by early 2015 (ACCESS 2013).

Grand Rapids Pipeline GP Ltd. (Grand Rapids), a subsidiary of TransCanada PipeLines Ltd. (TransCanada), is proposing to construct and operate the Grand Rapids Pipeline Project, a proposed pipeline that includes both a crude oil and a diluent line to transport volumes approximately 500 km between the producing area northwest of Fort McMurray and the Edmonton/Heartland region (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The application to the AER is currently under review (submitted May 23, 2013) (ERCB 2013c). Pending regulatory approval, construction is expected to commence in summer 2014, with an expected in-service date of early 2017 (TransCanada 2013a). Therefore, construction of the Grand Rapids Pipeline Project is assumed to be concurrent with Project construction.

Heartland Pipeline GP Ltd. and TC Terminals GP Ltd., subsidiaries of TransCanada, are proposing to construct and operate the Heartland Pipeline and TC Terminals Projects (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The development is split into two separate projects. The first project is a proposed

914 mm OD (36 inch) crude oil pipeline of extending approximately 200 km from 13 km northeast of Fort Saskatchewan to 7 km south of Hardisty, also entailing the construction of two pump stations. The second is a proposed tank storage facility near Fort Saskatchewan at SW/SE 28-55-21 W4M. The project is currently in the pre-application stage (AER filing planned for Q3 2013), with construction expected to commence from summer 2014 to early 2015 (TransCanada 2013b).

Enhance Energy Inc. has received regulatory approval to build the Alberta Carbon Trunk Line (AEAE 2013). The proposed route for the carbon capture and storage project begins near Fort Saskatchewan, Alberta and ends southeast of Lacombe, Alberta (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). Construction of the facilities associated with the Alberta Carbon Trunk Line began in 2012 and the pipeline is set to begin construction in 2013 with completion of the project expected by the end of 2013.

Enbridge Pipelines (Woodlands) Inc. is proposing to construct and operate the Woodland Pipeline Extension Project, which entails construction and operation of two pump stations and a pipeline that would transport diluted bitumen from Enbridge Pipelines (Athabasca) Inc.'s existing Cheecham terminal, located at 7-8-84-6 W4M in Fort McMurray, Alberta, to Enbridge's existing Edmonton terminal, located at 5-4-53-23 W4M in Sherwood Park, Alberta (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The proposed pipeline route generally parallels several existing pipelines and is approximately 385 km in length (Enbridge 2012). The Woodland Pipeline Extension Project was approved by the ERCB on August 30, 2012 (ERCB 2012). The construction schedule was revised and the anticipated start date is not known, however, operation is scheduled for 2015 (Enbridge 2012).

Shell Canada Ltd. (Shell) is proposing to construct and operate the Quest Carbon Capture and Storage Project, which entails construction of facilities for the capture of 1.2 megatonnes of CO_2 per year at the existing Shell Scotford Upgrader at 12-32-55-21 W4M; construction of an 80 km pipeline to transport dense-phase CO_2 from the Scotford Upgrader to the sequestration site located north of the County of Thorhild at 15-29-60-21 W4M; and construction of three to eight CO_2 injection wells connected to the main pipeline by laterals, each of which would be less than 15 km long (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The Quest Carbon Capture and Storage Project was approved by the ERCB on July 10, 2012 and is anticipated to enter operation during 2015 (Shell 2013).

Inter Pipeline Ltd. (Inter Pipeline) is proposing to construct and operate the Polaris Expansion Project – Edmonton Extension from Lamont to Sherwood Park (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The project consists of the installation of approximately 50 km of 24-inch diluent pipeline and facilities from Edmonton area diluent receipt points to the Polaris Lamont Pump Station. The new pipeline will provide 111,290 m^3/d (700,000 bbl/d) of diluent supply capacity to the Lamont Station. The project is currently in the proposal stage, with construction expected to commence from 2013 to 2016 (Inter Pipeline 2012).

Plains is proposing to construct and operate the Western Reach Pipeline System from Gordondale to Fort Saskatchewan (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1a). The project entails construction of a dual 570 km pipeline system originating in the Gordondale area to meet the transportation and processing demands of producers drilling in the Deep Basin. The project is currently in pre-application stages and, pending regulatory approval, is expected to be in-service by late 2015 (Plains 2013).

Trans Mountain is currently in the process of constructing the Edmonton Terminal Expansion Project, which involves constructing 10 new tanks and associated facilities at the Edmonton Terminal. This project was approved by the NEB in March 2008 and is now being constructed under Amending Order AO-005-XO-T246-04-2008. In February 2013, Trans Mountain applied to the NEB to vary Amending Order AO-005-XO-T246-04-2008 to permit construction of 4 additional tanks at the Edmonton Terminal for a total of 14 tanks. The NEB issued an Amending Order AO-006-XO-T246-04-2008 on June 20, 2013 and the 4 additional tanks are expected to come into service by late 2014.

Sasol Canada Holdings Ltd. (Sasol) is proposing to construct and operate the Natural Gas to Liquid Fuel Plant in Edmonton, which is a gas to liquid conversion facility. The approximately $8 billion development would create more than 500 new, permanent skilled jobs once in operation and employ over 5,000 other individuals during peak construction periods. The project is currently in the pre-application stages. Pending approval, the anticipated in-service date is late 2015 (Sasol 2012).

Minor Developments

The aforementioned oil and gas developments are considered to be major capital projects. In addition to these, however, there are numerous smaller oil and gas developments, including pipelines, facilities and wells, within the RSAs for various elements (ERCB 2013a, IHS 2013a,b,c) (Tables 8A.1-2 to 8A.1-4 of Appendix 8.1 and Figure 8.1-1a). Although the development schedules for these developments are unknown, given the limited scope and short anticipated construction times, for the purposes of the cumulative effects assessment, it was assumed that these developments would be constructed prior to construction of the Project.

Additional activities in the various RSAs not listed in Appendix 8.1 may include ongoing oil and gas exploration as well as regular pipeline and facility upgrades and maintenance activities.

Mineral Resources

Within the various RSAs, two proposed coal mine developments have been identified with project applications currently under regulatory review by the AER.

The Coal Valley Resources Inc. Robb Trend Project is a proposed extension to the existing mining and coal processing activities at Coal Valley Mine, approximately 40 km southeast of Hinton. The development is located adjacent to existing mining operations, and will yield approximately 88.75 million clean metric tonnes of coal available for sale. This additional tonnage would provide Coal Valley Resources Inc. with the necessary resources to operate until 2038. The proposed development application was submitted to ERCB in April 2012 and is currently under review. Pending regulatory approval, construction and operation will occur in stages, with construction of Stages 1A and 1B occurring from late 2013 to 2017 and initial operations anticipated to commence in late 2014 (AESRD 2013). Consequently, construction of the Robb Trend Project is assumed to be concurrent with Project construction.

The proposed Coalspur Mines Ltd. (Coalspur) Vista Coal Mine Project (Vista Project) will develop 5 million clean tonnes per year of moderately low-rank bituminous coal, suited for thermal electric generation. The proposed mine is approximately 10 km east of the Hinton town boundary and extends southeast for approximately 12 km to the McLeod River valley. The proposed development will involve construction of a surface coal mine including pits, external waste rock dumps and a full range of surface coal mining and support equipment and infrastructure. A load-out facility will load coal into rail cars on a siding that will be constructed, owned and operated by CN Rail. Projected labour requirements include approximately 700 person-years of construction and approximately 510 full-time positions during operation. The proposed development application was submitted to ERCB in May 2012 and is currently under review (AESRD 2013). Pending regulatory approval, construction will occur in stages, and is expected to start in 2014. Initial operations are anticipated to commence in 2015. Although operations will commence prior to Project construction, construction activities are expected to be ongoing and, therefore, construction of the Vista Project is assumed to be concurrent with Project construction.

Both the Robb Trend and Vista coal mine projects are listed in Table 8A.1-1 of Appendix 8.1 and shown on Figure 8.1-1a.

8.1.4.2 British Columbia (Alberta/BC Border to Westridge Marine Terminal)

Agriculture and Livestock Grazing

Within interior BC, there is increasing awareness of the importance and vulnerability of agricultural lands, as reflected in the recent amendment to the Thompson-Nicola Regional Growth Strategy, which is to provide support for the preservation of agricultural lands and local food production (TNRD 2013).

ALR-designated lands in southwest BC, particularly those west of the City of Abbotsford, are under encroachment from urban expansion and other non-agricultural uses (Condon and Mullinix 2009). The need to protect the over 50,000 ha of agricultural lands in Metro Vancouver is considered an important challenge moving into the future (Metro Vancouver 2011). In an effort to address this important issue, the Township of Langley and cities of Surrey, Abbotsford and Chilliwack have endeavoured to develop agricultural plans to guide agricultural practices into the future. Some of the key objectives, strategies and/or goals of Surrey's Agriculture Protection and Enhancement Strategy, the Township of Langley's

Draft Agricultural Viability Strategy, Abbotsford's Agriculture Strategy and Chilliwack's Agricultural Area Plan are to enhance opportunities for agricultural enterprise; encourage agricultural use, conservation and environmentally responsible practices; and invest in agricultural services and infrastructure (City of Abbotsford 2011, City of Chilliwack 2012, City of Surrey 2013b, Township of Langley 2013).

As an increasingly valued resource, agriculture and related activities within the RSAs of various elements are expected to continue strongly into the future and will act cumulatively with the Project. However, no specific future developments such as meat packing plants or greenhouses have been identified.

Forestry Activities

Future forestry activities within the RSAs are generally limited to timber harvesting within RSAs along the proposed pipeline corridor within the Fraser-Fort George/Thompson-Nicola and Fraser Valley regions.

Over the last decade, AAC for beetle-affected TSAs was increased as part of a provincial action plan to manage the mountain pine beetle infestation (BC Ministry of Forests 2004). For example, in 2011 approximately 63%, 52% and 75% of timber harvested in the Robson Valley, Kamloops and Merritt TSAs was pine, when pine stands only account for 13%, 30% and 58% of the timber harvesting land base, respectively (BC MFLNRO 2012a,b,c). However, harvest patterns are expected to change over the coming years, as the mountain pine beetle infestation is considered to have mostly run its course; as a result, the Province is working to update its forest inventory and reforestation plans (BC MFLNRO 2012d).

The latest provincial-level mountain pine beetle model for the Robson Valley RSA suggests that mortality is projected to end in 2017 with a cumulative total (TSA and community forests) dead pine volume of 3.2 million m^3. Future harvest rates and locations are difficult to predict. The Robson Valley TSA is currently undergoing a formal timber supply review process that is expected to be complete with a new AAC determination in late 2013 (BC MFLNRO 2012a).

The timber supply review analysis indicates the timber supply in the Kamloops TSA is expected to decline from an AAC of 4 million m^3 to 1.82 million m^3 for an estimated 80 years, preceded by a step down in 2012 to 2.5 million m^3 over the first 5 years (BC MFLNRO 2012b). Since actual harvest levels have not approached the AAC, the impact of maintaining a high AAC on timber supply is uncertain. Furthermore, current forecasts of the mountain pine beetle infestation are less severe. Original predictions were for a 78% cumulative kill of pine by 2017, whereas current projections are 51% by 2022 (BC MFLNRO 2012b). A decrease from the current harvest level of 2.5 million m^3 to 1.82 million m^3 will result in a reduction of approximately 948 person-years of total employment within the TSA (BC MFLNRO 2012b). Considerable reductions in the AAC uplift that was adjusted to address the mountain pine beetle infestation could reduce current regional milling output (BC MFLNRO 2012b).

A recent timber supply forecast demonstrated that timber supply in the Merritt TSA is projected to decline by 39%, from 2.4 million m^3 a year to 1.47 million m^3, which will be implemented over several decades of gradual reductions. Similar to the Kamloops TSA, if the volume cannot be replaced from other sources, reductions in the AAC uplift that was adjusted to address the mountain pine beetle infestation could reduce current regional milling output (BC MFLNRO 2012c).

Now that the mountain pine beetle infestation has mostly run its course, many beetle-affected TSAs are entering a recovery period and it is difficult to predict what future harvest activities will be. Based on reduced AAC rates, it could be inferred that forest harvesting activities in many RSAs will decrease to some degree compared to recent levels. However, other types of forestry activities may be on the rise as BC MFLNRO begins to concentrate greater efforts on reforestation, fuel management and intensive and innovative silviculture (BC MFLNRO 2012d).

Public, Tourism, Arts and Recreation Development and Activities

The BC Major Projects Inventory (BC MJTST 2012) provides an information source from which future public, tourism, arts and recreation-based developments are identified in the various RSAs. Details are variable for any given development, as such, it is difficult to determine how likely "proposed" developments are to proceed without confirmation from other publicly available information. Most public, tourism, arts and recreational-based future developments are located in the LMDA, which is shown on Figure 8.1-1c.

Public, tourism, arts and recreational-based future developments currently under construction or proposed are provided in Table 8A.1-6 of Appendix 8.1 and, in the Lower Mainland, include heath care facilities, such as the BC Children's and Women's Hospital Expansion and Surrey Memorial Hospital Emergency Department and Critical Care Tower; recreation and entertainment facilities, including the Pacific National Exhibition Expansion, Vancouver Aquarium Revitalization and Expansion Project and the Casino, Hotel and Convention Centre; arts facilities, including relocation of the Vancouver Art Gallery; and the Surrey City Hall and Civic Facility.

Various elementary, secondary and post-secondary institution capital projects, including expansions, upgrades and new developments, are proposed in the Lower Mainland (BC MJTST 2012). Notable developments for post-secondary institutions are provided in Table 8A.1-6 of Appendix 8.1 and include Great Northern Way Campus Expansion; Simon Fraser University Student Union Building and Stadium; and UBC Student Union Building.

Public, tourism, art and recreational-based future developments identified outside of the Lower Mainland include a new clinical services building, parking and site infrastructure upgrading at the Royal Inland Hospital in Kamloops; and a Faculty of Law Building at Thompson Rivers University in Kamloops.

Many of these developments will be in-service prior to 2016 and, therefore, will not occur concurrently with construction of the Project. Notable exceptions include:

- the Simon Fraser University Student Union Building and Stadium: construction of a 9,290 m^2 student union building and 2,500 seat outdoor stadium from 2013 to 2017 (Table 8A.1-6 of Appendix 8.1);
- BC Children's and Women's Hospital Expansion: redevelopment of the BC Children's and Women's Hospital to create a state of the art facility for pediatric care and research, which is currently under construction with an expected in-service date of 2018 (Table 8A.1-6 of Appendix 8.1); and
- the Great Northern Way Campus Expansion: construction of a state-of-the-art Emily Carr visual, media and design art facility that would accommodate up to 1,800 students, which is currently under construction with an expected in-service date of July 2016 (Table 8A.1-6 of Appendix 8.1).

Several developments were identified in the various RSAs in early development stages, or appeared to be inactive or on hold, including Westscapes Development Inc. Coquihalla Pass Resort Development Project, Fraser Health Royal Columbian Hospital Expansion, and Valemount Glacier Destinations Ltd. Valemount Glacier Destination Resort. These developments are considered to be hypothetical and are, therefore, excluded from the cumulative effects assessment.

Rural and Urban Residential and Commercial Development

The populations of many communities in the various RSAs will continue growing into the immediate future, with particularly strong growth projected for communities in the Fraser Valley and Metro Vancouver regions (refer to Section 5.3 and the Socio-Economic Technical Report [Volume 5D] for additional information).

Residential and commercial developments over $200 million that are either proposed or under construction in the Lower Mainland under the BC Major Projects Inventory include:

- 208 Street Residential Neighbourhood – Langley ($250 million) (proposed);
- Mission Waterfront Project – Mission ($1.5 billion) (proposed);
- Delsom Estates Residential Development – Delta ($250 million) (proposed);
- Silverdale Hill Housing Development – Mission ($400 million) (proposed);
- Waterfront Development Complex – New Westminster ($300 million) (proposed);
- Concord Gardens Residential Development – Richmond ($350 million) (proposed);

- River Green Residential Development – Richmond ($500 million) (construction started – summer 2010 to 2022);
- Holland Pointe Residential Development – Surrey ($200 million) (proposed);
- King George Commercial/Residential Development – Surrey ($1.6 billion) (proposed);
- Urban Village Condominium Development – Surrey ($1 billion) (construction started – complete by 2013);
- Quattro Residential Development – Surrey ($625 million) (construction started – completion date unknown);
- Central City Neighbourhood – Surrey ($1 billion) (construction started – completion date unknown);
- Guildford Town Centre Expansion – Surrey ($280 million) (construction started – May 2010 to fall 2015);
- Tsawwassen Springs Development – Tsawwassen ($400 million) (construction started – spring 2010 to 2016);
- the Exchange Office Tower – Vancouver ($200 million) (proposed);
- Burrard Gateway Mixed Use Development: Hornby and Drake Street – Vancouver ($500 million) (proposed);
- Oakridge Centre Redevelopment – Vancouver ($700 million) (proposed);
- Cambieplace Condominiums – Vancouver ($200 million) (proposed);
- Supportive Housing – Vancouver ($225 million) (proposed);
- South Burrard Development – Vancouver ($1 billion) (proposed);
- Little Mountain Housing Redevelopment – Vancouver ($300 million) (proposed);
- Telus Garden Communications Centre – Vancouver ($750 million) (under construction – complete by May 2015);
- Hotel and Residential Development: West Georgia – Vancouver ($500 million) (proposed);
- Residential Development and Arena Complex – Vancouver ($350 million) (proposed);
- BC Social Housing Initiative – Vancouver ($205 million) (under construction – complete by 2013);
- UBC Wesbrook Place Residential Development – Vancouver ($200 million) (under construction – complete by 2015);
- UBC University Town – Vancouver ($350 million) (under construction – complete by summer 2015);
- River District Development – Vancouver ($4 billion) (under construction – complete by 2032);
- Norquay Village Neighbourhood Centre – Vancouver ($ unknown) (under construction – complete by 2030); and
- Vicarro Ranch Residential Development – Abbotsford ($560 million) (proposed).

Other proposed developments under $200 million in the RSAs include condominiums, apartments, townhouses, housing, retail outlets, malls and other commercial and residential developments in Chilliwack, Abbotsford, Surrey, Coquitlam, Burnaby, Vancouver and other municipalities of the Lower

Mainland. The identified residential and commercial developments anticipated to be in-service prior to 2016 will not occur concurrently with construction of the Project. Other proposed residential and commercial developments where schedule details are unavailable are assumed to be constructed concurrently with the Project.

Transportation and Infrastructure Development

Current and future transportation activities within the RSAs of various elements include regular and commercial vehicle traffic and rail traffic, as well as maintenance, reconstruction and upgrade activity on roads, bridges and highways, particularly within the Lower Mainland where many transportation and infrastructure developments are currently under construction and in various planning and design phases (BC MJTST 2012).

Future transportation developments currently under construction or proposed in the Lower Mainland are provided in Appendix 8.1 and include Abbotsford International Airport (YXX) and Vancouver International Airport (YVR) upgrades and expansions; the Skytrain – Evergreen Line Rapid Transit Project and Expo Line Rapid Transit Project; Gateway Project – North and South Fraser Perimeter Road Projects; bridge improvements; overpasses and underpasses; road realignments and upgrades; grade separations and improvements; Shortsea shipping projects; and demolition of the old Port Mann Bridge.

Expansion activities at YVR are currently underway and involve several phases, many of which are completed. Future planned activities include an additional terminal (by 2015) and runway (by 2023) and 14 additional gates. Upgrades are also proposed at YVR, including 700 m of corridors, moving walkways and a high-speed baggage system for the international terminal ($408 million), and upgrades to the domestic terminal ($488.7 million). Airfield improvements ($286.4 million) will include runway safety enhancements and upgrades to roads, bridges and dykes ($559.8 million). Upgrades to YVR have not commenced; however, they are anticipated to be complete by 2022. In Abbotsford, expansion of YXX will include a 1,300 m^2 passenger terminal and runway upgrades as well as a hotel and tourist-related services. The $30 million runway expansion portion of the project was completed in September 2011. Approximately 81 ha will be designated for future aerospace related developments. Expansion activities are anticipated to be completed by 2020 (BC MJTST 2012).

According to the growth forecast in the Regional Growth Strategy, Metro Vancouver is expected to continue to grow by over 35,000 residents per year. Growth without sprawl implies greater density of development, which Metro Vancouver aims to achieve, in part, through support of a compact, transit-oriented urban form supporting a range of sustainable and strategically implemented transportation choices, including expansion of the SkyTrain network (Metro Vancouver 2011).

Two large-scale SkyTrain projects are currently underway in the Lower Mainland: the Evergreen Line; and the Expo Line Upgrade Strategy. The Evergreen Line is a new rapid transit line that will connect Coquitlam to Vancouver via Port Moody and Burnaby. Construction commenced in 2012 and the new line is expected to be in-service by 2016 (BC MTI 2013a, Province of BC 2013). The Expo Line Upgrade Strategy entails doubling the capacity of the existing Expo Line and adding a proposed 6 km SkyTrain extension in the Surrey to Fleetwood Area. Construction commenced in 2008 and the project is expected to be complete by 2020 (Province of BC 2013, TransLink 2013b). Construction of both lines is expected to be concurrent with Project construction. TransLink is also considering several other large-scale projects, including the UBC Line, Surrey Line, Burnaby Mountain Gondola and Pattullo Bridge Replacement. However, both SkyTrain lines and the bridge replacement are currently in early planning and routing stages and the gondola is considered low priority; therefore, these developments are hypothetical in nature and were not included in part of this cumulative effects assessment (TransLink 2013b,c).

The Gateway Program was established by the Province of British Columbia in 2003 to improve the movement of people, goods and transit throughout Metro Vancouver by providing efficient transportation choices and better connections. Ongoing projects as part of the Gateway Program include the Port Mann Bridge/Highway 1 Improvements and the South Fraser Perimeter Road. Both developments are anticipated to be fully complete by late 2013. The Port Mann Bridge/Highway 1 Improvements project includes a new 10-lane bridge across the Fraser River between Coquitlam and Surrey, 37 km of highway widening from Vancouver to Langley, including 30 km of new high occupancy vehicle lanes, and the

replacement of nine highway interchanges (BC MTI 2013b). As part of the improvements project, a portion of the Golden Ears Connector development has the potential to act in combination with the Project to impact a City of Surrey greenbelt in the LMDA (Figure 8.1-1c and Table 8A.1-1 of Appendix 8.1). The South Fraser Perimeter Road project includes a 40 km long four-lane route along the south side of the Fraser River from Deltaport Way in southwest Delta to 176th Street (Highway 15) in Surrey, with connections to Highways 1, 15, 17, 91, 99 and TransLink (Fraser Transportation Group Partnership 2011). The North Fraser Perimeter Road project is currently in the proposal stage, and entails improved trucking and vehicle routes along an extended United Boulevard through Coquitlam along Highway 7 to the north end of the Golden Ears Bridge and along the north end of the Queensborough Bridge along Front, Columbia and Brunette in New Westminster (BC MJTST 2013).

Several Trans-Canada Highway improvement projects are either planned or underway east of the City of Kamloops, including widening Highway 1 between Monte Creek and Pritchard (construction from October 2011 to fall 2014) to four lanes; improvements to re-align and widen 3.1 km of highway to four lanes through Hoffman's Bluff (construction from 2013 to fall 2015); and improvements to widen 3 km of the Trans-Canada Highway to four lanes from Pritchard to Hoffman's Bluff (construction from spring 2013 to fall 2015) (BC MJTST 2013) (Table 8A.1-6 of Appendix 8.1). These developments are part of the Highway 1 Kamloops to Golden Project, the long-term plan of which is to upgrade the primarily two-lane highway to a modern four-lane highway (BC MTI 2013c).

Additional minor capital works in the various RSAs outside the Lower Mainland not listed in Appendix 8.1 include 42 km of Highway 5 resurfacing north of Kamloops between the Avola Overhead and the Whitewater River; a 1.78 km passing lane along Highway 5 north of Blue River; overlay paving of existing lanes and shoulders on 23 km of Highway 5 from Albreda to CN Rail Overhead; resurfacing 19 km of Highway 5 between Valemount and the Junction of Highway 16 at Tête Jaune; asphalt resurfacing of 44 km of lanes along Highway 5 south of Kamloops; asphalt surfacing with overlay along Highway 5 south of Kamloops; and resurfacing of Highway 3 from the Hope overpass to Nicolum Creek Bridge along Highway 5 (6.6 km) and mill and fill of the slow lane along Highway 3 from the Othello Interchange onward, with localized pavement repair taking place as required (BC MTI 2013d). Given the limited scope and short anticipated construction times, for the purposes of the cumulative effects assessment, it was assumed that these developments would be constructed prior to construction of the Project.

Utility, Public Works and Alternative Energy Development

Utility, public works and alternative energy future developments currently under construction or proposed are provided in Tables 8A.1-1 and 8A.1-6 of Appendix 8.1 and include: water power projects; transmission lines; electrical substations; and other developments pertaining to energy generation and waste treatment and disposal.

To be considered in this cumulative effects assessment, at a minimum, water power projects must be granted an investigative license by BC MFLNRO to commence site studies as part of the investigative phase of a proposed water power project. Approximately 20 proposed hydroelectric developments under review as of May 31, 2013 for an investigative license in the various RSAs were considered hypothetical and therefore, were not included in this cumulative effects assessment.

In total, approximately 49 proposed future water power projects (*e.g.*, run-of-river, pumped storage) were identified within the various RSAs. Future water power projects for which location and footprint details were available (either publicly available online or through direct contact with FrontCounter BC) are provided in Table 8A.1-1 of Appendix 8.1 and shown in Figures 8.1-1b and 8.1-1c. However, location and footprint details were considered insufficient for 7 of the 49 identified future water power projects and, therefore, could not be shown in Figures 8.1.1b or 8.1.1c. These water power projects are provided in Table 8A.1-6 of Appendix 8.1 and include the Princeton Energy Inc. Eureka Creek and Berkey Creek hydroelectric projects; the TransAlta Clemina Creek and Serpentine Creek hydroelectric projects; and the Innergex Renewable Energy Inc. Esme Creek Hydroelectric Project. The Clemina and Serpentine creek projects are anticipated to be in-service by summer 2014. As indicated in Table 8A.1-1 of Appendix 8.1, the construction schedule for other waterworks developments is unavailable, therefore, these projects are assumed to be concurrent with Project construction.

Of the 42 water power projects in Table 8A.1-1 of Appendix 8.1, 36 are run-of-river and 6 are pumped storage. Both development types generate power by diverting a specific volume of surface water via a penstock to a generating station, where turbines produce electricity. The electricity is then transported via a substation and transmission line to connect to the existing electrical grid. Penstocks for pumped storage projects are often trenchless (*i.e.*, drilled). Typically, run-of-river projects range in generating capacity from 1 to 20 megawatts (MW), however, three developments — the Robson Valley Hydroelectric Project, Kwoiek Creek Hydroelectric Project and Upper Pitt River Waterpower Project — will generate approximately 76.5 MW, 50 MW and 180 MW, respectively (Figures 8.1-1b and 8.1-1c).

The Holmes Hydro Inc. Robson Valley Hydroelectric Project consists of a series of 10 run-of-river plants with a total of 76.5 MW located on tributaries in the Holmes River watershed, approximately 10 km west of McBride. A License of Occupation was granted by BC MFLNRO and construction is anticipated to commence within the next year (Stanyer pers. comm.).

The Kwoiek Creek Resources and Innergex II Inc. Kwoiek Creek Water Power Project is located on the lower reaches of Kwoiek Creek, a tributary to the Fraser River approximately 22 km south of Lytton. The project will include approximately 80 km of 138 kV transmission line to the BC Hydro substation at Highland Valley. A BC EAO Amendment Certificate was issued in July 2011 and the development is anticipated to be in service by late 2013 (Province of BC 2013).

Located approximately 45 km north of Coquitlam, the proposed Run-of-river Power Inc. Upper Pitt River Waterpower Project collectively consists of eight hydroelectric projects generating a combined 180 MW on Buklin, Steve, Pinecone, Homer, East Corbold, Corbold, Boise and Shale creeks. The draft Application Terms of Reference for the project (submitted to BC EAO on February 14, 2008) was never finalized and the project is currently considered inactive by the BC EAO (Murphy pers. comm.). However, investigative use permits were recently issued by BC MFLNRO (November 19, 2012 and March 5, 2013) and, although the project is considered low priority, Run-of-river Power Inc. is continuing site studies and other preliminary planning activities for the project (Hopp pers. comm.).

The largest pumped storage hydroelectric project identified for the cumulative effects assessment is the Isabel and Pitt Lake Pumped Storage Hydroelectric Project, a pumped storage hydro power system with a capacity of approximately 225 MW on Isabel and Pitt lakes, approximately 30 km north of Maple Ridge (Figure 8.1-1c). A License for Investigative Use was issued by BC MFLNRO on October 22, 2012 (BC MFLNRO 2013b). As indicated in Table 8A.1-1 of Appendix 8.1, the construction schedule for the Isabel and Pitt Lake Pumped Storage Hydroelectric Project and many other proposed waterworks developments is unavailable, therefore, these projects are assumed to be concurrent with Project construction.

Transmission line developments in the various RSAs that could be mapped are the Interior to Lower Mainland Transmission Project and Merritt Area Transmission Project (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1c). Currently under construction, the BC Transmission Corporation Interior to Lower Mainland Transmission Project involves installation of a new 500 kV transmission line, mostly along the existing right-of-way, from the Nicola Substation near Merritt to the Meridian Substation in Coquitlam. The anticipated in-service date is January 2015 (Province of BC 2013). Also currently under construction, the BC Hydro Merritt Area Transmission Project involves the installation of a 35 km 138 kV transmission line between the Merritt and Highland substations, mostly along an existing unused BC Hydro right-of-way. The anticipated in-service date is summer 2014 (BC Hydro 2013b).

In addition, BC Hydro is proposing the Robson Valley Transmission Project, which would entail construction of a 138 kV transmission line from the existing Valemount substation to a proposed new substation in the McBride area (BC Hydro 2012). However, since this development is currently in the early planning stages it is considered hypothetical and is not included in the cumulative effects assessment.

Utility, public works and alternative energy developments currently under construction or proposed within various RSAs in the Lower Mainland that are not mapped are provided in Table 8A.1-6 of Appendix 8.1, and include the BC Hydro Big Bend Substation; UBC Biomass Heating Project; BC Hydro Burnaby to New Westminster Area Reinforcement; BC Hydro Capilano Substation Upgrade; Greater Vancouver Regional District Capilano (Cleveland) Dam Powerplant; BC Hydro Coquitlam Area Reinforcement; Greater Vancouver Regional District Iona Island Wastewater Treatment Plant Upgrades; BC Hydro Kidd 2

Substation Upgrade Project; City of North Vancouver Lions Gate Sewage Treatment Plant; BC Hydro Lynn Valley Substation Upgrade, Phase 1; Metro Vancouver Waste-to-Energy Incineration Facility; City of Surrey Organic Biofuel Facility; BC Hydro Ruskin Dam Safety and Powerhouse Upgrade; Metro Vancouver Seymour-Capilano Filtration Project; BC Hydro Silverdale Substation Project; BC Hydro Surrey Area Substation Project; and City of Surrey Waste-to-Energy Incineration Facility. Construction schedules for these developments are provided in Table 8A.1-6 of Appendix 8.1, however, developments where a schedule is unavailable are assumed to be concurrent with Project construction.

In addition, utility, public works and alternative energy developments currently under construction or proposed within various RSAs outside the Lower Mainland that could not be mapped are provided in Table 8A.1-6 of Appendix 8.1 and include the Telus Data Centre in Kamloops; the BC Hydro Seymour Arm Series (Capacitor Station 5L71/5L72 Project) in Chase; the BC Hydro Nicola 500 kV Station Reconfiguration in Merritt; the Western Bioenergy Inc. Merritt Green Energy Project; the EcoTECH Energy Group McBride Biomass Project; the City of Kamloops Sewage Treatment Centre Upgrade; and Belkorp Environmental Services' Cache Creek Landfill Extension. Construction schedules for these developments are provided in Table 8A.1-6 of Appendix 8.1, however, developments where a schedule is unavailable are assumed to be concurrent with Project construction.

Environmental conditions in the Merritt area are ideal for wind energy production. However, no reasonably foreseeable wind energy developments have been identified in the RSAs. Proposed projects are either in early planning phases, on hold or inactive, as is the case for the proposed Premier Renewable Energy Nicomen Wind Energy Project (Province of BC 2013).

Additional activities in the various RSAs not listed in Appendix 8.1 may include new transmission lines, utility lines, substations and other facilities; and upgrades and maintenance activities to existing infrastructure.

Marine and Industrial Development

As noted above, although regulation and authorization of marine transportation is not specifically within the jurisdiction of the NEB, the environmental and socio-economic effects of the increased marine traffic is considered by Trans Mountain in accordance with the NEB's direction from their List of Issues for the Project, released on July 29, 2013. As a result, Trans Mountain is participating in Transport Canada's voluntary Technical Review Process of Marine Terminal Systems and Transshipment Sites (TERMPOL) process to address the potential increase in marine traffic to offload product from the Project. As part of the TERMPOL process, information on the movements of marine vessels, including fishing vessels and forecasts of likely future marine vessel traffic (*i.e.*, reasonably foreseeable) in the Marine Transport RSA, which includes Burrard Inlet, were identified (see Volume 8C-2). Marine vessel activities applicable to this cumulative effects assessment are further discussed below.

As a result of the Project, marine vessel traffic volume calling at the Westridge Marine Terminal will increase from approximately 5 to 34 loading tankers per month. The types of tankers calling at the Westridge Marine Terminal (*i.e.*, Panamax and Aframax sized tankers) will not change as a result of the Project. In addition, the vessels calling at the Westridge Marine Terminal (after the Project is in operation) will continue to use the existing marine shipping lanes.

Projected growth rates from 2012 to 2030 of non Project-related vessel movements by vessel type (*e.g.*, tanker, cargo, tug, passenger) were calculated as part of the cumulative effects assessment for Marine Transportation (Volume 8A). Projected increases were calculated for the entire Marine Transportation RSA, from which predicted growth rates from 2012 to 2030 were roughly extrapolated for Burrard Inlet. Based on this approach, a reasonably foreseeable approximation of 288 vessels/year is anticipated by 2016 above existing 2012 levels of 6,858, and by 2030 there is estimated to be approximately 1,400 vessels/year over 2012 levels (not including Project-related marine vessel traffic) (refer to Section 4.4 of Volume 8A for additional details).

Proposed future industrial developments were identified in the various RSAs within the Lower Mainland, including shoreline developments regulated by the PMV, and are listed in Table 8A.1-6 of Appendix 8.1.

The Neptune Bulk Terminals Ltd. Coal Handling Infrastructure Upgrade and Expansion entails expansion of metallurgical coal handling systems at an existing terminal at North Vancouver to increase throughput

and improve coal handling operations. The project involves the construction of a second railcar dumper at the existing terminal, a conveyor to transport coal from the new dumper to the storage area, replacement of a shiploader boom, and reinforcement of a berth foundation. The new rail dumper will have a floor area of 420 m^2 and a height of 12 m and will be built within the existing terminal footprint. The Neptune Terminal is located at 1001 Low Level Road, North Vancouver, in the Inner Harbour of Burrard Inlet. This development will not involve any in-water works. The increased vessel traffic from the project is expected to be approximately one additional vessel per week. Construction is currently underway and the expected in-service date is November 2014 (PMV 2013c).

The Richardson International Ltd. Grain Storage Capacity project includes installation of approximately 494 open-ended steel wall piles and 315 timber piles, and construction of two 40,000 metric tonne concrete storage annexes at the existing facility. The new infrastructure will have a floor area of 4,550 m^2 and a height of 55 m, and will be built adjacent to the existing grain storage facility located at 375 Low Level Road, North Vancouver, in the Inner Harbour of Burrard Inlet. This development will not involve any in-water works. Construction is currently underway and the expected in-service date is early 2015 (PMV 2013d).

As part of an initiative of the Canadian Government to build new ships for the Royal Canadian Navy and Canadian Coast Guard, construction of the Seaspan ULC (Seaspan) Vancouver Shipyard Improvements project in Seaspan's Vancouver shipyard located at 10 Pemberton Avenue in North Vancouver (Burrard Inlet) is underway. This project includes construction of several buildings, offices, cranes and other infrastructure, as well as the installation of state-of-the-art equipment (Seaspan 2013). Additional proposed works under the PMV permit review process for the shipyard modernization include construction of a 32 m wide x 50 m long concrete load-out pier with a marine footprint of approximately 1,720 m^2. The pier will be constructed within Seaspan's water lot lease located on the north shore of the Inner Harbour of Burrard Inlet. Physical works required to construct the pier include: removal of existing concrete ways; installation of temporary containment sheetpile walls; excavation (dredging) within the sheetpile walls; densification of the seabed within the load-out pier footprint (includes installation of timber piles); installation of concrete caissons and infilling; and removal of the temporary sheetpile walls. Dredge material may be disposed of on-land or at sea depending on the results of contaminant analysis. Construction is currently underway and the project is expected to be in service by early 2015 (PMV 2013e).

The proposed Fraser Surrey Docks Direct Transfer Coal Facility in Surrey entails the development of a direct transfer coal facility at the southwest end of the existing terminal to handle up to 4 million metric tonnes of coal per year. The coal will be transferred by rail to the terminal and will be loaded onto barges at an existing berth. When loaded, tugs will take single barges down to the mouth of the Fraser River. Once barges pass Sand Heads, they will be towed in tandem to Texada Island. From there the coal will be stored before transferring it to a deep-sea vessel for overseas export. The project application is currently under review. Pending regulatory approval, the facility is expected to be operational some time in 2014 (PMV 2013f).

The proposed Lehigh Hanson Materials Ltd. South Richmond Terminal Project entails the development of an aggregate (sand and gravel) processing and distribution facility on leased property owned by the PMV in southeast Richmond. Components include a wash plant, aggregate material stockpiles, reclaimer, rail and truck loading facilities and two marine berths for loading and unloading barges. Several years of site preparation will be required to achieve the necessary ground settlement across the site prior to construction of the facility, which is expected to begin in 2018. Pending regulatory approval, construction is expected to commence from 2014 to 2022 (PMV 2013g).

The PMV is proposing to construct and operate the Roberts Bank Terminal 2 Expansion Project. In 2011, the PMV moved 2.5 million twenty-foot equivalent unit (TEUs) containers, and forecasts suggest that container traffic is expected to double over the next 10 to 15 years and triple by 2030. The proposed new multi-berth container terminal at Roberts Bank in Delta would provide 2.4 million TEUs of container capacity. The project is part of PMV's Container Capacity Improvement Program, a long-term strategy to deliver projects to meet anticipated growth in demand for container capacity to 2030. The project is currently in the pre-application phase (field studies are currently underway), with construction anticipated from 2017/2018 to 2024 (PMV 2013h).

Several industrial parks are either proposed or under construction in the Lower Mainland. In fall 2012, construction began on the Maple Ridge Industrial Park, which entails development of 81 ha of land on 203rd Street in Maple Ridge for an industrial park, community garden, park space, trails and community amenities (BC MJTST 2012).

Oil and Gas Exploration and Development Activities

FortisBC is proposing to construct and operate the Kingsvale – Oliver Natural Gas Pipeline Reinforcement Project, which entails looping the existing FortisBC pipeline system between Kingsvale, BC and Oliver, BC over a length of approximately 161 km, as well as a 1 km pipeline extension near Yahk and the addition of compression facilities at Kingsvale, Trail and Yahk (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1c). The project is currently in the pre-application phase, having received BC EAO approval of final Application Information Requirements on December 5, 2012. Pending approval, clearing and construction is anticipated to occur from Q4 2015 to Q4 2016 (Province of BC 2013). Therefore, construction of the Kingsvale – Oliver Natural Gas Pipeline Reinforcement Project is expected to be concurrent with Project construction.

Vancouver Airport Fuel Facilities Corp. is proposing to construct and operate the Vancouver Airport Fuel Delivery Project marine terminal expansion in Richmond along the south arm of the Fraser River, a fuel receiving and storage facility near the marine terminal and a new jet fuel delivery pipeline to YVR (Table 8A.1-6 of Appendix 8.1). The project application is currently under review by the BC EAO. Should approval be granted, construction is estimated to occur over a 24-month period. Since the construction schedule could not be determined, construction of the Vancouver Airport Fuel Delivery Project is assumed to be concurrent with Project construction (Province of BC 2013).

Additional activities in the various RSAs not listed in Appendix 8.1 may include regular pipeline and facility upgrades and maintenance activities.

Mineral Resources

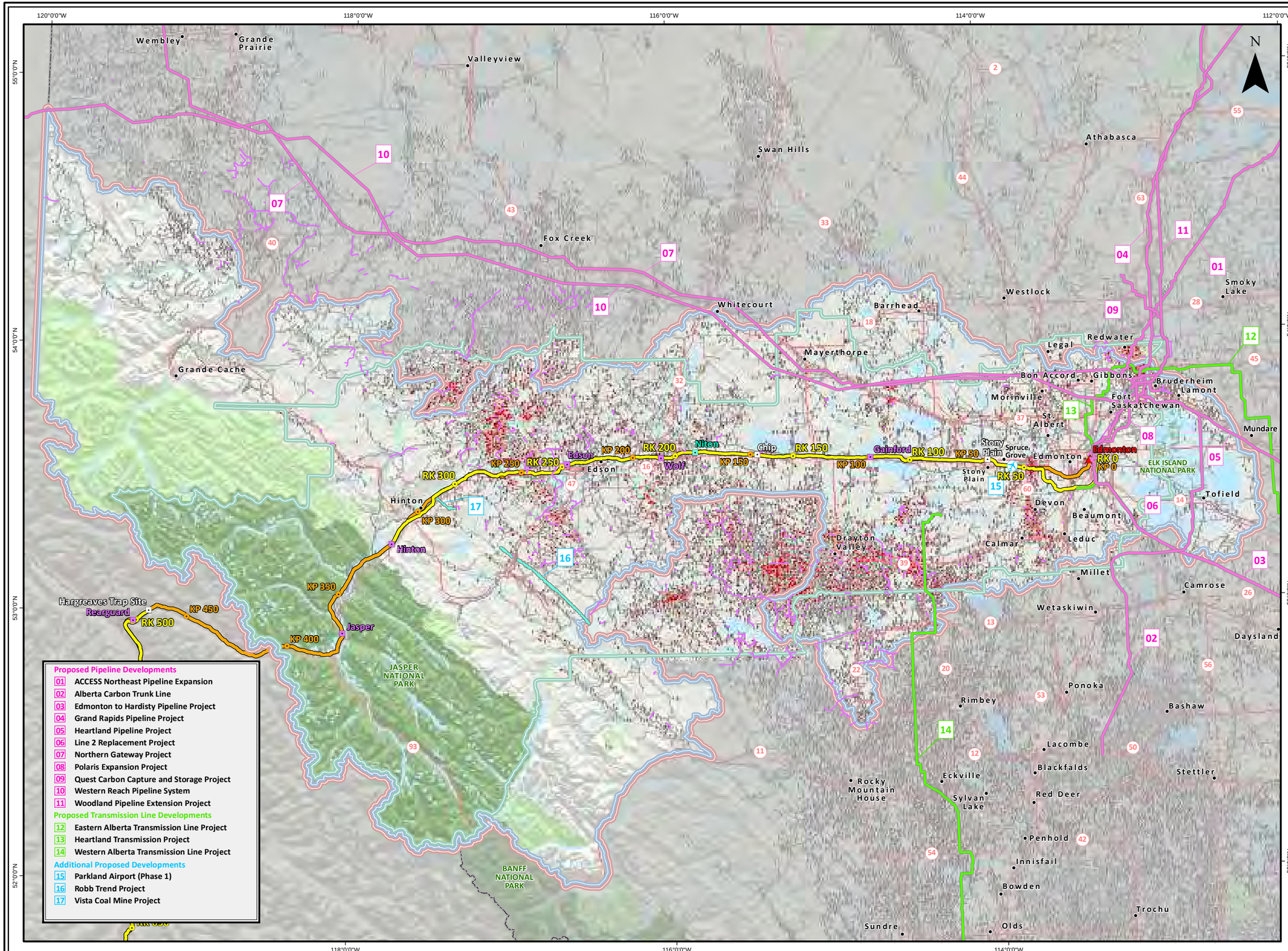
KGHM Ajax Mining Inc. (Ajax) proposes to develop the Ajax Copper/Gold Project (Ajax Project), a new open-pit copper and gold mine near Kamloops with a production capacity of 21.9 million tonnes of ore per year (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1c). The mine's life expectancy is 23 years. The development area is partially within southwest city limits. Project application review will be conducted collaboratively between BC EAO and the CEA Agency. The project is currently in the pre-application stage (Ajax submitted draft Application Information Requirements to BC EAO on January 11, 2012). Pending approval, construction is expected to commence in 2014, with production beginning by 2016 (Province of BC 2013). Therefore, construction of the Ajax Project is assumed to be concurrent with Project construction.

Yellowhead Mining Inc. proposes to develop the Harper Creek Copper-Gold-Silver Project approximately 10 km south of Vavenby (Table 8A.1-1 of Appendix 8.1 and Figure 8.1-1b). This is a proposed open-pit mine with a 28-year mine life based on throughput of 70,000 tonnes/day. Additional infrastructure includes transmission lines, access roads, facilities and storage areas. The mining development is currently moving forward with pre-application activities (final Application Information Requirements submitted to BC EAO on October 21, 2011), including public and stakeholder consultation as well as biophysical and socio-economic studies. Pending regulatory approval, the mine will be constructed over a period of 18 to 24 months, with production expected to begin in late 2016. Therefore, construction of the Harper Creek Copper-Gold-Silver Project is assumed to be concurrent with Project construction.

Construction is currently underway on Teck's $465 million Highland Valley Copper Modernization project, with the objective of extending the life of the mill and increasing mill capacity (BC MJTST 2012) (Table 8A.1-6 of Appendix 8.1). By mid-2013, an estimated 700 full-time equivalent positions will be required for construction of the new mill (Kamloops Daily News 2013). The modernization project is expected to be complete by late 2013 (BC MJTST 2012).

Several mining developments were identified in the various RSAs in either early development stages (*e.g.*, exploration phase), inactive or on hold, including the proposed Imperial Metals Corp. Ruddock Creek Zinc-Lead Mine Development Project near Avola; the proposed Discover Corp. Enterprises Inc. Galaxy Mine near Kamloops; the proposed Strongbow Exploration Inc. Shovelnose Mine near Merritt; the

Gold Mountain Mining Corp. Elk Gold Mine near Merritt; the proposed New Carolin Gold Corp. Ladner Gold Project near Hope; the proposed North Pacific Alloys Ltd. Cogburn Magnesium Project near Hope; and the proposed Qualark Resources Inc. Hillsbar Aggregate Quarrying Project near Yale. These mining developments are considered to be hypothetical and, therefore, are excluded from the cumulative effects assessment.



TRANS MOUNTAIN

FIGURE 8.1-1a

REASONABLY FORESEEABLE DEVELOPMENTS

TRANS MOUNTAIN EXPANSION PROJECT

- City / Town
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- Pump Station (Reactivated)
- Existing Pump Station
- Other Existing Facility
- Road
- Railway
- Other Existing Pipeline
- National Park
- Provincial Park
- Natural Area / Provincial Recreation Area / Wilderness Provincial Park
- Provincial Boundary

Minor Proposed Oil and Gas Developments

- Proposed Facility
- Proposed Well Site
- Proposed Pipeline

Major Proposed Developments

- Proposed Airport
- Proposed Pipeline
- Proposed Transmission Line
- Proposed Mine Site

Local and Regional Study Areas

- RSA - HORU
- RSA - Socio-Economic
- RSA - TLRU

Projection: UTM Zone 11N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., ESRI, 2005; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011; First Nation Lands: Government of Canada, 2012, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

tera ENVIRONMENTAL CONSULTANTS

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER		PAGE
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DRAWN: AJS	CHECKED: TGG	DESIGN: TGG

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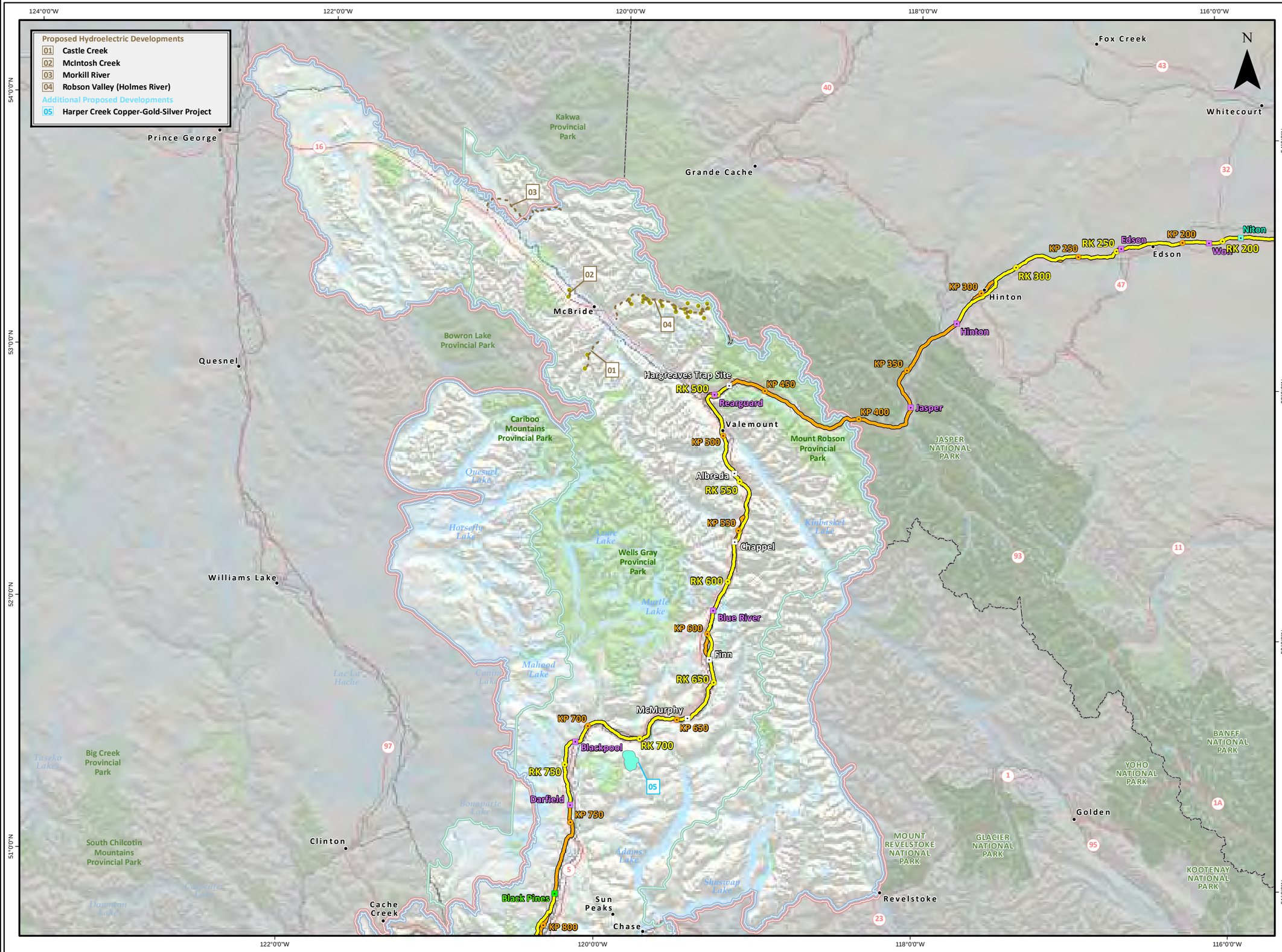

TRANS MOUNTAIN

FIGURE 8.1-1b

REASONABLY FORESEEABLE DEVELOPMENTS

TRANS MOUNTAIN EXPANSION PROJECT

- City / Town
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Pump Station (Reactivated)
- Existing Pump Station
- Other Existing Facility
- Road
- Railway
- Other Existing Pipeline
- National Park
- Provincial Park
- Natural Area / Provincial Recreation Area / Wilderness Provincial Park
- Provincial Boundary

Hydroelectric Developments

- Hydroelectric Point Features (i.e. intakes, dams, staging/laydown areas and/or powerhouses)
- Hydroelectric Linear Features (i.e. access roads, penstocks and/or transmission lines)

Major Proposed Developments

- Proposed Pipeline
- Proposed Transmission Line
- Proposed Mine Site

Regional Study Areas

- RSA - HORU
- RSA - Socio-Economic
- RSA - TLRU

Projection: UTM Zone 11N.Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., ESRI, 2005; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011; First Nation Lands: Government of Canada, 2012, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: ESRI, 2009.

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Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

MAP NUMBER		PAGE
201309_MAP_TERA_CEA_00408_REV0_02		SHEET 2 OF 3
DATE	TERA REF.	REVISION
December 2013	7894	0
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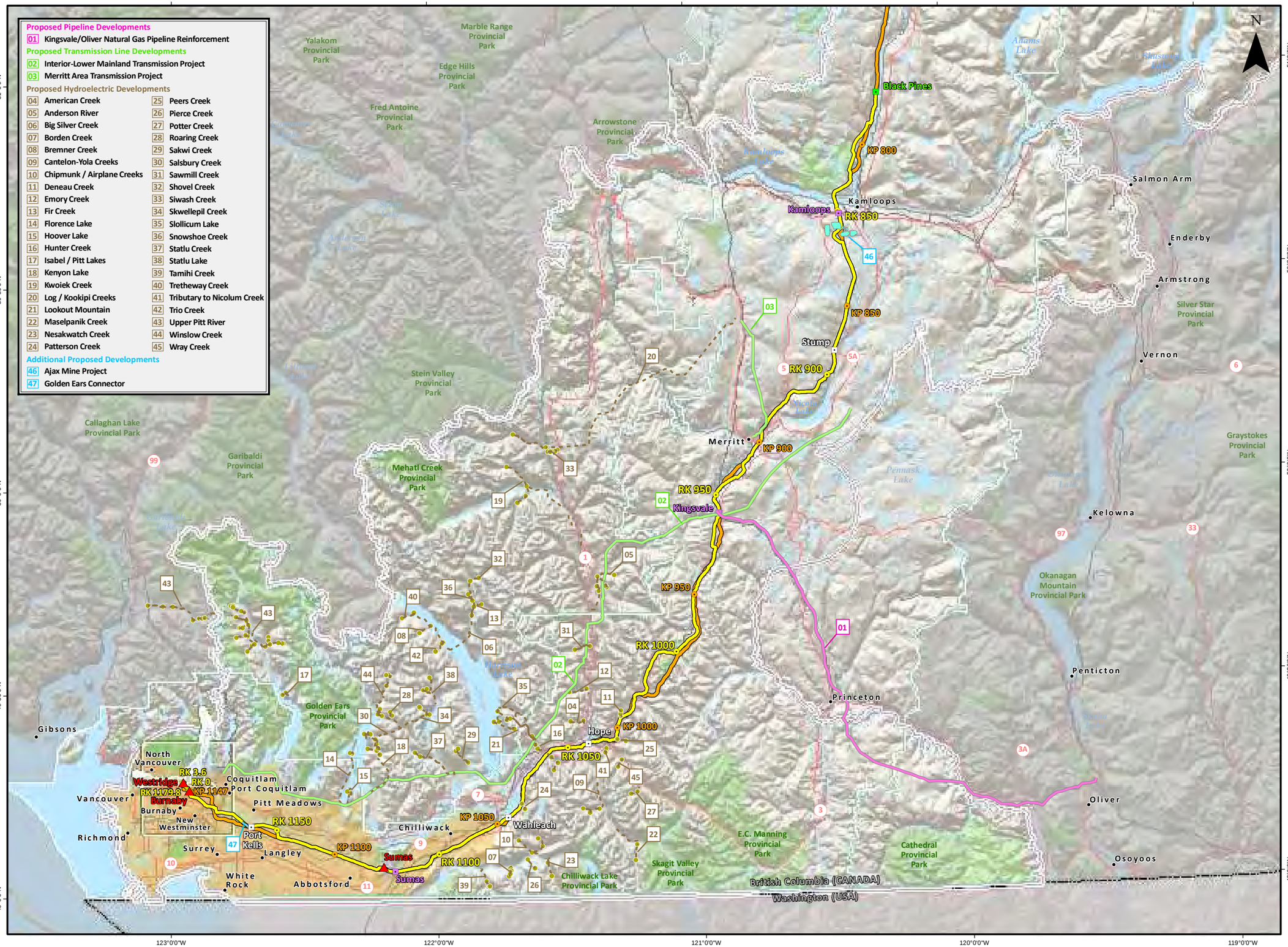

TRANS MOUNTAIN

FIGURE 8.1-1c

REASONABLY FORESEEABLE DEVELOPMENTS

TRANS MOUNTAIN EXPANSION PROJECT

- City / Town
- Kilometre Post (KP)
- Reference Kilometre Post (RK)
- Trans Mountain Pipeline (TMPL)
- Trans Mountain Expansion Project Proposed Pipeline Corridor
- Terminal
- Pump Station (Pump Additions, Station Modifications and/or Scraper Facilities)
- New Pump Station (Proposed)
- Existing Pump Station
- Other Existing Facility
- Road
- Railway
- Other Existing Pipeline
- LMDA
- National Park
- Provincial Park
- Natural Area / Provincial Recreation Area / Wilderness Provincial Park
- International Boundary

Hydroelectric Developments

- Hydroelectric Point Features (i.e. intakes, dams, staging/laydown areas and/or powerhouses)
- Hydroelectric Linear Features (i.e. access roads, penstocks and/or transmission lines)

Major Proposed Developments

- Proposed Pipeline
- Proposed Transmission Line
- Proposed Road
- Proposed Mine Site

Local and Regional Study Areas

- RSA - HORU
- RSA - Marine HORU
- RSA - Marine TLRU
- RSA - Socio-Economic
- RSA - TLRU

Projection: UTM Zone 10N. Routing: Baseline TMPL & Facilities: provided by KMC, 2012; Proposed Pipeline Corridor V6: provided by UPI, Aug. 23, 2013; Transportation: IHS Inc., ESRI, 2005; Geopolitical Boundaries: Natural Resources Canada, 2003, AltaLIS, 2012, IHS Inc., 2011; First Nation Lands: Government of Canada, 2012, AltaLIS, 2010 & IHS Inc., 2011; Hydrology: Natural Resources Canada, 2007 & BC Crown Registry and Geographic Base Branch, 2008; Parks and Protected Areas: Natural Resources Canada, 2012, AltaLIS, 2012 & BC FLNRO, 2008; ATS Grid: AltaLIS, 2009; Canadian Hillshade: TERA Environmental Consultants, 2008; US Hillshade: Copyright:© 2013 Esri.

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MAP NUMBER: 201309_MAP_TERA_CEA_00408_REV0_03A		PAGE: SHEET 3 OF 3
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SCALE: 1:1,000,000	PAGE SIZE: 11x17	DISCIPLINE: CEA
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8.1.5 Identify Potential Cumulative Effects

The Project's contribution to potential cumulative effects depends on many factors, including:

- the source of the disturbance;
- spatial and temporal boundaries;
- resilience of the receiving environment; and
- the way in which disturbances interact in time and space.

The level of detail provided in the analysis reflects the extent to which a cumulative effect on a socio-economic element is probable, the likely scale or magnitude of effect, as well as the extent to which these effects can be accurately and reasonably identified and described relative to the receiving environment.

Potential residual effects were assessed qualitatively due to a lack of detailed information on reasonably foreseeable developments and the lack of accepted cause-and-effect relationships and cumulative effects models for socio-economic issues and indicators (Mitchell and Parkins 2011) (refer to Section 8.3).

8.1.6 Mitigation Measures

Best management practices implemented to mitigate project-specific effects often limit the potential cumulative environmental effects (Finley and Revel 2002). The goal of mitigation is to attempt to avoid or reduce adverse effects to acceptable or non-significant levels. Mitigation measures are implemented to reduce the impact of any residual effects which may occur, including reducing the magnitude of the effect, limiting the extent of the effect and shortening the reversibility of the effect (*i.e.*, allowing time to alleviate the residual effect).

In order to ensure that potential cumulative socio-economic effects are reduced during Project construction and/or operation, additional mitigation measures beyond those listed in Section 7.0 are provided, where warranted.

8.1.7 Determination of Significance

The overall cumulative effects on an element and the Project's contribution to these cumulative effects (*i.e.*, cumulative effects of the Project) are described for each applicable element or indicator. The significance of the Project's contribution to cumulative effects is determined in a manner similar to that used to determine the significance of Project-related residual effects as previously outlined in Section 7.1.7 and summarized in Table 7.1-2, with the exception of spatial and temporal boundaries, which are discussed in Sections 7.2 to 7.7.

All significance assessment criteria (*e.g.*, temporal context, magnitude, etc.) listed in Table 7.1-2 apply to cumulative effects and are considered by the assessment team for each cumulative socio-economic effect.

8.1.8 Cumulative Effects Assessment

Socio-economic effects in which adverse residual effects are predicted, and are analyzed in the cumulative effects assessment, are: traditional land use and resource use (TLRU) and traditional marine resource use (TMRU); social and cultural well-being; HORU; infrastructure and services; community health; and human health risk assessment (HHRA).

The following subsections identify potential and likely residual effects associated with the construction and operation of the Project on each element. Existing activities or reasonably foreseeable developments acting in combination with the Project are also identified, as well as the cumulative effect and, if warranted, any additional mitigation measures.

Community knowledge and traditional ecological knowledge (TEK) can provide valuable insight into understanding potential effects of the Project and existing and future developments on current and future

use of lands and resources in a given area. Any information gathered through Aboriginal engagement activities and TEK studies pertaining to the cumulative effects assessment has been incorporated into the assessment of applicable elements for which the information applies.

An evaluation of the significance of the Project's contribution to cumulative effects was conducted. Details of the significance evaluation are discussed in each of the following subsections.

8.2 Traditional Land Use and Resource Use

This subsection discusses how the Project could act in combination with existing activities and reasonably foreseeable developments to cumulatively affect TLRU indicators (*i.e.*, subsistence activities and sites, cultural sites and TMRU). It discusses how existing activities and reasonably foreseeable future developments may act in combination with the residual effects of the Project to create cumulative effects on TLRU. While existing activities and land uses are relevant to the assessment of TLRU cumulative effects, they are also taken into account as existing baseline conditions against which the Project-specific effect assessment is based.

The assessment of cumulative effects on TLRU has been approached in a qualitative manner. Maps of the reasonably foreseeable projects within the TLRU RSA (Figures 8.1-1a, 8.1-1b and 8.1-1c) were examined to determine their location relative to the Project, and whether they could act in combination with anticipated Project-specific residual effects in the same location as the Project (*e.g.*, additional physical disturbance) or contribute to wider-reaching effects on TLRU across the TLRU RSA. Precise land footprint disturbances of reasonably foreseeable and existing land uses were not calculated for the purposes of assessing TLRU cumulative effects, since the assessment is focused on effects related to resource use patterns and their socio-economic implications, rather than on the amount of resource disturbance itself. However, as discussed in Section 7.2.2, all components of the terrestrial environment are understood to support the subsistence resource base and habitat conditions essential to the practice of traditional activities. Therefore, the potential cumulative effects on TLRU are assessed in consideration of all pertinent biophysical resources known or assumed to be of importance to Aboriginal communities for traditional use, as well as in consideration of the existing, estimated distribution of harvesting areas within the TLRU RSA. A qualitative approach is also considered most appropriate because the locations of reasonably foreseeable future projects and details of land and resource use patterns in their proximity cannot be quantified.

The assessment of cumulative effects on TLRU pertains to the terrestrial components of the Project as a whole (*e.g.*, pipeline, temporary facilities, pump stations, tanks and the Westridge Marine Terminal), since the communities and regions in which the Project occurs will experience Project-related activities in a combined manner.

8.2.1 Reasonably Foreseeable Developments

Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 provide a list of the certain and reasonably foreseeable developments located within the TLRU RSA considered in the evaluation of cumulative effects on the TLRU indicators. A description of these and other developments, including vessel traffic, is provided in Section 8.1.4, and developments in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 are shown on Figures 8.1-1a, 8.1-1b and 8.1-1c. Reasonably foreseeable developments shown in Table 8A.1-5 (for Alberta) and Table 8A.1-6 (for BC) of Appendix 8.1 with the potential to act in combination with the Project were excluded from mapping, since development details (*e.g.*, approval status and location) were either not available or the developments were located within urban municipal boundaries, such as the City of Edmonton and LMDA (with the exception of the Golden Ears Connector project [Figure 8.1-1c]).

In the TLRU RSA, there are approximately 215 reasonably foreseeable developments either fully within the TLRU RSA or, for some transmission lines and pipelines, partially within the TLRU RSA (Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1). In addition, there are approximately 2,663 reasonably foreseeable minor oil and gas developments in Alberta: 573 pipelines; 1,768 facilities; and 322 wells (Tables 8A.1-2 to 8A.1-4 of Appendix 8.1).

8.2.2 Potential Cumulative Effects

The potential and likely combined adverse residual effects associated with the construction and operation of the Project on TLRU indicators were identified in Section 7.10.2 and are listed in Table 8.2-1 along with existing activities and reasonably foreseeable developments that could act in combination with the Project.

TABLE 8.2-1

POTENTIAL RESIDUAL EFFECTS OF THE PROJECT ON TRADITIONAL LAND AND RESOURCE USE CONSIDERED FOR THE CUMULATIVE EFFECTS ASSESSMENT

Potential Residual Project Effect on Indicator	Spatial Boundary	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
1. Combined effects of the Project on subsistence activities and sites.	TLRU RSA	All components	Construction to Operation	Project contribution to cumulative effects on subsistence activities and sites.	• Existing activities including: agriculture and livestock grazing; forestry; rural and urban residential and commercial development; transportation and infrastructure development; utilities activities; oil and gas exploration and development; and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities associated with construction as well as site-specific maintenance activities that could interact with above activities to cause land and resource use disturbance, change in access and use patterns, and sensory disturbance.
2. Combined effects of the Project on cultural sites.	TLRU RSA	All components	Construction to Operation	Project contribution to cumulative effects on cultural sites.	
3. Combined effects of the Project on TMRU.	Marine TLRU RSA	Westridge Marine Terminal	Construction to Operation	Project contribution to cumulative effects on traditional marine resource use.	• Existing marine traffic in Burrard Inlet. • Reasonably foreseeable developments within the RSA listed in Table 8A.1-6 of Appendix 8.1 and Project and non Project-related vessel traffic discussed in Section 8.1.4.

8.2.3 Significance Evaluation of Potential Cumulative Effects

A qualitative assessment was deemed to be the most appropriate approach by which to evaluate the significance of the Project's contribution to potential cumulative effects on subsistence activities and sites, cultural sites and TMRU. This approach was selected based on the lack of quantifiable data about the precise location, footprint and/or design of many reasonably foreseeable developments and particular human use patterns in the vicinity of each development. Although the general locations of the reasonably foreseeable developments are known, their precise interactions with traditional land use areas are unknown. For the purposes of the cumulative effects assessment, it was assumed that the construction of these developments will interact with such land and resource use areas to some degree. In the absence of specific data, the evaluation of significance of the Project's contribution to the cumulative effects relied on the professional judgment and extensive experience of the assessment team.

Table 8.2-2 provides a summary of the significance evaluation of the Project's contribution to potential TLRU cumulative effects. The rationale used to evaluate the significance of each of the cumulative effects is provided below.

TABLE 8.2-2

SIGNIFICANCE EVALUATION OF THE PROJECT'S CONTRIBUTION TO CUMULATIVE EFFECTS ON TRADITIONAL LAND AND RESOURCE USE

Potential Cumulative Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
1. TLRU Indicator – Subsistence Activities and Sites									
1(a) Project contribution to cumulative effects on subsistence activities and sites.	Negative	TLRU RSA	Short-term	Isolated to periodic	Short to long-term	Medium	High	Moderate	Not significant
2. TLRU Indicator – Cultural Sites									
2(a) Project contribution to cumulative effects on cultural sites.	Negative	TLRU RSA	Short-term	Isolated to periodic	Short-term	Medium	High	Moderate	Not significant
3. TLRU Indicator – Traditional Marine Resource Use									
3(a) Project contribution to cumulative effects on TMRU.	Negative	Marine TLRU RSA	Long-term	Isolated to periodic	Medium-term to permanent	Medium	High	High	Not significant
4. Project Contribution to Combined Cumulative Effects on TLRU									
4(a) Project contribution to combined cumulative effects on the TLRU indicators (1[a], 2[a], 3[a]).	Negative	TLRU RSA; Marine TLRU RSA	Short-term to long-term	Isolated to periodic	Short to long-term	Medium	High	Moderate	Not significant

Notes: 1 Significant Contribution to a Cumulative Socio-Economic Effect: the Project's contribution to a cumulative socio-economic effect is considered significant if the Project's contribution to the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

8.2.3.1 Subsistence Activities and Sites

As discussed in Section 7.2.2, the TLRU RSA is used for various subsistence activities including hunting, fishing, trapping and plant gathering. These subsistence activities, sites and supporting resources will likely be physically disturbed during the construction phase of the Project at particular locations and specific times. In general, the Project will not cause physical disturbances to land and resource use areas during operations; however, site-specific maintenance may cause short-term disturbances. The Project is likely to interact with existing and reasonably foreseeable developments causing cumulative effects on subsistence resources through habitat alteration and availability, changes to wildlife movement, and increased mortality risk within the TLRU RSA.

Changes to access and use patterns during construction and operations are anticipated to result from short-term physical disturbance of land, from alteration of traffic patterns, movements and volumes along highways and roads or from temporary access restrictions that may affect the practice of traditional activities by Aboriginal communities. In areas where the proposed pipeline corridor deviates from the existing TMPL system right-of-way, the Project's contribution to the cumulative effect will extend throughout the operations phase. Sensory disturbances (*e.g.*, nuisance air emissions and noise) will occur during the construction of the Project and may affect traditional resource users in the vicinity of Project components.

Reasonably foreseeable developments may also disturb these components of subsistence activities and sites, some in the same locations as the Project activities and more commonly at a TLRU RSA level. Reasonably foreseeable developments in Appendix 8.1 that may occur within the proposed pipeline corridor and, therefore, have the potential to overlap in both time and space with the Project, include the Edmonton to Hardisty Pipeline Project, the Heartland Transmission Project, the Ajax Project, the Kingsvale/Oliver Natural Gas Pipeline Project, the Patterson Creek Hydroelectric Project and various oil and gas activities.

Most of the reasonably foreseeable developments occur outside the proposed pipeline corridor within the wider TLRU RSA. These developments will not overlap spatially with the Project, but rather will contribute to cumulative disturbances to traditional use areas and resources at the regional scale.

Existing activities contributing to disturbance of certain traditional use areas include agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development.

A detailed assessment discussion of components that inform this cumulative effect (*i.e.*, changes to access and use patterns, sensory disturbance) is provided in Section 8.4.3, which includes traditional resource users.

Mitigation measures proposed in Section 7.2.2 and the Project-specific EPPs (Volumes 6B, 6C and 6D) will avoid or reduce the Project-related cumulative effects on subsistence activities and sites, recommended in combination with the measures outlined within the assessment of environmental resources implemented to mitigate potential effects of the Project on these resources (Volume 5A). Potentially affected traditional resource users will be notified of the construction schedule and any maintenance activities (*e.g.*, integrity digs). Mitigation measures related to sensory disturbance and change in access and use patterns proposed in Section 7.2.4 will reduce the Project's contribution to cumulative effects on change to access and use patterns. Proposed mitigation measures related to air quality and noise will reduce sensory disturbances (Section 7.2.4). It is expected that many other operators will implement similar mitigation.

Trans Mountain will track cumulative socio-economic issues and the outcomes of Project-specific mitigation strategies, where applicable, to confirm predications made based on desktop studies, TLU studies, ongoing Aboriginal engagement activities, existing literature and the professional experience of the assessment team. The Project will develop an issues tracking process, as noted in the Environmental Compliance Program in Volume 6A.

No mitigation measures beyond the Project-specific mitigation already proposed in Section 7.2.2 and in the Project-specific EPPs (Volumes 6B, 6C and 6D) are deemed to be warranted. The Project's contribution to a cumulative effect on subsistence activities and sites is considered reversible in the short to long-term and is of medium magnitude (Table 8.2-2, point 1[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on subsistence activities and sites is provided below.

- Spatial Boundary: TLRU RSA - the Project's contribution to cumulative effects on subsistence activities and sites is assessed within the regional context of the TLRU RSA to include wide-ranging harvested species.

- Duration: short-term - the Project events causing a contribution to cumulative changes to subsistence activities and sites are construction activities and site-specific maintenance that would occur during any one year during operations.

- Frequency: isolated to periodic - the Project's contribution to cumulative effects on subsistence activities and sites is confined to the construction phase or occurs intermittently, but repeatedly during the operations phase.

- Reversibility: short to long-term - the Project's contribution to the cumulative effect on traditionally harvested resources will be dependent on each target species' sensitivities and could extend greater than 10 years following decommissioning and abandonment, once native vegetation regenerates over the Project Footprint.

- Magnitude: medium - the cumulative effects assessment results for fish and fish habitat, wildlife and wildlife habitat, vegetation, wetlands (Section 8.0 of Volume 5A) indicates that effects to traditionally harvested resources may be detectable. The implementation of proposed mitigation measures during construction and operations will reduce, but not eliminate, potential Project contribution to cumulative effects on subsistence activities and sites. Mitigation strategies are also in place in the event any unidentified subsistence sites are discovered.

- Probability: high - construction activities for the Project will act in combination with other reasonably foreseeable developments to cause cumulative effects on subsistence activities and sites, also overlapping with hunting and fishing seasons and trapping activities.

- Confidence: moderate - based on the professional experience of the assessment team, in consideration of the lack of specific footprint information for many reasonably foreseeable developments and location of specific land use activities in the vicinity of reasonably foreseeable developments.

8.2.3.2 Cultural Sites

The construction and operations phases of the Project may result in the disturbance of cultural sites as well as potentially preventing traditional resource users from accessing these site types, resulting in limited access or increased public access to cultural sites that may affect the practice of traditional activities by Aboriginal communities. As discussed in Section 8.2.3.1, the existing activities and reasonably foreseeable developments listed in Appendix 8.1 may contribute to cumulative disturbances to cultural sites, sensory disturbance and changes to access and use patterns at the regional scale.

A detailed assessment discussion of components that inform this cumulative effect (*i.e.*, changes to access and use patterns, sensory disturbance) is provided in Section 8.4.3, which includes traditional resource users.

Mitigation measures proposed in Section 7.2.2 and the Project-specific EPPs (Volumes 6B, 6C and 6D) will avoid or reduce the Project-related cumulative effects on cultural sites. Affected traditional resource users will be notified of the construction schedule and any maintenance activities (*e.g.*, integrity digs). Mitigation measures related to change in access and use patterns proposed in Section 7.2.4 will reduce the Project's contribution to cumulative effects on change to access and use patterns. Proposed mitigation measures related to air quality and noise will reduce sensory disturbances (Section 7.2.4). It is expected that many other operators will implement similar mitigation.

Trans Mountain will track cumulative socio-economic issues and the outcomes of Project-specific mitigation strategies, where applicable, to confirm predications made based on desktop studies, TLU studies, ongoing Aboriginal engagement activities, existing literature and the professional experience of the assessment team. The Project will develop an issues tracking process, as noted in the Environmental Compliance Program in Volume 6A.

No mitigation measures beyond the Project-specific mitigation already proposed in Section 7.2.2 and in the Project-specific EPPs (Volumes 6B, 6C and 6D) are deemed to be warranted. The Project's contribution to a cumulative effect on cultural sites is considered reversible in the short-term and is of medium magnitude (Table 8.2-2, point 2[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on cultural sites is provided below.

- Spatial boundary: TLRU RSA - the Project's contribution to cumulative effects on cultural sites is assessed within the regional context of the TLRU RSA.

- Duration: short-term - the Project events causing a contribution to cumulative effects on cultural sites are construction activities and site-specific maintenance that would occur during any one year during operations.

- Frequency: isolated to periodic - the Project's contribution to cumulative effects on cultural sites is confined to the construction phase or occurs intermittently, but repeatedly during the operations phase.

- Reversibility: short-term - the Project's contribution to cumulative effects on cultural sites will result during the construction phase or site-specific maintenance that would occur within any one year period during operations.

- Magnitude: medium - implementation of proposed mitigation measures during construction and operations will reduce, but not eliminate, potential Project contribution to cumulative effects on cultural sites. Mitigation strategies are also in place in the event any unidentified cultural sites are discovered.

- Probability: high - construction activities for the Project will act in combination with other reasonably foreseeable developments to cause cumulative effects on cultural sites.

- Confidence: moderate – based on the professional experience of the assessment team, in consideration of the lack of specific footprint information for many reasonably foreseeable developments and location of specific land use activities in the vicinity of reasonably foreseeable developments.

8.2.3.3 Traditional Marine Resource Use

As discussed in Section 7.6.2, the Marine TLRU RSA is used for various subsistence activities including fishing, plant gathering and cultural pursuits. These subsistence activities, sites and supporting resources will likely be physically disturbed during the construction phase of the Project at particular locations and specific times. The Project is likely to interact with existing and reasonably foreseeable developments causing cumulative effects on subsistence resources through loss of marine habitat, sensory disturbance, injury or mortality.

Sensory disturbances (*e.g.*, nuisance air emissions and noise) will occur during the expansion of the Westridge Marine Terminal and may affect traditional resource users in the vicinity of Project activities. Sensory disturbance related to the increased berthing of tankers at the Westridge Marine Terminal and associated anchor chain noise may also occur during the operations phase. Increased activity at the terminal during construction may factor into traditional resource users changing their movement patterns away from areas around the terminal.

All existing activities and marine traffic, reasonably foreseeable development and future marine traffic in the Marine TLRU RSA will interact with Project-related activities to contribute to the potential for cumulative changes in marine access and use patterns and on traditionally harvested resources during the construction phase of the Project. Sensory disturbance related to the increased berthing of tankers at the Westridge Marine Terminal and associated anchor chain noise may also occur during the operations phase.

A detailed assessment discussion of components that inform this cumulative effect (*i.e.*, changes in marine access and use patterns, sensory disturbance) is provided in Section 8.4.3, which includes traditional resource users.

Mitigation measures proposed in Section 7.6.2 and the Westridge Marine Terminal EPP (Volume 6D), such as those designed to communicate construction activities and schedules to the marine community in Burrard Inlet, should lessen the Project-related contribution to cumulative effects on TMRU. The Project's contribution to combined effects will also be reduced by the measures outlined within the assessment of marine resources implemented to mitigate potential effects of the Project on these resources (Volume 5A). Proposed mitigation measures related to air quality and noise will reduce sensory disturbances (Section 7.6.4).

No mitigation measures beyond the Project-specific mitigation already proposed in the Westridge Marine Terminal EPP (Volume 6D) are deemed to be warranted. The Project's contribution to a cumulative effect on TMRU is considered reversible in the medium-term to permanent and of medium magnitude (Table 8.2-2, point 3[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on TMRU is provided below.

- Spatial Boundary: Marine TLRU RSA - the Project's contribution to cumulative effects on traditional marine resource use is assessed within the regional context of the Marine TLRU RSA to include wide-ranging harvested species.

- Duration: long-term - while the Project's contribution to disruption to traditional marine resource activities is short-term, the events causing cumulative effects to harvested marine species are the repeated and regular Project-related disturbances during terminal and vessel operations for the life of the Project.

- Frequency: isolated to periodic - the Project's contribution to cumulative effects on subsistence activities and sites is confined to the construction phase and occurs intermittently, but repeatedly during the operations phase throughout the life of the Project.

- Reversibility: medium-term to permanent - the Project's contribution to cumulative effects on traditionally harvested marine resources will be dependent on each target species' sensitivities throughout the Marine TLRU RSA while localized loss of marine riparian habitat will be permanent.

- Magnitude: medium - the cumulative effects assessment results for marine fish and fish habitat and marine birds (Section 8.0 of Volume 5A) indicates that effects to traditionally harvested resources may be detectable. The implementation of proposed mitigation measures during construction and operations will reduce, but not eliminate, potential Project contribution to cumulative effects on traditional marine resource use.

- Probability: high - expansion of the Westridge Marine Terminal will act in combination with other reasonably foreseeable developments to cause cumulative effects on traditional marine resource use.

- Confidence: high - based on Project information and the professional experience of the assessment team.

8.2.3.4 Combined Cumulative Effects on Traditional Land and Resource Use

The potential cumulative effects (*i.e.*, effects on subsistence activities and sites, cultural sites and TMRU) may emerge as the Project acts in combination with existing activities and reasonably foreseeable developments. Where two indicators had different criterion conclusions, the more conservative assessment was carried forward to the combined effects assessment.

The impact balance of the overall combined cumulative effects is negative. Reversibility is considered short-term to long-term since the Project's contribution to combined cumulative effects will be largely limited to the construction phase or site-specific maintenance activities that would occur within any one year period during operations, while the effects of disturbance to traditionally harvested resources will be dependent on each target species' sensitivities. The magnitude of the Project's contribution to cumulative effects is considered medium; given the predicted cumulative effects on traditionally harvested resources. The implementation of mitigation measures described in Sections 7.2.2 and 7.6.2 and the Project-specific EPPs (Volumes 6B, 6C and 6D) will reduce the magnitude of cumulative effects associated with the Project. The Project's contribution to an overall cumulative effect on TLRU is considered short-term to long-term in duration, isolated to periodic in frequency and reversible in the short to long-term depending on the particular effect (Table 8.2-2, point 4[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on TLRU is provided below.

- Spatial Boundary: TLRU RSA; Marine TLRU RSA - the Project's contribution to cumulative effects on TLR may extend to areas of the TLRU RSA and Marine TLRU RSA.

- Duration: short to long-term - while the Project's contribution to the terrestrial components of TLRU will be construction activity or site-specific maintenance that would occur within any one year period during operations, effects on marine resources will be initiated during construction and extend throughout operations for the operational life of the Westridge Marine Terminal potentially affecting Aboriginal communities with both marine and terrestrial interests.

- Frequency: isolated to periodic - the events causing the Project's contribution to cumulative effects on TLRU include pipeline and facility construction as well as site-specific maintenance activities and the presence of moored tankers at Westridge Marine Terminal which would occur intermittently but repeatedly throughout the assessment period.

- Reversibility: short to long-term - the Project's contribution to cumulative effects on HORU are for the most part reversible with the end of construction or site-specific maintenance activities (short-term); however, a contribution to some effects (*i.e.*, changes in access and use in select areas of new pipeline right-of-way or changes in viewshed) may persist throughout operations.

- Magnitude: medium - the Project's contribution to cumulative effects on TLRUs will be detectable by traditional resource users. The cumulative effects to traditionally harvested resources range from negligible to detectable and are dependent on each target species' sensitivities.

- Probability: high - there is a high degree of probability that a Project contribution to cumulative effects on TLRU will occur.

- Confidence: moderate – this is based on Project information and the professional experience of the assessment team. Particulars of the Project's contribution to cumulative effects will be influenced by finalization of a pipeline route during the detailed engineering and design phase.

8.2.4 Summary

As identified in Table 8.2-2, there are no situations where the Project's contribution to cumulative effects on TLRU indicators will be significant. Consequently, the Project's contribution to adverse cumulative effects on TLRU within the TLRU RSA and Marine TLRU RSA will be not significant.

8.3 Social and Cultural Well Being

This subsection discusses how the Project could act in combination with existing activities and reasonably foreseeable developments to cumulatively affect social and cultural well-being indicators anticipated to have an adverse combined Project-specific residual effect, as discussed in Section 7.10 of Volume 5B. For social and cultural well-being, the only indicator anticipated to have a combined adverse residual effect is community way-of-life.

The primary cause of any adverse cumulative effects on community way-of-life is expected to be related to temporary increased potential for in-migration of people from outside the Socio-Economic RSA to regional commercial centres. Many existing activities and reasonably foreseeable developments will be competing for available labour within the Socio-Economic RSA, which would cumulatively increase regional labour market demand. This increased demand will likely draw new workers and population to the region. An influx in labour in to the Socio-Economic RSA due to multiple demands could lead to increased economic growth, employment and income benefits. Furthermore, population growth associated with economic development is a desirable outcome for most communities and regions when balanced with social and environmental outcomes and when infrastructure and services can be planned to meet the needs of a growing population. Economic growth represented by reasonably foreseeable future developments, including the Project, is factored into regional population growth estimates prepared by provincial governments. However, short-term growth associated with temporary workers can affect community way-of-life due to capacity pressures on infrastructure, services and amenities, and also related to the presence of temporary workers and the potential for undesirable community/worker interactions.

Cumulative effects on community way-of-life could also be affected by the potential for disturbance to key community assets or use areas (*e.g.*, school yards, recreational areas, or municipal parks), as well as sensory disturbance associated with nuisance air and noise emissions related to all developments. These issues are explored in the context of HORU cumulative effects (in relation to physical disturbance to land use areas and aesthetic attributes) in Section 8.4.

Although much has been done to better understand the social dimension of cumulative effects, there are no standard cumulative effects models to address socio-economic issues including concepts of community and regional well-being (Mitchell and Parkins 2011). The complexity of assessing socio-economic cumulative effects is a function of numerous factors, including:

- the constant change that is occurring in the socio-economic conditions of any community or region, influenced by an array of economic, political and cultural factors;

- a lack of precise information about scheduling, work force, procurement and housing strategies of other future projects considered in future cumulative scenarios;

- the role of human interpretation and its influence on individuals' physical and perceptual experiences of social impacts; and

- inherent uncertainty regarding individuals' abilities, willingness and confidence to respond to change (Loxton *et al.* 2013).

Such factors make predicting cumulative effects — or the additive and integrated experience of various projects/activities by communities — extremely challenging. Nonetheless, there is value in explicitly evaluating cumulative effects potential to identify opportunities for project-specific or regional measures that could avoid or reduce potentially significant adverse effects or enhance anticipated benefits.

The assessment of cumulative effects on community way-of-life pertains to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the Westridge Marine Terminal), because the communities and regions in which the Project occurs will experience Project-related activities in an integrated manner. It is not meaningful from a community perspective to discuss the social and cultural well-being effects of each Project component on a stand-alone basis.

8.3.1 Reasonably Foreseeable Developments

Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 provide a list of the certain and reasonably foreseeable developments located within the Socio-Economic RSA considered in the evaluation of cumulative effects on the community way-of-life indicator. Description of these and other developments is provided in Section 8.1.4, and developments in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 are shown on Figures 8.1-1a, 8.1-1b and 8.1-1c. Reasonably foreseeable developments summarized in Table 8A.1-5 (for Alberta) and Table 8A.1-6 (for BC) of Appendix 8.1 with the potential to act in combination with the Project were excluded from mapping since development details (*e.g.*, approval status, location) were either not available or the developments were located within urban municipal boundaries, such as the City of Edmonton and LMDA (with the exception of the Golden Ears Connector project [Figure 8.1-1c]).

In the Socio-Economic RSA, there are approximately 196 reasonably foreseeable developments either fully within the Socio-Economic RSA or, for some transmission lines and pipelines, partially within the Socio-Economic RSA (Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1). In addition, there are approximately 3,147 reasonably foreseeable minor oil and gas developments in Alberta: 712 pipelines; 2,093 facilities; and 342 wells (Tables 8A.1-2 to 8A.1-4 of Appendix 8.1).

8.3.2 Potential Cumulative Effects

The potential and likely combined socio-economic residual effects associated with the construction and operation of the Project on social and cultural well-being indicators were identified in Section 7.10.3. Those Project-specific residual effects considered to have an adverse impact balance are listed in Table 8.3-1, along with existing activities and reasonably foreseeable developments that could act in combination with the Project.

TABLE 8.3-1

POTENTIAL RESIDUAL EFFECTS OF THE PROJECT ON SOCIAL AND CULTURAL WELL-BEING CONSIDERED FOR THE CUMULATIVE EFFECTS ASSESSMENT

Potential Residual Project Effect on Indicator	Spatial Boundary[1]	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
1. Combined effects of the Project on community way-of-life.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction	Project contribution to cumulative effects on community way-of-life.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities resulting in the presence of temporary workers in communities during the construction phase.

Note: 1 RSA = Socio-Economic RSA.

8.3.3 Significance Evaluation of Potential Cumulative Effects

As quantitative assessment was not possible, a qualitative assessment was deemed to be the most appropriate approach by which to evaluate the significance of the Project's contribution to potential cumulative effects on community way-of-life. The evaluation of significance of the Project's contribution to the cumulative effects relied on the professional judgment and extensive experience of the assessment team.

Table 8.3-2 provides a summary of the significance evaluation of the Project's contribution to the potential cumulative effect on the community way-of-life indicator. The rationale used to evaluate the significance of the cumulative effect is provided below. As noted, the only indicator with a combined Project effect that was negative was community way-of-life.

TABLE 8.3-2

SIGNIFICANCE EVALUATION OF THE PROJECT'S CONTRIBUTION TO CUMULATIVE EFFECTS ON SOCIAL AND CULTURAL WELL-BEING

Potential Cumulative Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Social and Cultural Well-Being Indicator – Community Way-of-Life									
1(a) Project contribution to cumulative effects on community way-of-life.	Negative to positive	RSA	Short-term	Isolated	Short-term	Negligible to medium	Low or high	Moderate	Not significant

Notes: 1 RSA = Socio-Economic RSA.

2 Significant Contribution to a Cumulative Socio-Economic Effect: the Project's contribution to a cumulative socio-economic effect is considered significant if the contribution to the cumulative effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

8.3.3.1 Community Way-of-Life

There is great diversity in the population characteristics of the communities and regions that may interact with the Project and reasonably foreseeable developments in the Socio-Economic RSA. On the east and west ends of the Project are two large urban hubs: the Edmonton Region on the east (population in 2011 was approximately 1.2 million); and the Metro Vancouver Region on the west (population in 2011 was approximately 2.3 million). In between are more sparsely populated areas. The Rural Alberta Region includes the less industrial and more agricultural areas west of the City of Edmonton, and includes the entire Yellowhead County, the Town of Edson and the Town of Hinton (regional population in 2011 was 29,336). The Jasper National Park Region comprises the boundaries of Jasper National Park, which includes the Municipality of Jasper (municipal population in 2011 was 4,051). The Fraser-Fort George/Thompson-Nicola Region extends from the Alberta/BC border through Electoral Area H, of the Regional District of Fraser-Fort George, and south through the entire length of the TNRD (regional population in 2011 was approximately 129,000). The Fraser Valley Region is largely agricultural, with key incorporated of the District of Hope, the City of Chilliwack and the City of Abbotsford (regional population in 2011 was approximately 274,400).

Way-of-life in communities along the proposed pipeline corridor varies considerably. Looking at the measurement endpoints of focus related to community way-of-life, it is clear that each community has had a different experience of interactions with temporary populations. Also, each community has different experiences and occurrences of crime and social issues. Further, each community also has a unique range of community events and community areas assets that may interact with the Project, existing activities and reasonably foreseeable developments. The population across all socio-economic regions is anticipated to increase, as per provincial population projections. Capacity in the labour market to meet the workforce demands of all existing activities and reasonably foreseeable developments is limited, although there is a larger workforce available in urban centres such as the City of Edmonton and the City of Vancouver. Labour market outlooks across all socio-economic regions indicate a continued tightening of labour supply in relation to demand, with labour demand growing at faster rates than supply in the medium-term.

Existing activities are the basis of the current supply/demand balance in each labour market within the Socio-Economic RSA. The Project, existing activities and all reasonably foreseeable developments identified in the Socio-Economic RSA (listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1) will compete for regional labour, and it is assumed that this will necessitate an influx of labour into the Socio-Economic RSA to meet growing demand. While it is understood that projects may be delayed to match available labour, free movement of labour to meet demand is assumed for the purposes of the analysis. Construction schedules identified for developments in Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1 provide an indication of which reasonably foreseeable developments are likely to be constructed during the same period as the Project. However, without knowing the respective duration of the construction period for many of the reasonably foreseeable developments in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1, it is difficult to accurately predict the Project's contribution to a change in community way-of-life related to the presence of temporary workers. For the purpose of the cumulative effects assessment for change in community way-of-life, it was assumed that smaller scope developments such as minor oil and gas developments (shown in Tables 8A.1-2 to 8A.1-4 of Appendix 8.1) will be constructed before the Project, while larger scope developments will be constructed during the same period as the Project.

Given the absence of detailed construction schedules and/or detailed workforce and procurement strategies for many reasonably foreseeable developments in the Socio-Economic RSA, a methodology that is primarily qualitative has been adopted in order to assess cumulative in-migration of workers. Calculations were used to estimate the potential demands of the Project relative to those for all reasonably foreseeable developments in the Socio-Economic RSA that will also draw on labour, goods and services. The calculations examined the total of known capital expenditures associated with reasonably foreseeable developments within the six study regions of the Socio-Economic RSA (including the Project) against the proportion of the total anticipated regional capital spending that is represented by the Project. While capital expenditure does not equate directly with labour demands (workforce demands of all other projects are not known), it provides a logical basis for an order-of-magnitude estimate of the Project's contribution to the overall future labour demands during the construction phase. This informed the understanding of likely in-migration of a workforce to meet the growing needs of the regional economy. Table 8.3-4 presents information on the Project's size in the context of other reasonably

foreseeable developments with which it will be competing for regional labour during the timeframe of the Project.

TABLE 8.3-4

TRANS MOUNTAIN EXPANSION PROJECT COMPARATIVE SIZE IN RELATION TO REASONABLY FORESEEABLE DEVELOPMENTS IN THE SOCIO-ECONOMIC RSA

Socio-Economic Region	Other Reasonably Foreseeable Major Developments, including Trans Mountain Expansion Project ($ Million)[1,2,3]	Size of Trans Mountain Expansion Project in Region[4] ($ Million)	Trans Mountain Expansion Project as % of All Reasonably Foreseeable Major Projects
Edmonton Region	24,553	547	2.2%
Rural Alberta Region	774	524	40.4%
Jasper National Park Region	0	0	--
Fraser-Fort George/Thompson-Nicola Region	1,119	1,753	61.0%
Fraser Valley Region	408	626	60.5%
Metro Vancouver Region	16,710	1,150	6.4%

Notes:
1 Capital cost estimates for all reasonably foreseeable projects are not known; only those where capital cost estimates are known (as provided in Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1) are included in the regional totals, so the relative contribution of the TMEP is likely overestimated. Some projects may span several regions.

2 Only reasonably foreseeable major developments with construction schedules potentially overlapping with the anticipated Project schedule were included. For the purposes of analysis, developments with a construction schedule that extended to 2015 or beyond were included (allowing for delay in schedules); developments where the construction schedule was unknown were also included. As such, the relative contribution of the TMEP may further be overestimated.

3 Estimated capital spending of the TMEP in each region was included, so the Project was considered in the cumulative total.

4 Construction capital expenditures related to activity in each socio-economic region were estimated based on the proportion of construction workforce anticipated in each region; the percentage of total workforce estimate in each region was applied to Project's total capital expenditures, with exclusions made for financing and sunk costs (approximately $4.6 billion).

The Project's contribution to overall increased presence of temporary workers, and the resulting potential for increased temporary community/worker interactions and effects on community ways-of-life, will vary throughout the Socio-Economic RSA. In larger urban centres such as the City of Edmonton and the LMDA, the Project's contribution to cumulative changes in community way-of-life is anticipated to be negligible to low as the Project is only one of many other reasonably foreseeable developments anticipated to be under construction during the same timeframe. For example, in the Edmonton Region, the Project accounts for approximately 2.2% of all reasonably foreseeable development expenditures likely to occur in the same timeframe that will require construction workforce, and, therefore, will contribute to labour in-migration. In the Metro Vancouver Region, the Project's contribution is anticipated to be approximately 6.4% of projected expenditures. The Project's contribution to overall cumulative effects related to community way-of-life will be greatest in the Fraser-Fort George/Thompson-Nicola Region and Fraser Valley Region; in both regions the Project represents approximately 61% of reasonably foreseeable developments anticipated to be under construction in each region during the same time frame as the Project.

Mitigation measures proposed in Section 7.2.3 will reduce the Project-related contribution to cumulative effects on community way-of-life related to temporary workers, including: establishing a Code of Conduct for workers; implementing community awareness training in worker orientation sessions; establishing a mechanism for communities to register construction-related complaints; developing a detailed Worker Accommodation Strategy that will include camps in key locations where local communities will not have adequate housing capacity; and providing recreational and leisure facilities for workers within the camps. It is anticipated that many companies involved in existing activities and reasonably foreseeable developments within the Socio-Economic RSA have codes of conduct in place and other measures similar to those developed by Trans Mountain to encourage respectful behaviour in communities during construction, as was generally noted during the TMX Anchor Loop Project. Nevertheless, companies cannot prevent workers from engaging in certain behaviours, and undesirable behaviour by some temporary workers may occur. No mitigation measures beyond the Project-specific mitigation already proposed in Section 7.2.3 are deemed to be warranted.

The importance of ongoing issues tracking and monitoring is particularly relevant in the context of cumulative socio-economic effects. Exogenous factors, workforce needs of future projects, and additional activities cannot be predicted, and socio-economic effects — including population-related effects — can interact and aggregate in unintended ways (Loxton *et al.* 2013). Tracking cumulative socio-economic effects and the outcomes of Project-specific mitigation strategies, where applicable, is therefore critical to their success. Issues tracking also allows for adaptive management where mitigation measures can be refined or developed depending how cumulative effects unfold. The Project will develop an issues tracking process to monitor and respond to Project-related socio-economic issues and opportunities, as noted in the Socio-Economic Management Plan (SEMP) in Volume 6B.

Overall, the Project's contribution to changes to community way-of-life related to increased in-migration of labour and associated effects related to community/worker interactions could be negative, neutral or positive. It will depend on the size of the construction hub community in relation to the size of the temporary workforce, worker housing strategies within each region, and individual choices of workers. The Project's contribution to effects are anticipated to be neutral in larger urban centres (*e.g.*, Edmonton, Metro Vancouver communities) as any temporary workers are likely to be easily absorbed and the size of the Project is relatively small in relation to the aggregate of all proposed developments. The contribution to an effect on community way-of-life may be positive or negative in other locations depending on community and individual perspectives. In most areas, the opportunities for Project-related income, local economic spin-offs for businesses and notable increases in municipal taxes are anticipated to largely off-set any short-term nuisance associated with presence of temporary workers (*e.g.*, while some issues were identified, the community experiences with the TMX Anchor Loop Project in Valemount and Jasper were largely positive). The reversibility of the Project's contribution to the effect is short-term, since any disruption to community way-of-life would only occur during the construction phase. The magnitude of the Project's contribution to any negative change in community way-of-life is considered to be negligible to medium. It is anticipated to be negligible in large urban centres such as the City of Edmonton and the City of Vancouver, where Project-specific workers can easily be absorbed into the population and where the Project is a smaller contributor to overall demand for worker in-migration. The magnitude is likely to be medium in smaller population centres, where the Project's contribution to overall workforce demands is greater and communities have less capacity to absorb workers. While the Project's contribution to the overall demand for temporary labour could be considered high in particular regions (*e.g.*, in the Fraser-Fort George/Thompson-Nicola Region and Fraser Valley Region where the Project represents approximately 61% of all reasonably foreseeable developments anticipated to be under construction in each region during the same time frame), the aforementioned mitigation measures (*i.e.*, use of construction camps, Code of Conduct policies, ongoing issues-tracking process, etc.) are anticipated to avoid or reduce the Project's contribution to any worker-related adverse effects on community way-of-life to a medium magnitude. The overall level of confidence in the effects characterization is moderate; the assessment team has a good understanding of regional labour force capacity, but limited information about the workforce demands, procurement strategies, and code of conduct policies of the other developments that will act in combination with the Project (Table 8.3-2, point 1[a]). A summary of the rationale for all the significance criteria on community way-of-life is provided below.

- Spatial Boundary: Socio-Economic RSA – potential cumulative effects could occur throughout communities in the Socio-Economic RSA that serve as construction hubs for the Project and other reasonably foreseeable developments or where workers may choose to spend time when off-shift.

- Duration: short-term – the Project's contribution to effects on community way-of-life are related only to the presence of the temporary workforce during the construction phase; the Project will not contribute noticeably to population change or regional workforce demands during the operations phase.

- Frequency: isolated – the presence of temporary workers which would contribute to any potential cumulative community disruption would be limited to the construction phase of the Project.

- Reversibility: short-term – contribution to disruption of community way-of-life would only occur during the Project's construction phase.

- Magnitude: negligible to medium – the Project's contribution is considered to be negligible to in large urban centres and medium in smaller population centres.

- Probability: low or high – depending on the size of construction hub communities in relation to the temporary workforce associated with concurrent developments; a Project contribution to the effect is considered unlikely in large centres but is considered likely in smaller and moderately sized centres.

- Confidence: moderate – limited information is available regarding construction schedules, workforce and procurement strategies for reasonably foreseeable developments in the Socio-Economic RSA; there is also the inherent uncertainty around individual behaviour.

8.3.4 Summary

As identified in Table 8.3-2, there are no situations where the Project's contribution to adverse cumulative effects on community way-of-life will be significant. Consequently, the Project's contribution to adverse cumulative effects on social and cultural well-being within the Socio-Economic RSA will be not significant.

8.4 Human Occupancy and Resource Use

This subsection discusses how the Project could act in combination with existing activities and reasonably foreseeable developments to cumulatively affect HORU indicators (*i.e.*, parks and protected areas, Indian Reserves (IRs), Métis Settlements and asserted traditional territories, residential use, agricultural use, outdoor recreation use, other land and resource use, water supply and use, aesthetic attributes, and marine commercial, recreational and tourism use [MCRTU]). It discusses how existing activities and reasonably foreseeable future developments may act in combination with the residual effects of the Project to create cumulative effects on human land or resource use, patterns of human use, or people's experience of use. While existing activities and land uses are relevant to the assessment of HORU cumulative effects, they are also taken into account as existing baseline conditions against which the Project-specific effect assessment is based.

The approach to cumulative effects for HORU differs from biophysical and some other socio-economic elements in that the focus is on how a range of effects *themes* may interplay with other existing activities and reasonably foreseeable developments. This is because certain effects will be experienced similarly by a range of different land and resource users, as represented by different HORU indicators. For example, sensory or viewshed disruption, physical land disturbance and changes in access and use patterns may be experienced by all user types. As such, these broad themes are the focus around which HORU cumulative effects are explored in order to avoid duplication of discussion for various indicators.

The assessment of cumulative effects on HORU has been approached in a qualitative manner. Maps of the reasonably foreseeable projects within the HORU RSA (Figures 8.1-1a, 8.1-1b and 8.1-1c) were examined to determine their location relative to the Project, and whether they could act in combination with anticipated Project-specific residual effects in the same location as the Project (*e.g.*, additional physical disturbance) or contribute to wider-reaching effects on HORU across the HORU RSA. Precise land footprint disturbances of reasonably foreseeable and existing land uses were not calculated for the purposes of assessing HORU cumulative effects, since the assessment is focused on effects related to resource use patterns, use experiences and their socio-economic implications, rather than on the amount of resource disturbance itself. A qualitative approach is also considered most appropriate because the locations of reasonably foreseeable future projects and details of land and resource use patterns in their proximity are not fully known.

The assessment of cumulative effects on HORU pertains to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the Westridge Marine Terminal), since the communities and regions in which the Project occurs will experience Project-related activities in a combined manner. It is not meaningful from a community perspective to discuss the human occupancy and resource use effects of each Project component on a stand-alone basis.

8.4.1 Reasonably Foreseeable Developments

Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 provide a list of the certain and reasonably foreseeable developments located within the HORU RSA considered in the evaluation of cumulative effects on the HORU indicators. A description of these and other developments, including vessel traffic, is provided in Section 8.1.4, and developments in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 are shown on Figures 8.1-1a, 8.1-1b and 8.1-1c. Reasonably foreseeable developments shown in Table 8A.1-5 (for

Alberta) and Table 8A.1-6 (for BC) of Appendix 8.1 with the potential to act in combination with the Project were excluded from mapping, since development details (*e.g.*, approval status, location) were either not available or the developments were located within urban municipal boundaries, such as the City of Edmonton and LMDA (with the exception of the Golden Ears Connector project [Figure 8.1-1c]).

In the HORU RSA, there are approximately 215 reasonably foreseeable developments either fully within the HORU RSA or, for some transmission lines and pipelines, partially within the HORU RSA (Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1). In addition, there are approximately 2,663 reasonably foreseeable minor oil and gas developments in Alberta: 573 pipelines; 1,768 facilities; and 322 wells (Tables 8A.1-2 to 8A.1-4 of Appendix 8.1).

8.4.2 Potential Cumulative Effects

The potential and likely combined adverse residual effects associated with the construction and operation of the Project on HORU indicators were identified in Section 7.10.4 and are listed in Table 8.4-1 along with existing activities and reasonably foreseeable developments that could act in combination with the Project.

As noted, there are several themes of potential cumulative effects that are common across most of the HORU indicators. For the purposes of the cumulative effects assessment, these are the focus of the analysis. These themes include:

- disturbance to land and resource use areas;
- changes to access and use patterns;
- sensory or viewshed disturbance; and
- changes in marine access and use patterns.

TABLE 8.4-1

POTENTIAL RESIDUAL EFFECTS OF THE PROJECT ON HORU CONSIDERED FOR THE CUMULATIVE EFFECTS ASSESSMENT

Potential Residual Project Effect on Indicator	Spatial Boundary	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
1. Combined effects of the Project on parks and protected areas.	HORU RSA; Marine HORU RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction to Operation	Project contribution to cumulative physical disturbance to land and resource use areas. Project contribution to cumulative change to access and use patterns.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities associated with construction as well as site-specific maintenance activities that could interact with above activities to cause land and resource use disturbance, change in access and use patterns, and sensory and viewshed disturbance.
2. Combined effects of the Project on IRs and traditional use areas.	HORU RSA; Marine HORU RSA				
3. Combined effects of the Project on residential use.	HORU RSA	Pipeline Temporary Facilities			
4. Combined effects of the Project on agricultural use.	HORU RSA	Pipeline Temporary Facilities Pump Stations Pipeline Reactivation	Construction to Operation	Project contribution to cumulative physical disturbance to land and resource use areas. Project contribution to cumulative change to access and use patterns.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities associated with construction as well as site-specific maintenance activities that could interact with above activities to cause land and resource use disturbance, change in access and use patterns, and sensory and viewshed disturbance.
5. Combined effects of the Project on outdoor recreation use.					
6. Combined effects of the Project on other land and resource uses.					
7. Combined effects of the Project on water supply and use.					
8. Combined effects of the Project on aesthetic attributes.	HORU RSA; Marine HORU RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction to Operation	Project contribution to cumulative sensory or viewshed disturbance.	• Existing activities: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities associated with construction as well as site-specific maintenance activities that could interact with above activities to cause land and resource use disturbance, change in access and use patterns, and sensory and viewshed disturbance. Operations of new or expanded Project facilities could interact with above activities to cause change in access and use patterns, and sensory and viewshed disturbance.

TABLE 8.4-1 Cont'd

Potential Residual Project Effect on Indicator	Spatial Boundary	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
9. Combined effects of the Project on MCTRU.	Marine HORU RSA	Westridge Marine Terminal	Construction to Operations	Project contribution to cumulative change to marine access and use patterns. Project contribution to cumulative sensory or viewshed disturbance.	• Existing marine traffic in Burrard Inlet. • Reasonably foreseeable Project and non Project-related vessel traffic discussed in Section 8.1.4.

8.4.3 Significance Evaluation of Potential Cumulative Effects

A qualitative assessment was deemed to be the most appropriate approach by which to evaluate the significance of the Project's contribution to potential cumulative effects on disturbance to land and resource use areas, changes in access and use patterns, and sensory or viewshed disturbance. This approach was selected based on the lack of quantifiable data about the precise location, footprint and/or design of many reasonably foreseeable developments and particular human use patterns in the vicinity of each development. Although the general locations of the reasonably foreseeable developments are known, their precise interactions with land use areas such as parks and protected areas, IRs and traditional land use areas, residential use areas, water supply and use, and other land and resource use areas are unknown. For the purposes of the cumulative effects assessment, it was assumed that the construction of these developments will interact with such land and resource use areas to some degree. In the absence of precise data, the evaluation of significance of the Project's contribution to the cumulative effects relied on the professional judgment and extensive experience of the assessment team.

Table 8.4-2 provides a summary of the significance evaluation of the Project's contribution to potential HORU cumulative effects. The rationale used to evaluate the significance of each of the cumulative effects is provided below.

TABLE 8.4-2

SIGNIFICANCE EVALUATION OF THE PROJECT'S CONTRIBUTION TO CUMULATIVE EFFECTS ON HORU

Potential Cumulative Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
1. HORU Indicators – Parks and Protected Areas									
1(a) Project contribution to cumulative physical disturbance to land and resource use areas.	Negative	Footprint	Short-term	Periodic	Short-term	Low to medium	High	Moderate	Not significant
1(b) Project contribution to cumulative change to access and use patterns.	Negative to positive	HORU RSA	Short-term	Isolated to periodic	Short to long-term	Low to medium	High	Moderate	Not significant
2. HORU Indicator – Indian Reserves, Métis Settlements and Asserted Traditional Territories									
2(a) Refer to Potential Cumulative Effects 1(a) and 1(b).	Refer to Potential Cumulative Effects 1(a) and 1(b).								
3. HORU Indicator – Residential Use									
3(a) Refer to Potential Cumulative Effects 1(a) and 1(b).	Refer to Potential Cumulative Effects 1(a) and 1(b).								

TABLE 8.4-2 Cont'd

Potential Cumulative Effects	Impact Balance	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance[1]
			Duration	Frequency	Reversibility				
4. HORU Indicator – Agricultural Use									
4(a) Refer to Potential Cumulative Effects 1(a) and 1(b).	Refer to Potential Cumulative Effects 1(a) and 1(b).								
5. HORU Indicator – Outdoor Recreation Use									
5(a) Refer to Potential Cumulative Effects 1(a) and 1(b).	Refer to Potential Cumulative Effects 1(a) and 1(b).								
6. HORU Indicator – Other Land and Resource Use									
6(a) Refer to Potential Cumulative Effects 1(a) and (b).	Refer to Potential Cumulative Effects 1(a) and 1(b).								
7. HORU Indicator – Water Supply and Use									
7(a) Refer to Potential Cumulative Effect s1(a) and (b).	Refer to Potential Cumulative Effects 1(a) and 1(b).								
8. HORU Indicator – Aesthetic Attributes									
8(a) Project contribution to cumulative sensory or viewshed disturbance.	Negative	HORU RSA; Marine HORU RSA	Short-term	Isolated to periodic	Short to long-term	Low	High	High	Not significant
9. HORU Indicator – MCRTU									
9(a) Project contribution to cumulative changes in marine access and use patterns.	Neutral to negative	Marine HORU RSA	Short-term	Isolated	Short-term	Low to medium	High	High	Not significant
10. Project Contribution to Combined Cumulative Effects on HORU									
10(a) Project contribution to combined cumulative effects on the HORU indicators (1[a], 1[b], 8[a], 9[a]).	Negative to positive	HORU RSA; Marine HORU RSA	Short-term	Isolated to periodic	Short to long-term	Low to medium	High	Moderate	Not significant

Notes: 1 Significant Contribution to a Cumulative Socio-Economic Effect: the Project's contribution to a cumulative socio-economic effect is considered significant if the Project's contribution to the effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

8.4.3.1 Physical Disturbance to Land and Resource Use Areas

As discussed in Section 8.4.2, various land use types including parks and protected areas, IRs and traditional land use areas, residential use and other land resource use are crossed by the proposed pipeline corridor and occur throughout the HORU RSA. These land and resource use types will likely be physically disturbed during the construction phase of the Project at particular locations and specific times. In general, the Project will not cause physical disturbances to land and resource use areas during operations; however, site-specific maintenance may cause short-term disturbances.

Reasonably foreseeable developments may also disturb various land and resource use types, some in the same locations as proposed Project activities and more commonly at a HORU RSA level. Reasonably foreseeable developments in Appendix 8.1 that may occur within the proposed pipeline corridor and, therefore, have the potential to overlap in both time and space with the Project, include:

- Edmonton Region: the Edmonton to Hardisty Pipeline Project, the Heartland Transmission Project, Parkland Airport Phase 1, Line 2 Replacement Project, and the Polaris Expansion Project;
- Rural Alberta Region: Vista Project, various oil and gas activities;

- Fraser-Fort George/Thompson-Nicola Region: Ajax Project, Merritt Area Transmission Project, Interior-Lower Mainland Transmission Project, Kingsvale/Oliver Natural Gas Pipeline Project;

- Fraser Valley Region: Deneau Creek Hydroelectric Project, Patterson Creek Hydroelectric Project; and

- Metro Vancouver Region: Sky Train Evergreen Line Rapid Transit Project.

Most of the reasonably foreseeable developments occur outside the proposed pipeline corridor within the wider HORU RSA. These developments will not overlap spatially with the Project, but rather will contribute to cumulative disturbances to human use areas at the regional scale.

Existing activities contributing to disturbance of certain land and resource use areas include agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. However, such existing activities are in themselves valued types of human uses, so the level of perceived effect generally depends upon an existing activity's consistency with local and regional management plans and other existing and desired land uses in a particular area.

There will be cumulative effects on different land and resource use types in different areas of the HORU RSA. For example, in the Edmonton and Metro Vancouver regions, other reasonably foreseeable developments may act in combination with the Project to affect residential and commercial/industrial use areas. In rural areas, such as those in the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions, reasonably foreseeable developments are likely act in combination with the Project to create cumulative effects in traditional land use areas, areas used for outdoor recreational use, commercial hunting/trapping/fishing/outfitting, forestry, and mineral/aggregate/oil and gas resource use areas. In the Fraser Valley Region, reasonably foreseeable developments are likely act in combination with the Project to create cumulative effects for agricultural use areas. Map reviews indicate it is likely that few if any of the reasonably foreseeable developments are proposed within provincial parks or other protected areas, thereby limiting cumulative disturbance effects on this particular indicator.

Mitigation measures proposed in Section 7.2.4 will avoid or reduce the Project-related cumulative effects on physical disturbance to land and resource user areas. Affected land and resource users will be notified of the construction schedule and any maintenance activities (*e.g.*, integrity digs), and access and use agreements will be negotiated with landowners, occupants, and tenure holders as required. No mitigation measures beyond the Project-specific mitigation already proposed in Section 7.2.4 are deemed to be warranted.

Trans Mountain will track cumulative socio-economic issues and the outcomes of Project-specific mitigation strategies, where applicable, to confirm predications made based on desktop studies, existing literature and the professional experience of the assessment team. The Project will develop an issues tracking process, as noted in the SEMP in Volume 6B.

Overall, the Project's contribution to cumulative effects on physical disturbance to land and resource use areas is considered to have a negative impact balance, but will be reversible in the short-term since it is limited to the construction phase and short periods of site-specific maintenance. The Project's contribution to cumulative effects on disturbance to land and resource use areas is considered to be of low to medium magnitude (Table 8.4-2, point 1[a]), because there will be distinctions between regions. There are a large number of reasonably foreseeable developments in the Edmonton Region, Rural Alberta Region, Fraser Valley Region and Metro Vancouver Region; consequently, the Project's contribution to cumulative effects in these regions is considered to be low. In regions with fewer existing activities and reasonably foreseeable developments, the Project's contribution may result in a more detectable change to the overall effect. A summary of the rationale for all of the significance criteria of combined cumulative effects on disturbance to land and resource use areas is provided below.

- Spatial Boundary: Footprint – the Project's contribution to cumulative effects on physical disturbance to land and resource use areas will be limited to the Footprint.

- Duration: short-term – Project construction and site-specific maintenance (occurring within any one year during operations) are the activities that would contribute to the cumulative effect.

- Frequency: periodic – the Project events that may act in combination with other activities and developments will occur intermittently and repeatedly (*i.e.*, during the construction phase and then during site-specific maintenance during operations).

- Reversibility: short-term – the Project's contribution to the cumulative effect will occur during construction and site-specific maintenance activities completed within any one year during operations.

- Magnitude: low to medium – the Project's contribution will be smaller in larger regions with a greater level of anticipated activity; while the Project's contribution will be greater in smaller regions with a lower level of anticipated activity.

- Probability: high – construction activities for the Project will act with other reasonably foreseeable developments to cause a cumulative disturbance to land and resource use areas.

- Confidence: moderate – based on the professional experience of the assessment team, in consideration of the lack of specific footprint information for many reasonably foreseeable developments and location of specific land use activities in the vicinity of reasonably foreseeable developments.

8.4.3.2 Change to Access and Use Patterns

Changes to access and use patterns of land and resource use areas extending into some areas of the HORU RSA are anticipated to result from physical disturbance of access roads and/or from alteration of traffic patterns, movements and volumes along highways and roads. This potential cumulative effect could also result from physical disturbance to land, resulting in an inability to access certain use areas. As discussed, various land use types — including parks and protected areas, IRs and traditional land use areas, residential use, outdoor recreation use, and other land resource uses — are crossed by the proposed pipeline corridor. As a result, recreationalists may alter their use destinations away from areas that are directly or indirectly affected by Project construction. Disruption of access may result in certain Aboriginal land and resource users being temporarily deterred from practicing traditional activities in select locations. Also, construction activity could temporarily deter people from visiting specific commercial locations or affect resource-based business practices. Changes in access and use patterns related to construction activities will be planned, coordinated with appropriate authorities and short-term in duration. While the Project may contribute to short-term disturbance of some resource-based business and livelihood practices (*e.g.*, agriculture, commercial hunting/trapping/fishing/outfitting, forestry, commercial-recreation operations), with the implementation of mitigation measures to avoid or reduce disturbance and provide compensation (considering various forms) for proven economic loss, the likelihood of any residual contribution to a loss of income for resource users is low.

As discussed in Section 8.4.2, it is anticipated that the reasonably foreseeable developments listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 will also cause changes in access and use patterns of various land and resource users that would overlap with Project effect. In the Edmonton and Metro Vancouver regions, other reasonably foreseeable developments will act in combination with the Project to affect access and use patterns of residential and commercial/industrial use areas. In rural areas, such as those in the Rural Alberta and Fraser-Fort George/Thompson-Nicola regions, reasonably foreseeable developments will likely act in combination with the Project to create cumulative effects on access and use patterns for traditional land use areas, areas used for outdoor recreational use, commercial hunting/trapping/fishing, outfitting, forestry, and mineral/aggregate resource use areas.

Mitigation measures proposed in Section 7.2.4 will reduce the Project-related planned and coordinated activities' contribution to cumulative effects on change to access and use patterns. These measures include: implementing Traffic Control plans for site-specific sections of roads affected by the Project; developing a communication plan for activities that impact normal traffic flow, such as road closures and detours; and boring under heavily used roads. It is expected that operators of other reasonably foreseeable developments will implement similar mitigation. No mitigation measures beyond the

Project-specific mitigation already proposed in Section 7.2.4 and the SEMP (Volume 6B) are deemed to be warranted.

The Project's contribution to cumulative effects on change to access and use patterns within the HORU RSA is considered to have both a negative and positive impact balance. It will be negative where access may be impaired during construction, and positive for some users where new access is opened up in areas where new right-of-way deviates from the existing TMPL system right-of-way (*e.g.*, recreationalists, commercial hunting/trapping/fishing, outfitters). The contribution to the cumulative effect is reversible in the short to long-term. In existing right-of-way areas, changes to access and use patterns resulting from the Project will occur during the construction phase and during short periods of site-specific maintenance. However, in areas where the proposed pipeline corridor deviates from the existing TMPL system right-of-way, the Project's contribution to the cumulative effect will extend throughout the operations phase and, therefore, is considered to be reversible in the long-term. The Project's contribution to cumulative effects on changes to access and use patterns is low to medium in magnitude (Table 8.4-2, point 1[b]); this range in magnitude results from distinctions between regions. There are a large number of reasonably foreseeable developments in the Edmonton Region, Rural Alberta Region, Fraser Valley Region and Metro Vancouver Region; consequently, the Project's contribution to cumulative effects in these regions is considered to be low. In other regions with fewer reasonably foreseeable developments, the Project's contribution will result in a more detectable change to the overall effect. A summary of the rationale for all of the significance criteria of combined cumulative effects on access and use patterns is provided below.

- Spatial Boundary: HORU RSA – the Project's contribution to cumulative effects on changes to access and use patterns may extend to some users in the HORU RSA, but will not extend throughout the entire HORU RSA.

- Duration: short-term – the Project events causing a contribution to cumulative changes to access and use patterns are construction activities and site-specific maintenance that would occur during any one year during operations.

- Frequency: isolated to periodic – the Project events causing a contribution to cumulative changes to access and use patterns are either limited to construction phase activities (isolated) or would occur intermittently and repeatedly related to site-specific maintenance (periodic).

- Reversibility: short to long-term – the Project's contribution to the cumulative effect is limited to the construction phase and site-specific maintenance activities, except where the proposed pipeline corridor deviates from the existing TMPL system right-of-way, where areas of new right-of-way may result in long-term changes in use and access.

- Magnitude: low to medium – the Project's contribution will be smaller in larger regions that have a greater level of anticipated activity, while the Project's contribution will be greater in smaller regions that have a lower level of anticipated activity.

- Probability: high – the Project will act with other reasonably foreseeable developments to cause cumulative changes in access and use patterns of various land and resource use areas.

- Confidence: moderate – based on the professional experience of the assessment team in consideration of the lack of specific footprint information for many reasonably foreseeable developments and the location of specific land use activities in the HORU RSA.

8.4.3.3 Sensory or Viewshed Disturbance

Nuisance air emissions, noise and disturbance-related visual effects will occur during the construction of the Project and may affect land and resource users living, working or recreating in the vicinity of Project components. Effects may result from emissions (including nuisance odours) and noise from construction equipment and vehicles, as well as dust from vehicles. It may also include lighting associated with construction activities. The high population density in urban areas of the proposed pipeline corridor is likely to result in the disturbance of many people, while in rural, less populated areas, disturbance will be of similar magnitude but will likely affect fewer people. Sensory disturbance related to the increased berthing of tankers at the Westridge Marine Terminal and associated anchor chain noise may also occur

during the operations phase. Changes in viewshed during operations are anticipated to occur in areas where the Project will result in new above ground facilities: these include the expanded Westridge Marine Terminal, the proposed Black Pines Pump Station and power line, the Kingsvale Pump Station power line, and where new storage tanks are added at the Edmonton, Sumas and Burnaby terminals. Changes in viewshed may also occur in areas of new vegetation cut in the select areas where the proposed pipeline corridor deviates from the existing TMPL system right-of-way.

All existing activities in the proposed pipeline corridor and HORU RSA (*e.g.*, existing traffic, current business/industrial operations, residential/settlement areas, other built areas) currently contribute to sensory and viewshed disturbance for land and resource users. Reasonably foreseeable developments are likely to cause nuisance air emissions, noise, and visual disturbance effects during their construction periods. Where they result in above ground structures or new vegetation cuts, reasonably foreseeable developments will also act in combination with the Project to create cumulative viewshed disruptions during their operations phases. As such, the Project will act cumulatively with existing oil and gas activities (*e.g.*, pipeline rights-of-way and facilities), agricultural activities, rural and urban residential development, transportation activities (*e.g.*, roads) and utility activities in the area to cause sensory or viewshed disturbance within the HORU RSA. The Project will also act in combination with the reasonably foreseeable developments identified in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 to create cumulative sensory disturbance effects during the construction phase. Where reasonably foreseeable developments will result in above ground structures or new clearings, they will also act in combination with the Project to create changes in the viewshed.

Many mitigation measures are in place to reduce the visual effects of the Project and related cumulative effects on the viewshed. These include: replacing ornamental trees and other vegetation disturbed during construction or site-specific maintenance; reclaiming the pipeline right-of-way and allowing for natural recovery of the proposed construction right-of-way and temporary workspace, where appropriate; using seeds that ensure vegetation regrowth blends with adjacent vegetation; and painting expanded facility components neutral colours and/or the same colours as pre-existing structures, as outlined in the Pipeline, Facilities and Westridge Marine Terminal EPPs (Volume 6B, 6C and 6D). Proposed mitigation measures related to air quality and noise (*e.g.*, working with local and provincial regulatory authorities for what is required through by-laws and legislation, and maintaining noise suppression equipment on all construction machinery and vehicles) will reduce sensory disturbances. It is expected that operators of reasonably foreseeable developments will also implement similar measures developed in accordance with industry and provincial regulatory guidelines to reduce sensory and viewshed disturbance. No mitigation measures beyond the Project-specific mitigation already proposed in the SEMP (Volume 6B) and EPPs (Volumes 6B, 6C and 6D) are deemed to be warranted.

The Project's contribution to cumulative sensory or viewshed disturbance within the HORU RSA is considered to have a negative impact balance. The contribution to the cumulative effect is considered to be reversible in the short to long-term; sensory disturbance due to construction and site-specific maintenance activities will be short-term, while viewshed change associated the Project's new above ground structures (*i.e.*, Westridge Marine Terminal, Black Pines Pump Station and power line, the Kingsvale Pump Station power line, and new storage tanks at the Edmonton, Sumas and Burnaby terminals) and new cuts along areas of new right-of-way will be long-term (Table 8.4-2, point 8[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on sensory or viewshed disturbance is provided below.

- Spatial Boundary: HORU RSA and Marine HORU RSA – the Project's contribution to sensory and/or viewshed effects may extend to some users in the HORU RSA and Marine HORU RSA, but will not extend throughout the entire HORU RSA or Marine HORU RSA.

- Duration: short-term – the events causing the Project's contribution to cumulative sensory disturbance are construction activities and site-specific maintenance that would occur during any one year during operations.

- Frequency: isolated to periodic – the events causing the Project's contribution to cumulative sensory disturbance occur intermittently but repeatedly over the assessment period (*i.e.*, construction and site-specific maintenance) (periodic); the event causing a Project contribution to changes in viewshed is the construction of the pipeline and facilities (isolated).

- Reversibility: short to long-term – the Project's contribution to sensory disturbance will occur over the short-term during construction and site-specific maintenance activities, and over the long-term at above ground facilities and new areas of cut where the Project deviates from the existing TMPL system right-of-way. In these areas, the Project's contribution to viewshed alteration is not expected to reverse until abandonment.

- Magnitude: low – the Project's contribution to sensory or viewshed disturbance may be detectable, but is considered to be an inconvenience or nuisance.

- Probability: high – construction and operation of the Project will contribute to sensory disturbance during construction, and will alter viewsheds where new above ground facilities and new cut areas are viewable by various land and resource users.

- Confidence: high – based on the professional experience of the assessment team.

8.4.3.4 Changes to Marine Access and Use Patterns

It is anticipated that barges will be used to transport most construction materials related to the Westridge Marine Terminal expansion, since the access road off the Barnet Highway is narrow with a steep grade and has limited capacity to manage heavy equipment vehicles. As such, tugs, barges, other vessels and booms related to expansion of the docks will be around the new dock area while it is being built. The marine facilities will be built from the water using marine derricks, and construction-related equipment may extend up to about 100 m beyond the footprint of the expanded dock (the current dock extends 75 m into Burrard Inlet and the new dock is anticipated to extend approximately 250 m into Burrard Inlet; thus, maximum marine footprint of construction activities may be approximately 350 m into Burrard Inlet). It is not anticipated that construction-related vessels and marine equipment will obstruct passage of other vessels in Burrard Inlet, given the size of the inlet passage at the terminal site. In the unlikely event that there is any potential short-term obstruction of the waterway during construction that would affect safe navigation of other vessels, this would be coordinated in advance through the PMV Harbour Master and Canadian Coast Guard. Waterway users are notified of such activities through the Canadian Coast Guard's weekly Notice to Mariners. Increased activity at the terminal during construction may factor into certain users (*e.g.*, recreational or traditional marine users) changing their movement patterns away from areas around the terminal.

There are existing uses of the marine waters in Burrard Inlet that may interact with Project construction-related marine delivery vessels and any marine construction equipment. Marine vessel traffic in the area of Burrard Inlet around the Westridge Marine Terminal includes tugs, tankers, barges and other cargo vessels, service vessels, passenger vessels (such as pleasure craft and harbour cruises) and fishing vessels. There are also recreational users including kayakers, scuba divers, and fishers in addition to traditional Aboriginal users. As discussed in Volume 8A (Marine Transportation Assessment) and in Volume 8C (TERMPOL Origin, Destination and Marine Traffic Volume Survey), in 2012 there were an estimated 6,858 counted vessel movements in Burrard Inlet (moving north-south across Burrard Inlet just west of the Westridge Marine Terminal). Most of these movements (5,631) were tugs; the total counted movements excluding tugs was 1,227. These counts do not include small vessels that do not report to Vessel Traffic Services of the Canadian Coast Guard (*e.g.*, sailing yachts, motor yachts and sport fishing boats less than 30 m in length, or other vessels less than 20 m in length). The TERMPOL studies estimate that vessel traffic in this portion of Burrard Inlet is anticipated to increase by approximately 1.0% per year for cargo/carrier, tugs, service, passenger and other vessel types, and that tanker vessels are anticipated to increase approximately 2.0% annually (not including Project-related marine vessels). Based on this, in 2016 marine vessel traffic in Burrard Inlet is estimated be approximately 288 vessels/year above 2012 levels, and in 2030 it is estimated to be approximately 1,400 vessels/year more than 2012 levels (not including Project-related vessels).

All existing activities and future marine traffic in Burrard inlet will interact with Project-related activities to contribute to the potential for cumulative changes in marine access and use patterns during the construction phase of the Project. Mitigation measures outlined in Section 7.6.4.4, such as those designed to communicate construction activities and schedules to the marine community in Burrard Inlet, should lessen the Project's effect by allowing other users to consider alternate movement patterns during the key construction window. No mitigation measures beyond the Project-specific mitigation already

proposed in the SEMP (Volume 6B) and Westridge Marine Terminal EPP (Volume 6D) are deemed to be warranted.

The Project's contribution to cumulative effects on changes in marine access and use patterns is considered to be neutral to negative. Construction-related delivery barges and an increased construction zone around the terminal temporarily reduce marine access channels around the Westridge Marine Terminal, but they will not constrict marine passage and waterway users will be notified of all activity in the area (neutral impact balance). There may, however, be a negative contribution to effects on recreational or traditional marine users that change their use patterns to avoid the terminal area during construction. The contribution to the cumulative effect is short-term, since these activities would only occur during the construction phase. The frequency of the Project's contribution is isolated and the reversibility is considered short-term. The Project's contribution to any cumulative change in marine access and use patterns is low to medium in magnitude, as it is considered to be primarily that of an inconvenience or nuisance but may have implications for livelihood practices for some traditional or tourism marine users. The probability of a Project contribution to the cumulative effect is high, given the location of the Westridge Marine Terminal in relation to other marine use routes and the increased use of barges during construction (Table 8.4-2, point 9[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on marine access and use patterns is provided below.

- Spatial Boundary: Marine HORU RSA – marine access routes disrupted by construction could be located in the Footprint while the recreation, commercial or traditional use areas connected by the access routes could be located in the Footprint, Marine HORU LSA and/or Marine HORU RSA.

- Duration: short-term – the Project's contribution to disruption to marine access and use patterns is caused by construction-phase delivery barges and an expanded off-limits area around the Westridge Marine Terminal.

- Frequency: isolated – the event contributing to cumulative disruption to marine access and use is confined to a specific period (*i.e.*, specific months of construction activity).

- Reversibility: short-term – the Project's contribution to the cumulative effect is limited to the construction phase.

- Magnitude: low to medium – marine passage through Burrard Inlet will not be constricted around the terminal during construction, but for some marine users (*e.g.*, recreational, tourism, traditional) who choose to change their movement patterns away from the terminal, it may be considered an inconvenience or nuisance (low). There is the possibility for implications for livelihood practices for some marine users (medium).

- Probability: high – this is based on Project information and the location of the Westridge Marine Terminal in relation to the vessel traffic routes in Burrard Inlet.

- Confidence: high – this is based on the location of shipping lanes, dock complex layout, and knowledge of locations of popular use areas in relation to the Westridge Marine Terminal.

8.4.3.5 Combined Cumulative Effects on Human Occupancy and Resource Use

The potential cumulative effects (*i.e.*, effects on physical disturbance to land and resource use areas, change in access and use patterns, sensory and viewshed disturbance, and changes in marine access and use patterns) may emerge as the Project acts in combination with existing activities and reasonably foreseeable developments. The impact balance of the Project's contribution to HORU cumulative effects could be both negative and positive. The Project may contribute negatively to cumulative physical disturbance to land and resource use areas, disruption to access in select areas, and sensory/viewshed disturbance in select locations; however, the Project may also contribute positively to improved access in certain areas where new right-of-way deviates from the existing TMPL system right-of-way. The implementation of mitigation measures described in Section 7.2.4 will reduce the magnitude of adverse cumulative effects associated with the Project. The Project's contribution to combined cumulative effects on HORU is considered low to medium in magnitude, depending on the size and extent of other activity in different regions within the HORU RSA and marine vessel traffic increases Marine HORU RSA during the

construction phase. The Project's contribution to an overall cumulative effect on HORU is considered short-term in duration, isolated to periodic in frequency and reversible in the short to long-term depending on the particular effect (Table 8.4-2, point 10[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on HORU is provided below.

- Spatial Boundary: HORU RSA/Marine HORU RSA – the Project's contribution to cumulative effects on HORU may extend to areas of the HORU RSA and Marine HORU RSA.

- Duration: short-term – the events causing the Project's contribution to cumulative effects on HORU are limited to the construction phase or periods of site-specific maintenance occurring within any one year during operations.

- Frequency: isolated to periodic – the events causing the Project's contribution to cumulative effects on HORU are associated with the construction (isolated) or site-specific maintenance (periodic).

- Reversibility: short to long-term – the Project's contribution to cumulative effects on HORU are for the most part reversible with the end of construction or site-specific maintenance activities (short-term); however, a contribution to some effects (*i.e.*, changes in access and use in select areas of new pipeline right-of-way or changes in viewshed) may persist throughout operations.

- Magnitude: low to medium – the Project's contribution to cumulative effects on HORU will be limited to a nuisance or inconvenience for some effects (*i.e.*, sensory disturbance, changes in viewshed, recreational land and resource use) (low); the Project's contribution may be medium in magnitude where it may have implications for business or livelihood use patterns.

- Probability: high – there is a high degree of probability that a Project contribution to cumulative effects on HORU will occur.

- Confidence: moderate – this is based on Project information, feedback from stakeholders, available information on land and resource use patterns, and the professional experience of the assessment team. Particulars of the Project's contribution to cumulative effects will be influenced by right-of-way finalization and advancement of Project details in terms of traffic estimates and facility design.

8.4.4 Summary

As identified in Table 8.4-2, there are no situations where the Project's contribution to cumulative effects on HORU indicators will be significant. Consequently, the Project's contribution to adverse cumulative effects on HORU within the HORU RSA and Marine HORU RSA will be not significant.

8.5 Infrastructure and Services

This subsection discusses how the Project could act in combination with existing activities and reasonably foreseeable developments to cumulatively affect infrastructure and services indicators (*e.g.*, transportation infrastructure, linear infrastructure, housing, waste and water infrastructure, educational services, emergency, protective and social services, and recreational amenities).

The discussion of cumulative effects focuses only on indicators that are anticipated to have an adverse combined Project-specific residual effect, as discussed in Section 7.10 of Volume 5B. For infrastructure and services, the indicators anticipated to have a combined overall adverse residual effect are transportation infrastructure; linear infrastructure and power supply; waste and water infrastructure; housing; and emergency, protective and social services. The educational services and recreational amenities indicators are not considered in the cumulative effects assessment, since no adverse effects related to the Project were identified.

As with some other socio-economic elements, it is expected that a key cause of cumulative effects on infrastructure and services is related to a temporary in-migration of people from outside the Socio-Economic RSA to regional commercial centres. Many projects and activities will be competing for available labour within the Socio-Economic RSA, which can cumulatively increase pressure on the regional labour market such that new workers and population will be drawn to the region. Such cumulative population increases will increase demand on regional infrastructure and services. However,

infrastructure planning at the regional and municipal levels typically considers future population growth based on economic growth projections for industrial development and capital projects. There is also potential for projects and activities to act cumulatively in terms of direct physical disruption or disturbance to certain types of infrastructure and services. This may occur from use of key regional highways for transportation of materials and labour, other linear projects requiring road/rail crossings, and any capital construction projects requiring municipal or regional water and waste services.

As previously noted in Section 8.3, socio-economic cumulative effects are highly complex, are affected by multiple dynamic factors, and no standard models are available for conducting socio-economic cumulative effects assessments. Furthermore, there are insufficient details around scheduling, work force, and procurement strategies of many reasonably foreseeable developments that would otherwise assist in predicting overall labour needs and resulting population changes. Projected population changes are the precursor to understanding many other potential cumulative effects in the Socio-Economic RSA, including those related to infrastructure and services. There is also a lack of information on the precise infrastructure and service requirements of, and anticipated traffic volumes associated with, reasonably foreseeable projects that could overlap in time and space with Project construction. In addition, there is limited available information on regional infrastructure and service capacity limits; however, future announced projects are in the public domain and are typically considered in municipal, regional and provincial population growth estimates and infrastructure planning decisions. Given the lack of quantitative and specific data, the assessment of cumulative effects on infrastructure and services relies on a qualitative approach.

The assessment of cumulative effects on infrastructure and services pertains to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the Westridge Marine Terminal), because the communities and regions in which the Project occurs will experience Project-related activities in an integrated manner. It is not meaningful from a community perspective to discuss the infrastructure and services effects of each Project component on a stand-alone basis.

The approach to cumulative effects for infrastructure and services differs from biophysical and some other socio-economic elements in that the focus is on how a range of effects *themes* may interplay with other existing activities and reasonably foreseeable developments. A key theme is capacity pressure on regional infrastructure and services, since all types of infrastructure and services may be impacted by cumulative labour demands and associated population growth.

8.5.1 Reasonably Foreseeable Developments

Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 provide a list of the certain and reasonably foreseeable developments located within the Socio-Economic RSA considered in the evaluation of cumulative effects on the infrastructure and services indicators. Description of these and other developments is provided in Section 8.1.4, and developments in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 are shown on Figures 8.1-1a, 8.1-1b and 8.1-1c. Reasonably foreseeable developments shown in Table 8A.1-5 (for Alberta) and Table 8A.1-6 (for BC) of Appendix 8.1 with the potential to act in combination with the Project were excluded from mapping since development details (*e.g.*, approval status, location) were either not available or the developments were located within urban municipal boundaries, such as the City of Edmonton and LMDA (with the exception of the Golden Ears Connector Project [Figure 8.1-1c]).

In the Socio-Economic RSA, there are approximately 196 reasonably foreseeable developments either fully within the Socio-Economic RSA or, for some transmission lines and pipelines, partially within the Socio-Economic RSA (Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1). In addition, there are approximately 3,147 reasonably foreseeable minor oil and gas developments in Alberta: 712 pipelines; 2,093 facilities; and 342 wells (Tables 8A.1-2 to 8A.1-4 of Appendix 8.1).

8.5.2 Potential Cumulative Effects

The potential and likely combined socio-economic residual effects associated with the construction and operation of the Project on infrastructure and services indicators were identified in Section 7.10.5. The combined Project effects on infrastructure and services indicators, where the overall combined effect was adverse and considered likely, are listed in Table 8.5-1 along with existing activities and reasonably foreseeable developments that could act in combination with the Project.

When examining the potential for the Project's residual effects on infrastructure and services to act in combination with the residual effects of other existing activities and reasonably foreseeable developments, several themes emerge that are the focus of the discussion of cumulative effects. These themes are:

- effects on transportation infrastructure;
- decrease in land available for future sub-surface linear infrastructure planning; and
- increase in demand on regional infrastructure and services.

TABLE 8.5-1

POTENTIAL RESIDUAL EFFECTS OF THE PROJECT ON INFRASTRUCTURE AND SERVICES CONSIDERED FOR THE CUMULATIVE EFFECTS ASSESSMENT

Potential Residual Project Effect on Indicator	Spatial Boundary[1]	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
1. Combined effects of the Project on transportation infrastructure.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction	Project contribution to cumulative effects on transportation infrastructure.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities that could interact with the above activities including Project traffic, road use and crossings, and construction phase workers.
2. Combined effects of the Project on linear infrastructure and power supply.	Footprint to RSA	Linear Infrastructure: Pipeline Power Supply: Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction Operations	Project contribution to cumulative decrease in land available for future sub-surface linear infrastructure planning. Project contribution to cumulative increase in demand on regional infrastructure and services.	• Existing activities including: agriculture and livestock grazing, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas development, and mineral resource development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities that could interact with the above activities including construction activities, operations power needs, and the ongoing presence of the pipeline.

TABLE 8.5-1 Cont'd

Potential Residual Project Effect on Indicator	Spatial Boundary[1]	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
3. Combined effects of the Project on waste and water infrastructure.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction	Project contribution to cumulative increase in demand on regional infrastructure and services.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities and personnel requirements associated with construction.
4. Combined effects of the Project on housing.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction		
5. Combined effects of the Project emergency, protective and social services.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction		

Note: 1 RSA = Socio-Economic RSA.

8.5.3 Significance Evaluation of Potential Cumulative Effects

A qualitative assessment was deemed to be the most appropriate approach by which to evaluate the significance of the Project's contribution to potential cumulative effects on infrastructure and services. This was due to the lack of quantifiable data on traffic volumes and traffic management plans for other developments, an absence of precise locations of reasonably foreseeable linear developments in relation to municipal utility corridors and uncertainties around projected infrastructure needs and plans and regional infrastructure/services capacity limits. Consequently, the evaluation of the potential contribution to cumulative effects on infrastructure and services relied on the professional judgment and extensive experience of the assessment team.

Table 8.5-2 provides a summary of the significance evaluation of the Project's contribution to potential cumulative effects on infrastructure and services indicators. The rationale used to evaluate the significance of each of the cumulative effects is provided below.

TABLE 8.5-2

SIGNIFICANCE EVALUATION OF THE PROJECT'S CONTRIBUTION TO CUMULATIVE EFFECTS ON INFRASTRUCTURE AND SERVICES

Potential Cumulative Effects	Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
			Duration	Frequency	Reversibility				
1. Infrastructure and Services Indicator – Transportation Infrastructure									
1(a) Project contribution to cumulative effects on transportation infrastructure.	Negative	RSA	Short-term	Isolated	Short-term	Low to medium	High	Moderate	Not significant
2. Infrastructure and Services Indicator – Linear Infrastructure and Power Supply									
2(a) Project contribution to cumulative decrease in land available for future linear infrastructure planning.	Negative	RSA	Long-term	Continuous	Long-term	Low to medium	High	Low	Not significant
3. Infrastructure and Services Indicator – Waste and Water Infrastructure									
3(a) Project contribution to cumulative increased demand on regional infrastructure and services.	Negative and positive	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	Moderate	Not significant
4. Infrastructure and Services Indicator – Housing									
4(a) Refer to Potential Cumulative Effect 3(a).	Refer to Potential Cumulative Effect 3(a).								
5. Infrastructure and Services Indicator – Emergency Protective and Social Services									
5(a) Refer to Potential Cumulative Effect 3(a).	Refer to Potential Cumulative Effect 3(a).								
6. Project Contribution to Combined Cumulative Effects on Infrastructure and Services									
6(a) Project contribution to cumulative effects on the infrastructure and services indicators (1[a], 2[a] and 3[a]).	Negative and positive	RSA	Short to long-term	Isolated to continuous	Short to long-term	Negligible to medium	High	Moderate	Not significant

Notes: 1 RSA = Socio-Economic RSA.

2 Significant Contribution to a Cumulative Socio-Economic Effect: the Project's contribution to a cumulative socio-economic effect is considered significant if the contribution is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

8.5.3.1 Transportation Infrastructure

During Project construction, there will be an increase in traffic on road and rail networks due to Project-related vehicles and movement of supplies and equipment. The Project may also result in short-term physical disturbance to smaller roads (rail lines, as well as paved and high use roads, will be bored under), as well as disturbance related to increased wear and tear on smaller roads associated with Project-related traffic and heavy equipment vehicles. Construction-related road traffic will include vehicles used for the transportation of equipment, supplies and workers to various locations along the proposed pipeline corridor. National, provincial and municipal highways, municipal roads, and access roads (*e.g.*, residential, agricultural, forestry) within the Socio-Economic RSA will be used. Major highways likely to be used to access the Project include Highway 16 (Yellowhead) in Alberta and BC and Highway 5 (Coquihalla), Highway 1 (Trans-Canada) and Highway 7 (Lougheed Highway) in BC. Trans Mountain anticipates that from the point of manufacture, pipe and materials will be transported by ship or by rail to temporary stockpile sites along the construction right-of-way.

During construction, the proposed pipeline will cross various road types, including national, provincial and municipal highways, municipal roads and access roads (*e.g.*, residential, agricultural, forestry). Examples of highway crossings include Highway 16 in Alberta and BC; Highway 5 in BC; Highway 5A in Merritt; Highway 1 in the Fraser Valley and Metro Vancouver regions; Highway 11 in Abbotsford; and Highway 7 (Lougheed Highway) in the Metro Vancouver Region. Examples of road crossings include Baseline Road in Strathcona County; Range Road 41 north of the Village of Wabamun; Westsyde Road, Tranquille Road, Ord Road and Mission Flats Road in the City of Kamloops; Vedder Road in the City of Chilliwack;

Golden Ears Way in the Township of Langley; the South Fraser Perimeter Road in the City of Surrey; Brunette Avenue in the City of Coquitlam; and Burnaby Mountain Parkway and Barnet Road in the City of Burnaby. More details about municipal and other access road crossings will be finalized during detailed engineering and right-of-way finalization.

Project-related traffic will act in combination with existing users of the regional road and rail networks, including the general population and industrial and commercial users. Construction of the reasonably foreseeable developments within the Socio-Economic RSA listed in Appendices 8A.1-1 to 8A.1-6 will also contribute to increased traffic and some level of disturbance to roads, due to the movement of equipment, materials and workers and road/rail crossings (for linear developments). While it is not measurable, the cumulative effect on traffic volumes, particularly considering existing activities, is likely to be most noticeable in the Edmonton Region and Metro Vancouver Region, because they are already densely populated areas (and consequently high traffic volumes) and there are numerous reasonably foreseeable developments that would likely contribute to an increase in traffic on road and rail networks. In terms of cumulative effects on increased physical disturbance to road infrastructure due to wear and tear, however, major arterials in heavily populated/industrialized areas are designed for higher traffic loads, so the cumulative effects on road disturbance may be more noticeable in smaller centres.

Without knowing traffic volumes, transportation routes, and road crossing techniques (for linear developments) for each reasonably foreseeable development, it is difficult to accurately predict the Project's contribution to cumulative effects on transportation infrastructure. However, many of the reasonably foreseeable developments in the Socio-Economic RSA are likely to share the major highways also used by the Project (Highway 16 in Alberta and BC, Highway 5 and Highway 1 Trans-Canada in BC) for the movement of equipment and labour through various regions, as these are key regional transportation arterials.

The mitigation measures outlined in Section 7.5.5.4 of the SEMP (Volume 6B) and the Pipeline EPP (Volume 6B) will reduce the Project's contribution to cumulative effects on transportation infrastructure in the Socio-Economic RSA. The Project Traffic and Access Control Management Plan and the development of Traffic Control Plans for site-specific sections of roads affected by the Project will assist in the management of Project-related traffic effects. The use of multi-passenger vehicles will reduce personal vehicles on local roads and the use of rail for pipe and steel deliveries will limit the distances travelled by Project-related heavy equipment vehicles. Negotiating road and highway crossing agreements, boring under paved and high use roads, and boring under railways will reduce the disturbance of roads and rail lines during construction. Communicating with municipalities and placing notices announcing the Project location and construction schedule will allow road and highway users to be aware of the presence of Project-related activities in the vicinity of key transportation routes. It is anticipated that companies constructing reasonably foreseeable developments during the same period would also have measures in place to reduce the effects on transportation infrastructure, including traffic and road disturbance. In addition, it is anticipated that the contractors of other reasonably foreseeable developments will have a Traffic Management Plan in place, although this cannot be guaranteed. The Project will develop an issues tracking approach that will include socio-economic issues, as noted in the SEMP (Volume 6B), which will assist in identifying and responding to any unanticipated Project-related transportation infrastructure effects during the course of construction.

The overall Project's contribution to cumulative effects on transportation infrastructure within the Socio-Economic RSA resulting from existing activities, the Project and reasonably foreseeable developments combined will vary depending on location. In highly populated areas with multiple other potential developments, road networks designed for higher traffic volumes, and a wider range of alternate routes for road users (*e.g.*, Edmonton and Metro Vancouver regions), the Project's contribution is likely to be comparatively low. However, the contribution will be greater in areas with few proposed developments and more limited road networks. In some areas, the Project could result in the need for detours or the inability to access particular locations for a specific period of time during construction. For example, Mission Flats Road in the City of Kamloops is the single access to the city's wastewater treatment facility and landfill, as well as a Weyerhaeuser landfill. Inability to access these facilities could result in service disruptions to the city at select times. As noted, however, Trans Mountain will bore under paved and high-use roads where any physical disturbance would be more than a nuisance. The Othello Road in the District of Hope is heavily used by local residents, the local water bottling plant, and tourists; is in need of upgrading; and has limited passage way on either side. The addition of Project-related traffic on this

particular road could result in considerable modification to the socio-economic environment for local users.

The Project's contribution to cumulative effects on transportation infrastructure, including local road traffic volumes and road disturbance within the Socio-Economic RSA, is considered to be negative, and is expected to be reversible in the short-term since it will be limited to the Project construction phase. Given the potential for a disruption to access for certain locations associated with the Project, the magnitude of the cumulative effect of the Project is low to medium, depending on the location within the Socio-Economic RSA (Table 8.5-2, point 1[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on transportation infrastructure is provided below.

- Spatial Boundary: Socio-Economic RSA – increased traffic on local roads and road/rail disturbance resulting from the Project acting in combination with existing activities and reasonably foreseeable developments in the Socio-Economic RSA will extend along various transportation routes in the Socio-Economic RSA.

- Duration: short-term – the events causing the Project's contribution to cumulative increases in traffic on local roads, or road/rail disturbances, are limited to the construction phase of the Project.

- Frequency: isolated – the events causing the contribution to cumulative increases in traffic on local roads and road disturbance are confined to a specific period (*i.e.*, construction of the Project) and to specific periods of time during the construction phase in each community. Moreover, traffic effects may be further confined to certain periods of the day (*i.e.*, traffic to and from construction camps and work sites will be focused during morning and evening periods).

- Reversibility: short-term – the Project's contribution to cumulative effects on transportation infrastructure are limited to the Project construction phase.

- Magnitude: low to medium – the Project's contribution will be low in larger areas with more projects, higher capacity road design, and more transportation route alternatives. In smaller areas and specific road locations, the Project-specific contributions could be more than a nuisance to road users and, in some cases, could result in moderate modification of the socio-economic environment.

- Probability: high – the Project will act in combination with existing activities and reasonably foreseeable developments within the Socio-Economic RSA in terms of use of regional transportation infrastructure.

- Confidence: moderate – based on the Project location and the professional experience of the assessment team in consideration of the lack of detailed information about Project traffic volumes and routes, as well as those of other reasonably foreseeable future projects.

8.5.3.2 Decrease in Land Available for Future Linear Infrastructure Planning

In certain areas, the proposed pipeline corridor crosses existing sub-surface linear infrastructure (*e.g.*, water and sewer lines) operated by municipalities. Operationally, municipalities carry out general maintenance to these sub-surface facilities. Additionally, as infrastructure ages or populations grow, municipalities plan for future sub-surface facilities to meet the demand of users. Excavation and construction near pipelines requires adherence to the *NEB Act* and the *NEB Pipeline Crossing Regulations*, which places restrictions on land usable for future sub-surface municipal linear infrastructure.

It is anticipated that the construction of some of the reasonably foreseeable developments within the Socio-Economic RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 will decrease the amount of land available for future linear infrastructure. Reasonably foreseeable developments that are linear in nature, such as pipelines, rapid transit and roads, require rights-of-way during their construction and operation. This land is therefore removed from a municipality's land base. Some municipalities, such as the City of Chilliwack and the City of Surrey, have limited land space available for development. The Project, in combination with other linear reasonably foreseeable developments, could further limit the land available for future linear infrastructure. Without knowing the footprint for each reasonably foreseeable development, is it difficult to predict the Project's contribution to the decrease in land available for future

linear infrastructure planning. However, considering there are numerous reasonably foreseeable developments in the Socio-Economic RSA with the potential to be in operation during the operations phase of the Project, it is expected that the Project will contribute a small amount to any cumulative decrease in land available for future linear infrastructure planning.

Routing measures to stay within or adjacent to the existing TMPL system right-of-way as much as possible will reduce the implications for future linear infrastructure planning. Trans Mountain will continue discussions with municipalities and regional authorities regarding restrictions related to the presence of the proposed pipeline in relation to municipal sub-surface infrastructure and future infrastructure planning to ensure issues, restrictions and limitations are communicated, understood, and addressed by all affected parties.

As a result of existing activities, the Project and reasonably foreseeable developments, the overall Project's contribution to a cumulative decrease in land available for future sub-surface linear infrastructure planning is low to medium in magnitude, depending on the size of the community and the density of underground infrastructure. The Project's contribution to the cumulative effect is considered to be negative, and is expected to be reversible in the long-term since the contribution to the effect will be reversed with decommissioning and abandonment of the pipeline. While the inert pipeline may remain in the ground after abandonment, a process will be established to facilitate its removal where there is a compelling reason. Depending on the size of the community, the specific locations of other developments, the finalization of the Project right-of-way in relation to sub-surface infrastructure, and density of underground infrastructure, the magnitude of the cumulative effect of the Project is anticipated to be low to medium (Table 8.5-2, point 2[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on land availability for future sub-surface linear infrastructure is provided below.

- Spatial Boundary: Socio-Economic RSA – future municipal planning will need to consider the Project acting in combination with existing activities and reasonably foreseeable developments in the right-of-way and regulated activity restriction area (which may extend minimally into the Socio-Economic RSA).

- Duration: long-term – the Project's contribution to a cumulative decrease in land available for future sub-surface linear infrastructure planning continues for as long as the pipeline is underground.

- Frequency: continuous – the Project's contribution to a cumulative decrease in land available for future sub-surface linear infrastructure planning extends through operations.

- Reversibility: long-term – the Project's contribution to a cumulative decrease in land available for future sub-surface linear infrastructure planning will be reversed with the decommissioning and abandonment of the pipeline.

- Magnitude: low to medium – this varies depending on the size of the community, Project right-of-way finalization and density of underground infrastructure in each municipality.

- Probability: high – the Project will contribute, along with existing activities and reasonably foreseeable developments within the Footprint, to the cumulative effect.

- Confidence: low – the Project's final right-of-way location in relation to existing municipal sub-surface infrastructure and the precise location of other developments in relation to municipal subsurface infrastructure is not known.

8.5.3.3 Increase in Demand on Regional Infrastructure and Services

During construction and operations of the Project, there will be an increase in the use of regional infrastructure and services, contributing to increased demand on these services. Regional infrastructure and services that could be affected include power supply; water, solid and liquid waste services; short-term accommodation; emergency, protective and social services; and recreational amenities. In total, the Project will have an incremental power demand during operations of approximately 37.5 MW in Alberta and 1.4 MW in BC (an additional 16.9 MW of power in the BC North Thompson Region, 10.8 MW

of additional power in the BC Kamloops Nicola Valley Region, and a reduction of 26.3 MW of power in the BC Lower Mainland Region), related primarily to the power needs of the additional and upgraded pump stations. In addition, the Burnaby Terminal expansion will have an incremental power demand of approximately 3.2 MW over current demand and the Westridge Marine Terminal expansion will have an incremental power demand of approximately 2.7 MW over current demand. In terms of water, the Project is expected to cause a temporary increase in demand during construction due to the direct water needs of the Project and the indirect needs of the temporary construction workforce. The Project will also cause a temporary increase in solid and liquid waste flow due to direct and indirect Project activities during construction; various facilities such as landfills, transfer stations and wastewater treatment plants located in the Socio-Economic RSA may be used by the Project.

Given the size of the direct temporary workforce anticipated in the Socio-Economic RSA during construction, as well as the population effects associated with Project-related indirect and induced employment growth during construction, an increased demand for housing is anticipated during the construction phase. Increased demand for accommodations may contribute to upward pressure on the price of rental and/or short-term accommodations. During construction, the Project may also increase the demands put on regional emergency, protective and social services due to direct Project activities (*e.g.*, construction related incidents) as well as indirectly through the demands of the temporary construction workforce and social issues that may emerge associated with community/worker interactions.

It is anticipated that the construction of most reasonably foreseeable developments within the Socio-Economic RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1, and workers associated with their construction, will also contribute to the general increase in demand for regional infrastructure and services. To the extent that construction schedules overlap, there will be cumulative socio-economic effects associated with the need to bring in additional labour from outside the Socio-Economic RSA, as previously discussed. While this would lead to further economic growth and employment and income benefits, general population growth will contribute to upward pressure on all infrastructure and services. Increased labour in-migration would also lead to growth in local housing markets, which would largely be considered positive, but could increase concern about short-term accommodation demand outstripping supply. In turn, however, this would create economic opportunities for businesses supplying short-term accommodations.

Cumulative increases in traffic, as discussed above, have the potential to contribute to increased traffic incidents which could, in turn, require an increased response from policing and emergency medical services. Expanded growth in employment and income that may come with multiple capital intensive projects being constructed at the same time would generally increase the well-being of the regional population, but could also increase demand for protective and social services at the community level. Multiple capital projects, however, would also contribute to the municipal and provincial tax revenues that can generally support long-term infrastructure and services expansion.

Given limited information on the infrastructure and services demands and workforce requirements for each reasonably foreseeable development, it is difficult to predict the Project's contribution to the increase in demand on infrastructure and services. However, considering there are numerous reasonably foreseeable developments in the Socio-Economic RSA with the potential to be constructed during the construction phase of the Project, it is expected that the Project will contribute a minor amount across the Socio-Economic RSA as a whole.

There are anticipated to be differences in the Project's contribution to cumulative effects on infrastructure and services between socio-economic regions. In more densely populated and urbanized regions (*i.e.*, the Edmonton and the Metro Vancouver regions), the Project's contribution is anticipated to be minimal due the small number of in-migrating workers in relation to the population as a whole and the higher capacity of available services and services. In less populated regions, with existing infrastructure that has lower capacity, effects of the influx of workers associated with the Project will be more pronounced. For example, several hundred workers in the Village of Valemount, Community of Blue River, or the District of Clearwater could have pronounced effects, if unplanned and unmitigated. The District of Clearwater specifically has indicated that many of their services could be stretched beyond capacity if workers from the TMEP and the proposed Yellowhead Mining Inc. Harper Creek Copper-Gold-Silver Project were to be based in the community at overlapping times (refer to

Section 8.1.4.2 for additional details). The Town of Edson also indicated there may be population pressures associated with the Project overlapping with the nearby proposed Coalspur Vista Project (refer to Section 8.1.4.2 for additional details). The Project's contribution to cumulative effects on demand for power may also be most notable in the Fraser-Fort George/Thompson-Nicola Region, where existing transmission system constraints already exist.

The mitigation measures outlined in Section 7.2.5 of the SEMP (Volume 6B) and the Pipeline, Facilities, and Westridge Marine Terminal EPPs (Volume 6B, 6C and 6D) will reduce capacity pressure on regional infrastructure and services associated with the Project. This includes the development of a Worker Accommodation Strategy that will consider housing availability in construction hubs and will use construction camps in locations with known capacity constraints for temporary or short-term accommodation, as well as developing mutually-agreeable arrangements with water and waste service providers. It is anticipated that operators constructing reasonably foreseeable developments during the same period would also have measures in place to reduce contributions to demand on regional infrastructure and services. Ongoing consultation and issues tracking through the construction phase will also allow Trans Mountain to identify and respond to any unanticipated effects related to the Project.

The overall Project's contribution to cumulative increase in demand on regional infrastructure and services within the Socio-Economic RSA (related to existing activities, the Project and reasonably foreseeable developments) is both negative and positive. The Project may contribute to capacity pressures in some regions, but may also contribute to economic opportunities for new commercial service provision (*e.g.*, housing, waste management). The Project's contribution to the cumulative effect is considered to be negligible to medium in magnitude; it will likely be negligible in larger centres with capacity to absorb temporary workers and the demands of multiple projects, but may contribute to a moderate modification of the socio-economic environment, again both positively and negatively, in smaller communities with more limited existing service capacity. The Project's contribution to the cumulative effect is considered to be short-term in duration, as well as reversible in the short-term (*i.e.*, limited to the construction phase) (Table 8.5-2, point 3[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on regional infrastructure and services is provided below.

- Spatial Boundary: Socio-Economic RSA – the Project's contribution to cumulative demand on infrastructure and services may extend regionally, as Project workers may reside in various communities across the Socio-Economic RSA.
- Duration: short-term – the Project's contribution to the cumulative effect is associated with Project construction activities.
- Frequency: isolated – the Project's contribution to the cumulative effect is associated with Project construction activities and, consequently, confined to a specific period.
- Reversibility: short-term – the Project's contribution to cumulative effects on demand on regional infrastructure and services is limited to the Project construction phase.
- Magnitude: negligible to medium – the Project's contribution will be negligible in large urban centres with more infrastructure and services capacity and a larger local workforce; medium magnitude contributions may occur in smaller communities with less proposed development and less existing infrastructure and services capacity.
- Probability: high – the Project is likely to contribute, along with existing activities and reasonably foreseeable developments, to the cumulative effect.
- Confidence: moderate – based on the professional experience of the assessment team in consideration of the lack of information about particular workforce and infrastructure/services needs and arrangements of reasonably foreseeable developments.

8.5.3.4 Combined Cumulative Effects on Infrastructure and Services

The potential cumulative effects (*i.e.*, effects on transportation infrastructure, decrease in land available for future linear infrastructure planning, an increased demand on regional infrastructure and services)

may emerge as the Project acts in combination with existing activities and reasonably foreseeable developments. The impact balance is negative and positive, since the Project may contribute to increased pressure on and select disturbance of infrastructure and services, but it may also contribute to commercial opportunities for service provision (*e.g.*, commercial accommodations). The implementation of mitigation measures described in Section 7.2.5 will reduce the magnitude of adverse cumulative effects associated with the Project, existing activities and other reasonably foreseeable developments. The Project's contribution to combined cumulative effects on infrastructure and services is considered negligible to medium in magnitude, depending on the size and extent of other activity in different regions within the Socio-Economic RSA. The Project's contribution to an overall cumulative effect on infrastructure and services is considered short to long-term in duration, isolated to continuous in frequency and reversible in the short to long-term depending on the particular effect (Table 8.5-2, point 6[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on infrastructure and services is provided below.

- Spatial Boundary: Socio-Economic RSA – the Project's contribution to cumulative effects on infrastructure and services may appear anywhere throughout the Socio-Economic RSA but especially in communities used as construction hubs.

- Duration: short to long-term – most of the events causing the Project's contribution to cumulative effects on infrastructure and services are limited to the construction phase of the Project (short-term); however, effects on linear infrastructure and power supply may extend over the life of the Project (long-term).

- Frequency: isolated to continuous – most of the events resulting in Project contribution to cumulative effects on infrastructure and services are associated with the construction phase (isolated), although some contributions related to linear infrastructure and power supply are expected to extend over the life of the Project (continuous).

- Reversibility: short to long-term – the combined effects of the Project on infrastructure and services are for the most part reversible with the end of construction activities; however, some effects may persist until the decommissioning, abandonment and remediation of the pipeline.

- Magnitude: negligible to medium – the Project's contribution to cumulative effects on infrastructure and services will differ depending on the size and commensurate infrastructure and services a capacity of construction hubs. The Project's contribution is anticipated to be of negligible magnitude in larger urban centres and of medium magnitude in smaller communities where increases in infrastructure and services demand will be less easily absorbed.

- Probability: high – there is a high degree of probability that at a Project contribution to cumulative effects on infrastructure and services will occur.

- Confidence: moderate – based on Project information, feedback from stakeholders, available information on infrastructure and services capacity, and the professional experience of the assessment team. Particulars of the Project's contribution to cumulative effects will be influenced by right-of-way finalization and advancement of Project details in terms of traffic estimates, logistical plans, worker accommodation plans, and water/waste requirements.

8.5.4 Summary

As identified in Table 8.5-2, there are no situations where the Project's contribution to cumulative effects on infrastructure and services indicators will be significant. Consequently, the Project's contribution to adverse cumulative effects on infrastructure and services within the Socio-Economic RSA will be not significant.

8.6 Employment and Economy

There were no adverse combined effects on employment and economy indicators resulting from the Project that were considered likely to occur. Most Project effects were considered positive in nature, and residual effects related to the potential for loss of income due to business and livelihood disruption were

considered of low probability. As such, employment and economy was not considered in the cumulative effects assessment.

8.7 Community Health

This subsection discusses how the Project could act in combination with existing activities and reasonably foreseeable developments to cumulatively affect community health indicators.

This discussion of cumulative effects focuses only on indicators that are anticipated to have an adverse overall Project-specific residual effect, as discussed in Section 7.2.8, and that could act in combination with reasonably foreseeable developments. For community health, these indicators are socio-economic health outcomes and health care service provision. The public safety indicator was not included because the probability of the Project having an adverse effect was rated as low and the infectious disease and environmental health indicators were not included because the Project's effects on these indicators would act in isolation rather than synergistically on the health endpoints.

The assessment of cumulative effects on community health pertains to the terrestrial components of the Project as a whole (*e.g.*, pipeline, pump stations, tanks, facilities and the Westridge Marine Terminal), as the communities and regions in which the Project occurs will experience Project-related activities in an integrated manner. It is not meaningful from a community perspective to discuss the community health effects of each Project component on a stand-alone basis.

8.7.1 Reasonably Foreseeable Developments

Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 provide a list of the certain and reasonably foreseeable developments located within the Socio-Economic RSA considered in the evaluation of cumulative effects on community health indicators. A description of these and other developments is provided in Section 8.1.4, and developments in Tables 8A.1-1 to 8A.1-4 of Appendix 8.1 are shown on Figures 8.1-1a, 8.1-1b and 8.1-1c. Reasonably foreseeable developments shown in Table 8A.1-5 (for Alberta) and Table 8A.1-6 (for BC) of Appendix 8.1 with the potential to act in combination with the Project were excluded from mapping since development details (*e.g.*, approval status, location) were either not available or the developments were located within urban municipal boundaries, such as the City of Edmonton and LMDA (with the exception of the Golden Ears Connector project [Figure 8.1-1c]).

In the Socio-Economic RSA, there are approximately 196 reasonably foreseeable developments either fully within the Socio-Economic RSA or, for some transmission lines and pipelines, partially within the Socio-Economic RSA (Tables 8A.1-1, 8A.1-5 and 8A.1-6 of Appendix 8.1). In addition, there are approximately 3,147 reasonably foreseeable minor oil and gas developments in Alberta: 712 pipelines; 2,093 facilities; and 342 wells (Tables 8A.1-2 to 8A.1-4 of Appendix 8.1).

8.7.2 Potential Cumulative Effects

The potential and likely combined socio-economic residual effects associated with the construction and operation of the Project on community health indicators were identified in Section 7.10.8. Those Project-specific residual effects considered to have an adverse impact balance and that could act in combination with reasonably foreseeable developments are listed in Table 8.7-1.

As with some other socio-economic elements, the primary cause of any adverse cumulative effects on community health is expected to occur via the potential for in-migration of people from outside the Socio-Economic RSA to regional commercial centres. Many existing activities and reasonably foreseeable developments will also draw in temporary mobile workforces and may induce long-term population change. In combination, these developments and the Project have the potential to work synergistically to influence the indicators assessed in this subsection.

TABLE 8.7-1

POTENTIAL RESIDUAL EFFECTS OF THE PROJECT ON COMMUNITY HEALTH CONSIDERED FOR THE CUMULATIVE EFFECTS ASSESSMENT

Potential Residual Project Effect on Indicator	Spatial Boundary[1]	Project Component(s)	Temporal Boundary	Potential Cumulative Effect	Existing Activities/Reasonably Foreseeable Developments with Residual Effects Acting in Combination with the Project
1. Combined effects of the Project on socio-economic health effects.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction	Project contribution to cumulative effects on socio-economic health outcomes.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities resulting in the presence of workers in communities during the construction phase.
2. Combined effects of the Project on health care service provision.	RSA	Pipeline Temporary Facilities Pump Stations Tanks Westridge Marine Terminal Pipeline Reactivation	Construction	Project contribution to cumulative increase in capacity pressure on health care service provision.	• Existing activities including: agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. • Reasonably foreseeable developments within the RSA listed in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1 and discussed in Section 8.1.4. • Project-related activities resulting in the presence of workers in communities during the construction phase. • Project-related activities that could interact with the above activities including Project traffic and road use.

Note: 1 RSA = Socio-Economic RSA.

8.7.3 Significance Evaluation of Potential Cumulative Effects

A qualitative assessment was deemed to be the most appropriate approach by which to evaluate the significance of the Project's contribution to potential cumulative effects on community health. This is due to the lack of consistent and accepted cause–effect relationships and cumulative effects models for socio-economic issues and indicators (Mitchell and Parkins 2011) (see Section 8.3).

Table 8.7-2 provides a summary of the significance evaluation of the Project's contribution to potential cumulative effects on community health indicators. The rationale used to evaluate the significance of each of the cumulative effects is provided below.

TABLE 8.7-2

SIGNIFICANCE EVALUATION OF THE PROJECT'S CONTRIBUTION TO CUMULATIVE EFFECTS ON COMMUNITY HEALTH

Potential Cumulative Effects		Impact Balance	Spatial Boundary[1]	Temporal Context			Magnitude	Probability	Confidence	Significance[2]
				Duration	Frequency	Reversibility				
1.	Community Health Indicator – Socio-Economic Health Effects									
1(a)	Project contribution to cumulative effects on socio-economic health effects.	Negative to positive	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	Moderate	Not significant
2.	Community Health Indicator – Health Care Service Provision									
2(a)	Project contribution to cumulative effects on health care service provision.	Negative	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	Moderate	Not significant
3.	Project Contribution to Combined Cumulative Effects on Community Health									
3(a)	Combined cumulative effects on the community health indicators (1[a] and 2[a]).	Negative to positive	RSA	Short-term	Isolated	Short-term	Negligible to medium	High	Moderate	Not significant

Notes: 1 RSA = Socio-Economic RSA.

2 Significant Contribution to a Cumulative Socio-Economic Effect: the Project's contribution to a cumulative socio-economic effect is considered significant if the contribution to the cumulative effect is predicted to be:

- high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or
- high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated.

8.7.3.1 Socio-Economic Health Effects

As described in Section 7.2.8, socio-economic health outcomes are very broad and include the possibility of both beneficial and adverse changes in the areas of overall health status, mental well-being, chronic disease, behaviors and injury. The underlying stimulus for socio-economic health effects are changes in the socio-economic environment, such as changes in population demographics, employment and working conditions, individual or community revenue, housing, land-use, social cohesion and social networks, crime, or municipal or regional services or infrastructure (Barron *et al*. 2010, Pfeiffer *et al*. 2010, Orenstein *et al.* 2013). Socio-economic changes can result in either improvement or deterioration of individual and population-level health status. Improvements arise from beneficial changes to employment opportunities, income, housing quality or availability and, for smaller communities in particular, the development of a stable population base that affords numerous social opportunities and brings in people with a broad skill base (*e.g*., teachers, nurses). Deterioration of health can arise if social networks are strained, crime increases, the capacity of infrastructure and services is overstretched or alcohol or substance misuse increases.

Socio-economic health outcomes are generally multifactorial. That is, they are influenced by a wide range of factors or circumstances acting in combination. In addition to specific projects or activities such as the Project or other developments such as those in Tables 8A.1-1 to 8A.1-6 of Appendix 8.1, socio-economic health outcomes are influenced by broader trends across society that tend to change over time. For these reasons, it is very difficult to ascribe observed health changes to a particular influence such as the Project or to predict how health indicators or measurement outcomes may perform over time.

The tables provided in Appendix 8.1 list developments that include hydroelectric projects, transmission line developments, pipelines, transit projects, mines and other resource development activities. Like this Project, all of these developments involve construction and operation activities that require the mobilization of a temporary workforce that may be large at the community or regional scale. It is this increase in population that drives the potential for socio-economic health outcomes to be affected cumulatively. While the number of workers needed for any one development may have only a negligible effect on the socio-economic conditions that influence health, in combination, the total number of workers

for all concurrent developments can place a great deal of strain on housing availability or affordability, municipal infrastructure and services and social networks and, in turn, can affect health outcomes that are influenced by these conditions.

Despite the many uncertainties in accurately characterizing future change in socio-economic health effects, the pathways between social or economic change in health outcomes are well known, and there is a wealth of research evidence to support these associations. Therefore, the additive effect of the Project and the other planned developments has the combined potential to affect socio-economic health outcomes, although actual responses can vary as noted above. In addition, certain mitigation measures have well-established evidentiary links that are supported by public health principles. The application of appropriate mitigation measures by Trans Mountain and by other project developers, therefore, has the potential to mitigate potential adverse effects and enhance potential health co-benefits.

The Project's expected contribution to cumulative effects on socio-economic health outcomes is both positive and negative. Positive benefits could accrue to health outcomes that are linked to employment and income, and possibly to social cohesion and municipal services and infrastructure, if communities are strengthened from improved economic activity and long-term in-migration. Adverse affects on health outcomes could occur if the use of temporary workforces causes social disruption, violence and alcohol/drug misuse or overstresses the capacity of municipal services and infrastructure. These effects could extend throughout the Socio-Economic RSA in communities that act as construction hubs by housing workers, or where workers spend time off-shift. The duration of the cumulative effect on community health is considered short-term, and the frequency isolated and the reversibility short-term, since both the events that cause the residual effects and the subsequent cumulative effects would be limited to the construction phase. The magnitude of the Project's contribution to a change in socio-economic health outcomes ranges from negligible to medium. It will be negligible in large urban centres such as the City of Edmonton and the LMDA, where Project-specific workers will be easily absorbed into the population; it will likely be medium in the context of smaller population centres and where the Project's contribution to overall workforce numbers is greater. There is a high probability that the Project will contribute to cumulative effects; the confidence is moderate because, although the pathways are well-characterized and there is evidence of a cumulative effect in other Alberta and BC locations, socio-economic health outcomes are influenced by a wide range of factors across government, society and industry that have the capacity to modify how the Project or other developments affect these outcomes (Table 8.7-2, point 1[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on socio-economic health effects is provided below.

- Spatial Boundary: Socio-Economic RSA – potential cumulative effects could occur throughout communities in the Socio-Economic RSA that serve as construction hubs for the Project and other reasonably foreseeable developments, or where workers may choose to spend time when off-shift.

- Duration: short-term – the Project's contribution to the cumulative effect is primarily associated with Project construction activities when temporary workers will be used.

- Frequency: isolated – the Project's contribution to events causing cumulative effects on socio-economic health outcomes is limited to the construction phase.

- Reversibility: short-term – the cumulative effects on socio-economic health outcomes are limited to the Project construction phase.

- Magnitude: negligible to medium – this will range from negligible in large urban centres to medium in smaller population centres.

- Probability: high – the Project will contribute, along with existing activities and reasonably foreseeable developments, to the cumulative effect.

- Confidence: moderate – the pathways are well-characterized, but socio-economic health outcomes are influenced by a wide range of societal factors that may also influence observed outcomes.

8.7.3.2 Health Care Service Provision

As described in Section 7.2.8, in isolation the Project has the capacity to affect various facets of health care service provision, although the magnitude of effect is projected to be negligible to medium depending on the relative size of the workforce in relation to the capacity of local health care services. The effect in large metropolitan areas such as the LMDA or the City of Edmonton is projected to be negligible, while a medium magnitude effect may occur in smaller communities that act as construction hubs. The components of health care services that have the highest potential to be adversely affected are hospitals and health centres, emergency medical services and mental health and addictions services.

As with socio-economic health outcomes, health care service provision has the potential to be adversely affected by the cumulative effect of the Project in combination with other projects described in Appendix 8.1. The effect stems primarily from the potential for increased population growth in a given local area, both from construction workforces that are brought into the area by the Project or other developments, and from longer-term population growth that occurs as a result of economic opportunity. Whether or not a cumulative effect on health care service provision manifests will depend on the extent to which construction schedules of the various developments overlap, the total size of the construction workforce in a given area, the extent to which workers are sourced locally as opposed to being brought in to the area, and the plans each developer has for providing medical care on-site to its workers. Because these parameters are not known for other reasonably foreseeable developments, it is difficult to accurately predict the Project's contribution to cumulative effects on health care service provision in any given local area, or whether cumulative effects will be experienced at all.

The Project's contribution to cumulative effects on community health is likely to be small, particularly in light of the proposed mitigation measures, the relatively small size of the Project workforce in any given area in comparison to the size of some other planned developments, and the intended implementation of Trans Mountain's emergency medical response plans for occupational injuries. However, close communication with local health care service providers and ongoing monitoring will be important to ensure that Trans Mountain's approach remains appropriate and reduces pressure on these services. The Project will develop an issues tracking approach that will include socio-economic issues, as noted in the SEMP (Volume 6B), which will assist in identifying and responding to any unanticipated Project-related effects on community health during the course of construction.

The Project's overall contribution to cumulative effects on health care service provision is expected to be negative, because the Project may place additional demand on health services. The cumulative effects on health care service provision could extend throughout the Socio-Economic RSA, and could be greater particularly in smaller communities that act as construction hubs or that provide supportive services to those smaller communities. The duration of the Project's contribution to cumulative effects on health care service provision is considered short-term, the frequency isolated and the reversibility short-term, since it is limited almost entirely to the construction phase. The magnitude of the cumulative effect of the Project is negligible in large urban centres with numerous hospitals and health care providers, and medium for smaller communities with fewer resources. The probability of the Project's contribution to cumulative effects on health care service provision is considered high, and confidence in this assessment is moderate. Although information on other projects is not readily available, such as workforce sizes, sourcing strategies, medical response plans and timing of reasonably foreseeable developments, the cumulative effects of development projects on health care service provision have been observed in several different regions across BC and Alberta, such as the Fort St. John area (Table 8.7-2, point 2[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on health care service provision is provided below.

- Spatial Boundary: Socio-Economic RSA – the Project's contribution to cumulative effects on health care service provision will include communities where workers reside or are treated.

- Duration: short-term – the Project's contribution to the cumulative effect is primarily associated with Project construction activities.

- Frequency: isolated – the Project's contribution to events causing cumulative effects on health care service provision is limited to the construction phase.

- Reversibility: short-term – the cumulative effects on health care service provision are limited to the Project construction phase.

- Magnitude: negligible to medium – this ranges from negligible in large urban centres with numerous hospitals and health care providers to medium magnitude in some smaller communities with fewer resources.

- Probability: high – the Project will contribute, along with existing activities and reasonably foreseeable developments, to the cumulative effect.

- Confidence: moderate – although limited information available on other projects' workforce sizes, sourcing strategies, medical response plans and timing, this effect has previously been observed in the Socio-Economic RSA in conjunction with multiple development projects, particularly in BC.

8.7.3.3 Combined Cumulative Effects on Community Health

The combined cumulative effects on community health represent the potential for the Project to contribute to cumulative effects on socio-economic health effects and health care service provision. Both positive and negative effects are expected to occur. While these effects could occur anywhere in the Socio-Economic RSA, they are most likely to occur in smaller communities used as construction hubs. The duration is considered short-term, the frequency isolated and the reversibility short-term since the Project and its contribution to cumulative effects are limited almost entirely to the construction phase. The magnitude is considered negligible in large urban centres and medium in smaller population centres. There is a high probability that the Project will contribute to the cumulative effects; the confidence in this assessment is moderate because, although the pathways are well-characterized and there is evidence of a past cumulative effect in other Alberta and BC locations, community health is influenced by a wide range of factors across government, society and industry that have the capacity to modify how the Project or other reasonably foreseeable developments affect these outcomes (Table 8.7-2, point 3[a]). A summary of the rationale for all of the significance criteria of combined cumulative effects on community health is provided below.

- Spatial Boundary: Socio-Economic RSA – combined effects of the Project on community health may appear anywhere throughout the Socio-Economic RSA, but especially in areas used as construction hubs.

- Duration: short-term – the Project's contribution to the cumulative effect is primarily associated with Project construction activities.

- Frequency: isolated – the Project's contribution to events causing cumulative effects on community health is limited to the construction phase.

- Reversibility: short-term – the combined cumulative effects on community health is limited to the Project construction phase.

- Magnitude: negligible to medium – this varies from negligible in large urban centres to medium in smaller population centres.

- Probability: high – there is a high degree of probability that at least some of the predicted effects will manifest and that the Project will contribute, along with existing activities and reasonably foreseeable developments, to the cumulative effect.

- Confidence: moderate – combined effects of the Project on community health are supported in many instances by both research and local qualitative evidence; however, the strength of evidence varies.

8.7.4 Summary

As identified in Table 8.7-2, there are no situations where the Project's contribution to cumulative effects on community health indicators will be significant. Consequently, the Project's contribution to adverse cumulative effects on community health within the Socio-Economic RSA will be not significant.

8.8 Human Health Risk Assessment

This subsection outlines the nature of the potential health risks to people associated with short-term and long-term exposures to the chemical emissions from the Burnaby Terminal and Westridge Marine Terminal in combination with chemical exposures associated with existing activities as well as all other reasonably foreseeable developments within the combined Air Quality RSA (referred to as the "combined chemical exposures" for the purposes of this subsection). Consistent with the cumulative effects assessment for air quality (Section 8.4 of Volume 5A), a cumulative effects assessment was not completed for the potential health risks to people within the HHRA LSA for the Edmonton Terminal or the Sumas Terminal since the chemical emissions associated with these tank terminals are not expected to interact with the chemical emissions associated with any other reasonably foreseeable projects in the Air Quality RSA.

The HHRA evaluated the potential health risks to people associated with more than 100 chemicals, including criteria air contaminants, metals, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, sulphur-containing chemicals and volatile organic compounds. The HHRA was completed using a series of conservative assumptions reflecting worst-case circumstances, which collectively contributed to an exposure event being strictly hypothetical in nature, with a low probability of occurrence. In particular, the HHRA assumed that people would be found on both a short-term and long-term basis at the location within the HHRA LSA corresponding to the "maximum point of impingement" (MPOI). The MPOI refers to the location at which the highest ground-level air concentrations of each of the chemicals of potential concern would be expected to occur, and at which the exposures received by the people within the HHRA LSA would be greatest. The choice of the MPOI location was meant to ensure that any potential impacts that could result from exposure to the chemical emissions associated with the Project on the health of the people, regardless of where they might be found, would not be underestimated. The decision to use the MPOI to represent the location at which people would be found was made by default; that is, consideration was not given as to whether or not the MPOI location was suitable for a permanent residence and/or for residents to obtain their entire complement of locally grown or harvested foodstuffs, including home-garden produce, game meat, fish, beach foods and wild plants, from the local area.

8.8.1 Reasonably Foreseeable Developments

Refer to the air quality assessment for details regarding the reasonably foreseeable increase in marine traffic within the combined Air Quality RSA for Burnaby Terminal and Westridge Marine Terminal in Section 8.4 of Volume 5A.

8.8.2 Potential Cumulative Effects

Consistent with the Project effects assessment for the Burnaby Terminal and Westridge Marine Terminal (see Section 7.5.8 and Section 7.6.9, respectively), the assessment indicators for the cumulative effects assessment are people within the HHRA LSAs whose health might be adversely impacted as a result of the combined chemical exposures. The assessment indicators included both permanent residents living within the HHRA LSAs, as well as area users who might frequent the area for recreation or other purposes. The permanent residents identified within the HHRA LSAs for the Burnaby Terminal and Westridge Marine Terminal were separated into Aboriginal communities and urban dwellers. Additional details are available in Section 7.5.8 and Section 7.6.9, respectively.

The results of the HHRA for the Burnaby Terminal revealed that, despite the conservative assumptions employed, the maximum predicted combined chemical exposures remained below the levels of exposure that would be expected to cause health effects. In the majority of cases, the combined chemical exposure levels were well below those associated with health effects. Adverse health effects would, therefore, not be expected among either the residents or area users from the chemical exposures associated with the Burnaby Terminal in combination with chemical exposures associated with existing activities as well as all other reasonably foreseeable developments within the combined Air Quality RSA.

For the HHRA of the Westridge Marine Terminal, the results revealed that, despite the conservative assumptions employed, with very few exceptions, the maximum predicted levels of combined exposure to the chemicals of potential concern (acting either singly or in combination) remained below the levels of exposure that would be expected to cause health effects. In the majority of cases, the combined exposure levels were well below those associated with health effects. The exceedances revealed by the HHRA

were very few in number and in virtually all cases were modest in magnitude. The high degree of conservatism incorporated into both the combined chemical exposures and the exposure limits used for comparison as part of the HHRA must be considered in the interpretation of the exceedances. Based on the weight of evidence, it is unlikely that people would experience health effects from the chemical exposures associated with the Westridge Marine Terminal in combination with chemical exposures associated with existing activities as well as all other reasonably foreseeable developments within the combined Air Quality RSA. A more focused and detailed HHRA will be completed and submitted to the NEB in early 2014 to corroborate these conclusions and inform mitigation and emergency response plans.

8.9 Summary of the Assessment of Potential Cumulative Effects

An evaluation of the significance of the Project's contribution to cumulative effects was conducted for each indicator determined to have a likely combined residual effect associated with the Project, as identified in Section 7.10. Furthermore, an evaluation of the significance of the Project's contribution to cumulative effects was also conducted for each element where more than one likely cumulative effect may act in combination.

The cumulative effects assessment followed a standard approach for each likely combined residual effect associated with the Project. Effects resulting from existing activities and predicted for reasonably foreseeable developments were considered individually and in combination with those associated with the Project. Existing activities that have contributed to cumulative effects include agriculture and livestock grazing, forestry, rural and urban residential and commercial development, transportation and infrastructure development, utilities activities, oil and gas exploration and development, and mineral resource exploration and development. Reasonably foreseeable developments that could contribute to cumulative effects include oil and gas developments (predominantly in Alberta), hydroelectric developments (in BC), transmission line developments, mining developments, transportation and infrastructure developments, utility activities, and marine developments and activities. Overall, the cumulative socio-economic effects associated with the construction and operation of the Project are similar to those routinely encountered during pipeline and facility construction in western Canada.

A number of potential cumulative effects associated with the following socio-economic elements were identified: TLRU and marine TLRU; social and cultural well-being; HORU; infrastructure and services; community health.

No potential cumulative effects were identified for employment and economy indicators since most Project effects were considered positive in nature, and residual effects related to the potential for loss of income due to business and livelihood disruption were considered to be low probability. Furthermore, it is unlikely that people would experience health effects from the chemical exposures associated with the Burnaby Terminal or Westridge Marine Terminal in combination with chemical exposures associated with existing activities and reasonably foreseeable developments. However, a more focused and detailed HHRA will be completed and submitted to the NEB in early 2014 to corroborate these conclusions and inform mitigation and emergency response plans.

The Project's contribution to a cumulative socio-economic effect is considered significant if the contribution is predicted to be: high magnitude, high probability, short to medium-term reversibility and regional, provincial or national in extent that cannot be technically or economically mitigated; or high magnitude, high probability, long-term or permanent reversibility and any spatial boundary that cannot be technically or economically mitigated. As identified in this cumulative effects assessment, with the implementation of mitigation measures in Section 7.0 and the Pipeline, Facilities and Westridge Marine Terminal EPPs (Volumes 6B, 6C and 6D), the Project's contribution to cumulative effects on the socio-economic indicators for the pipeline and facilities component of the Project is considered to be not significant.

8.10 References

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TERA wishes to acknowledge those people identified in the Personal Communications for their assistance in supplying information and comments incorporated in this report.

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8.10.3 GIS Data and Mapping References

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APPENDIX 8.1

REASONABLY FORESEEABLE DEVELOPMENTS

TABLE 8A.1-1

REASONABLY FORESEEABLE DEVELOPMENTS (MAPPED)

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
EDMONTON TO HINTON SEGMENT (Edmonton Region and Rural Alberta Region)										
Proposed Pipeline Developments										
1	ACCESS Northeast Pipeline Expansion	Conklin area to Redwater area.	ACCESS Pipeline Inc.	Oil Pipeline	Under review (ERCB application submitted June 15, 2012).	Proposed approximately 295 km 1,067 mm low vapour pressure bitumen blend pipeline from a pump station near Conklin at 1-16-77-5 W4M to the existing ACCESS Sturgeon Terminal at 4-18-56-21 W4M.	$1 billion	In-service by early 2015.	TLRU RSA Socio-Economic RSA HORU RSA	AER Application #1724272: Website: http://www.ercb.ca/applications-and-hearings/notices/2012/1724272 ACCESS Northeast Pipeline Expansion Website: http://accessexpansion.com/ Project Information Package: http://accessexpansion.com/docs/Access-Northeast-Expansion-Project-Information.pdf
2	Alberta Carbon Trunk Line	Near Fort Saskatchewan, Alberta to southeast of Lacombe.	Enhance Energy Inc.	CO_2 Pipeline	Approved.	A large-scale CO_2 enhanced oil recovery and storage project Near Fort Saskatchewan, Alberta to southeast of Lacombe.	$ unknown	Currently under construction, in-service by late 2013.	TLRU RSA Socio-Economic RSA HORU RSA	Enhance Energy Inc. Website: http://www.enhanceenergy.com/actl
3	Edmonton to Hardisty Pipeline Project	Edmonton to Hardisty.	Enbridge Pipelines Inc.	Oil Pipeline	Under review (NEB application submitted December 14, 2012).	A proposed 181 km new 914.4 mm (NPS 36) crude oil pipeline from the existing Enbridge Edmonton Terminal to the existing Enbridge Hardisty Terminal. The proposed pipeline right-of-way will be alongside and contiguous to an existing Enbridge pipeline right-of-way and other linear disturbances for approximately 96.6% of its length.	$286 million	Construction from Q3 2014 to Q1 2015.	TLRU RSA Socio-Economic RSA HORU RSA	NEB Website: http://www.neb-one.gc.ca/clf-nsi/rthnb/pplctnsbfrthnb/nbrdgdmntnhrdsty/nbrdgdmntnhrdsty-eng.html#s1 Enbridge – Edmonton to Hardisty Pipeline Project Website: http://www.enbridge.com/EdmontonHardistyPipeline.aspx
4	Grand Rapids Pipeline Project	Fort McMurray to Edmonton.	TransCanada PipeLines Ltd. (Grand Rapids Pipeline GP Ltd.)	Oil and Diluent Pipeline	Under review (ERCB application submitted May 23, 2013).	Proposed pipeline project that includes both a crude oil and a diluent line to transport volumes approximately 500 km between the producing area northwest of Fort McMurray and the Edmonton / Heartland region.	$3 billion	Construction from summer 2014 to early 2017.	TLRU RSA Socio-Economic RSA HORU RSA	AER Website: https://www3.eub.gov.ab.ca/eub/dds/iar_query/ApplicationAttachments.aspx?AppNumber=1763130 TransCanada PipeLines Ltd. Website: http://www.transcanada.com/grand-rapids.html March 2013 – Project Update: http://www.transcanada.com/docs/Key_Projects/Grand-Rapids-Project-Update.pdf Right- of-Way: https://www3.eub.gov.ab.ca/eub/dds/iar_query/ApplicationAttachments.aspx?AppNumber=1763130
5	Heartland Pipeline and TC Terminals Projects	Fort Saskatchewan to Hardisty.	TransCanada PipeLines Ltd. (Heartland Pipeline GP Ltd. and TC Terminals GP Ltd.)	Oil Pipeline and Tank Storage Facility	Pre-application (AER filing planned in Q3 2013).	Split into two separate projects: a proposed approximately 200 km 914 mm (NPS 36) crude oil pipeline extending from 13 km northeast of Fort Saskatchewan to 7 km south of Hardisty, also entailing the construction of two pump stations; and a proposed tank storage facility near Fort Saskatchewan at SW/SE 28-55-21 W4M.	$900 million	Construction from summer 2014 to early 2015.	TLRU RSA Socio-Economic RSA HORU RSA	TransCanada PipeLines Ltd. Website: http://www.transcanada.com/6215.html
6	Line 2 Replacement Project	Enbridge Edmonton Terminal to Joseph Lake.	Enbridge Pipelines Inc.	Oil Pipeline	NEB approval granted on May 17, 2013.	Proposed 38.2 km pipeline paralleling the alignment of the Edmonton to Hardisty Pipeline Project (above) from the Enbridge Edmonton Terminal at NE 32-52-23 W4M to a valve located near Joseph Lake at SW 1-50-22 W4M.	$ unknown	Construction from August 2013 to late 2013.	TLRU RSA Socio-Economic RSA HORU RSA	NEB Website: https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=893373&objAction=browse&sort=-name
7	Northern Gateway Project	Bruderheim, Alberta to Kitimat, BC.	Northern Gateway Pipelines Limited Partnership	Oil and Condensate Pipeline	Under review (NEB application submitted May 2010).	Key components of the project include: • separate oil and condensate pipelines, each of about 1,172 km in length; • 10 pump stations; • all-weather road access and electrical power infrastructure for the pump stations and the Kitimat Terminal; • fourteen 496,000-barrel capacity tanks; • a utility berth; and • two marine loading and unloading berths. The project will generate approximately 62,694 person-years of employment during construction throughout the Canadian economy and 1,146 full-time jobs annually during operation.	$5.5 billion	Construction from 2014 to 2017.	TLRU RSA Socio-Economic RSA HORU RSA	NEB Website: https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90552/384192/620327/customview.html?func=ll&objId=620327&objAction=browse Northern Gateway Project Website: http://www.northerngateway.ca/ Enbridge Northern Gateway Project Joint Review Panel Website: http://gatewaypanel.review-examen.gc.ca/clf-nsi/hm-eng.html

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
8	Polaris Expansion Project – Edmonton Extension	Lamont to Sherwood Park.	Inter Pipeline Inc.	Diluent Pipeline	Proposed.	Installation of approximately 50 km of NPS 24 diluent pipeline and facilities from certain Edmonton area diluent receipt points to the Polaris Lamont Pump Station. The new pipeline will provide 111,290 m^3/d (700,000 bbl/d) of diluent supply capacity to the Lamont Station.	$80 million	Construction from 2013 to 2016.	TLRU RSA Socio-Economic RSA HORU RSA	Inter Pipeline Inc. Website: http://www.interpipelinefund.com/operations/new-projects.cfm
9	Quest Carbon Capture and Storage Project	Thorhild to approximately 5 km northeast of Fort Saskatchewan.	Shell Canada Ltd.	Carbon Capture and Storage Project	ERCB approval granted on July 10, 2012.	The proposed development entails: construction of facilities for the capture of 1.2 megatonnes of CO_2 per year at the existing Shell Scotford Upgrader at 12-32-55-21 W4M; an 80 km pipeline to transport dense-phase CO_2 from the Scotford Upgrader to the sequestration site located north of the County of Thorhild at 15-29-60-21 W4M; and three to eight CO_2 injection wells connected to the main pipeline by laterals, each of which would be less than 15 km long.	$1.35 billion	Construction from late 2012 to 2015.	TLRU RSA Socio-Economic RSA HORU RSA	ERCB Decision: http://www.ercb.ca/decisions/2012/2012-ABERCB-008.pdf Shell Website: http://www.shell.ca/en/aboutshell/our-business-tpkg/business-in-canada/upstream/oil-sands/quest.html
10	Western Reach Pipeline System	Gordondale to Fort Saskatchewan.	Plains Midstream Canada ULC	Gas Pipelines	Pre-application (in early planning stages).	A proposed dual 570 km pipeline system originating in the Gordondale area to meet the transportation and processing demands of producers drilling in the Deep Basin.	$900 million	In-service by late 2015.	TLRU RSA Socio-Economic RSA HORU RSA	Plains Midstream Canada ULC Website: http://www.plainsmidstream.com/content/open-season-proposed-new-western-reach-ngl-pipeline-system
11	Woodland Pipeline Extension Project	Fort McMurray to Sherwood Park.	Enbridge Pipelines (Woodlands) Inc.	Oil Pipeline	ERCB approval granted on August 30, 2012.	Construction and operation of two pump stations and a pipeline that would transport diluted bitumen from Enbridge Pipelines (Athabasca) Inc.'s existing Cheecham Terminal, located 7-8-84-6 W4M at Fort McMurray, Alberta to Enbridge Pipelines Inc.'s existing Edmonton Terminal, located at 5-4-53-23 W4M at Sherwood Park, Alberta.	$ unknown	Construction start in 2013, with operation scheduled for 2015.	TLRU RSA Socio-Economic RSA HORU RSA	ERCB Decision: http://www.ercb.ca/decisions/2012/2012-ABERCB-009.pdf Enbridge Website: http://www.enbridge.com/WoodlandPipelineExtensionProject/ProjectOverview.aspx
Proposed Transmission Line Developments										
12	Eastern Alberta Transmission Line Project	Northeast Edmonton area to Brooks area.	ATCO Electric Ltd.	Overhead Transmission Line	AUB approval granted on November15, 2012.	A new transmission line between the Gibbons-Redwater area northeast of Edmonton and the Brooks area southeast of Calgary. The new line will be built and operated as a 500 kilovolt (kV) high voltage direct current line and run approximately 500 km in length.	$1.65 billion	Currently under construction, in-service by late 2014.	TLRU RSA Socio-Economic RSA HORU RSA	AUC Website: http://www.auc.ab.ca/items-of-interest/eastern-alberta-transmission-line/Pages/default.aspx ATCO Electric Ltd. Website: http://hvdc.atcoelectric.com/
13	Heartland Transmission Project	Edmonton Area.	EPCOR Distribution and Transmission and AltaLink Management Ltd.	Overhead Transmission Line	AUB approval granted on November 1, 2011.	Involves the construction of an overhead double circuit 500 kV transmission line, which will connect to the Heartland Substation (northwest of Fort Saskatchewan) to the Ellerslie Substation.	$582 million	Currently under construction, in-service by fall 2013.	TLRU RSA Socio-Economic RSA HORU RSA	AUC Website: http://www.auc.ab.ca/items-of-interest/heartland-transmission-project/Pages/default.aspx Heartland Transmission Project Website: http://www.heartlandtransmission.ca/update/index.asp
14	Western Alberta Transmission Line Project	Genesee area to Langdon area.	AltaLink Management Ltd.	Overhead Transmission Line	AUB approval granted on December 6, 2012.	A new transmission line between the Genesee area west of Edmonton to Langdon area east of Calgary. The new line will be built and operated as a 500 kV high voltage direct current line.	$ unknown	Currently under construction, in-service by spring 2015.	TLRU RSA Socio-Economic RSA HORU RSA	AUC Website: http://www.auc.ab.ca/items-of-interest/western-alberta-transmission-line/Pages/default.aspx AltaLink Management Ltd. Website: http://www.altalink.ca/projects/centralabtransmission/watl/watl-project.cfm
Additional Proposed Developments										
15	Parkland Airport (Phase 1)	Approximately 15 km east of Spruce Grove	Parkland Airport Development Corp.	Airport	Proposed.	The proposed Parkland Airport will consist of two phases. Phase 1 will consist of an east–west runway with basic aviation services, hangars and offices. The potential Phase 2 (2015+) development would consist of a north-south runway to enhance the airport's operation in all wind conditions.	$35 million	Construction of Phase 1 from 2013 to 2014 and Phase 2 in 2015 or later.	TLRU RSA Socio-Economic RSA HORU RSA	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx Parkland Airport Development Corp Website: http://www.parklandairport.com/
16	Robb Trend Project	Approximately 40 km southeast of Hinton.	Coal Valley Resources Inc.	Coal Mine	Under review (Environmental Impact Assessment [EIA] submitted to ERCB in April 2012).	The proposed Robb Trend Project is a proposed extension to the existing mining and coal processing activities at Coal Valley Mine, approximately 40 km southeast of Hinton. The development is located adjacent to existing mining operations, and will yield approximately 88.75 million clean metric tonnes available for sale. This additional tonnage would provide Coal Valley Resources Inc. with the necessary resources to operate at projected rates of production until 2038.	$ unknown	Construction and operation will occur in stages, with construction of Stages 1A and 1B from late 2013 to 2017 and initial operations anticipated to commence in late 2014.	TLRU RSA Socio-Economic RSA HORU RSA	Alberta Environment and Sustainable Resource Development Website: http://environment.alberta.ca/02313.html

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
17	Vista Coal Mine Project	Approximately 10 km east of Hinton.	Coalspur Mines Ltd.	Coal Mine	Under review (EIA submitted to ERCB in May 2012).	The proposed mine will develop 5 million clean tonnes per year of moderately low-rank bituminous, suited for thermal electric generation. The proposed mine is approximately 10 km east of Hinton town boundary and extends southeast for approximately 12 km to the McLeod River valley. The proposed Vista Coal Mine Project will involve: • a surface coal mine including pits, external waste rock dumps, a full range of surface coal mining and support equipment and infrastructure; • associated infrastructure including raw and clean coal conveyors, crushers and sizers, a coal processing plant and drying facilities, fresh water storage pond, fines settling pond and clean-coal load-out facility. The load-out facility loads coal into rail cars on a siding that will be constructed, owned and operated by CN Rail; • access corridors, haul roads, utilities and environmental management systems for a 20-year mining area. Projected labour requirements include approximately 700 person-years of construction and approximately 510 full time positions during operation.	$ unknown	Construction will occur in stages, expected to start in 2014 and initial operations anticipated to commence in 2015.	TLRU RSA Socio-Economic RSA HORU RSA	Alberta Environment and Sustainable Resource Development Website: http://environment.alberta.ca/02313.html Coalspur Mines Ltd. Website: http://www.coalspur.com/
HARGREAVES TO DARFIELD SEGMENT (Fraser – Fort George/Thompson – Nicola Region)										
Proposed Hydroelectric Developments										
1	Castle Creek Hydropower Project	Approximately 30 km south of McBride.	Castle Mountain Hydro Ltd.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 8, 2012.	Proposed 8 MW hydropower project on Benjamin Creek located in the McBride area.	$20 million	In-service by November 2016.	TLRU RSA Socio-Economic RSA HORU RSA	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Northern Development Initiative Trust Website: http://investnorthcentralbc.ca/major-projects-investment-opportunities/map-view/robson-valley/castle-mountain-run-of-river-projects BC MFLNRO Investigative Use Application and Reasons for Decision (File #7408639): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8003 BC MFLNRO Investigative Use Application: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=19649 BC Hydro Website: http://www.bchydro.com/energy-in-bc/acquiring_power/closed_offerings/clean_power_call/outcome.html
2	McIntosh Creek Hydroelectric Project	Approximately 12 km northwest of McBride.	Snowshoe Power Ltd.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO.	Proposed 1.2 MW hydroelectric facility on McIntosh Creek, approximately 12 km northwest of McBride.	$ unknown	In-service by December 2013.	TLRU RSA Socio-Economic RSA HORU RSA	Northern Development Initiative Trust Website: http://investnorthcentralbc.ca/major-projects-investment-opportunities/map-view/mcbride-2/mcintosh-creek-project BC Hydro Interconnection Queue: http://transmission.bchydro.com/NR/rdonlyres/20779185-8EEC-4622-9B6A-0AF4DD50E642/0/TGIQueue2013Apr22.pdf Personal communication (information request) with FrontCounter BC (May 27, 2013).
3	Morkill River Hydroelectric Project	Approximately 22 km northeast of Crescent Spur.	Robson Valley Power Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on February 11, 2013.	Proposed 5 to 10 MW hydroelectric project on the Morkill River, a tributary to the Fraser River. The project will require access roads (temporary and permanent), staging and spoil areas. The project will require an approximately 52 km long 69 kV transmission line.	$ unknown	Construction to commence by 2017.	TLRU RSA Socio-Economic RSA HORU RSA	Robson Valley Power Corp Investigative Use Plan: http://www.arfd.gov.bc.ca/ApplicationPosting/getfile.jsp?PostID=11105&FileID=43595&action=view BC MFLNRO Investigative Use Reasons for Decision (File #7408964): http://arfd.gov.bc.ca/ApplicationPosting/getdecisionfile.jsp?DecisionID=30724&DecisionFileID=27460&action=view BC MFLNRO Websites: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=11105 http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=11106

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
4	Robson Valley (Holmes River) Hydroelectric Project	Approximately 10 km west of McBride.	Holmes Hydro Inc.	Run-of-River Hydroelectric Project	License of Occupation granted by BC MFLNRO.	Series of 10 run-of-river plants with a total of 76.5 MW located on tributaries in the Holmes watershed.	$ unknown	In-service by December 2013 (note – according to FrontCounter BC, construction has not commenced).	TLRU RSA Socio-Economic RSA HORU RSA	BC Hydro Generator Interconnection Queue shows as under review. Website: http://transmission.bchydro.com/NR/rdonlyres/20779185-8EEC-4622-9B6A-0AF4DD50E642/0/TGIQueue2013Apr22.pdf BC MFLNRO Transmission Line Application: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=7991 Holmes Hydro Inc. President letter to Regional District of Fraser-Fort George: https://rdffg.civicweb.net/Documents/DocumentDisplay.aspx?ID=10495 Personal communication (information request) with FrontCounter BC (May 13, 2013 and May 31, 2013).
Additional Proposed Developments										
5	Harper Creek Copper-Gold-Silver Project	Approximately 10 km south of Vavenby.	Yellowhead Mining Inc.	Copper-Gold-Silver Mine	Pre-application (final AIRs submitted on October 21, 2011).	A proposed open pit mine with a 28 year mine life based on throughput of 70,000 tonnes/ day. Additional infrastructure includes power lines, access roads, facilities and storage areas.	$759 million	Mine will be constructed over a period of 18 to 24 months, with production expected for late 2016.	TLRU RSA Socio-Economic RSA HORU RSA	BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_333.html Yellowhead Mining Inc. Website: http://www.yellowheadmining.com/s/Home.asp
BLACK PINES TO HOPE SEGMENT, HOPE TO BURNABY SEGMENT AND BURNABY TO WESTRIDGE SEGMENT (Fraser – Fort George/Thompson – Nicola Region, Fraser Valley Region and Metro Vancouver Region)										
Proposed Pipeline Developments										
1	Kingsvale – Oliver Natural Gas Pipeline Reinforcement Project	Kingsvale to Oliver.	FortisBC	Natural Gas Pipeline	Pre-application (FortisBC received BC EAO approval of final Application Information Requirements on December 5, 2012).	The proposed project consists of looping the existing FortisBC pipeline system between Kingsvale, BC and Oliver, BC over a length of approximately 161 km, as well as a 1 km pipeline extension near Yahk and the addition of compression facilities at Kingsvale, Trail and Yahk.	$ unknown	Clearing and construction from Q4 2015 to Q4 2016.	TLRU RSA Socio-Economic RSA HORU RSA	BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_375_35173.html
Proposed Transmission Line Developments										
2	Interior – Lower Mainland Transmission Project	Merritt to Coquitlam.	British Columbia Transmission Corporation	Overhead Transmission Line	BC EAO Certificate issued.	Construction of a new 500 kV transmission line, mostly along the existing right-of-way from the Nicola Substation near Merritt to the Meridian Substation in Coquitlam.	$725 million	Currently under construction with an in-service date of January 2015.	TLRU RSA Socio-Economic RSA HORU RSA	BC EAO: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_290.html BC Hydro Website: http://www.bchydro.com/energy_in_bc/projects/ilm.html
3	Merritt Area Transmission Project	Merritt.	BC Hydro	Overhead Transmission Line	BC EAO Certificate issued.	Proposed 35 km 138 kV transmission line between the Merritt and Highland substations, mostly along existing unused BC Hydro right-of-way.	$66 million	Construction to start in early 2013 with operations by summer 2014.	TLRU RSA Socio-Economic RSA HORU RSA	BC Hydro: http://www.bchydro.com/energy_in_bc/projects/mat.html Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Hydroelectric Developments										
4	American Creek Hydroelectric Project	Approximately 5 km north of Hope.	Highwater Power Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on September 25, 2012.	Proposed 11.6 MW hydroelectric project on American Creek, approximately 5 km north of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408339): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4085
5	Anderson River Hydroelectric Project	Approximately 10 km southeast of Boston Bar.	Syntaris Power Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 15, 2012.	Proposed 13 MW run-of-river hydro project from Anderson, East Anderson and Uztlius intakes located approximately 10 km southeast of Boston Bar.	$90 million	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409681): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8966
6	Big Silver Creek Hydroelectric Project	Approximately 55 km north-northwest of Agassiz.	Innergex Renewable Energy Inc.	Run-of-River Hydroelectric Project	BC EAO Certificate Issued on August 17, 2012.	The project collectively consists of three hydroelectric projects: a 23 MW hydroelectric project on Tretheway Creek, a 13 MW hydroelectric project on Shovel Creek; and a 36 MW hydroelectric project on Big Silver Creek. The area of development is approximately 55 km north-northwest of Agassiz.	$ unknown	In-service planned for December 2015 for Tretheway Creek and November 2016 for Shovel Creek and Big Silver Creek.	TLRU RSA HORU RSA	BC EAO Application File for Tretheway Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_325.html BC EAO Application File for Shovel Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_327.html BC EAO Application File for Big Silver Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_325.html
7	Borden Creek Hydroelectric Project	Approximately 18 km southeast of Chilliwack.	Trigen Renewable Energy	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 19, 2012.	Proposed 4.1 MW hydroelectric project on Borden Creek, approximately 18 km southeast of Chilliwack.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (file #2409751): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9221
8	Bremner Creek Hydroelectric Project	Approximately 50 km north-northwest of Agassiz	Second Reality Effects Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on August 31, 2012.	Proposed hydroelectric project on Bremner Creek, approximately 50 km north-northwest of Agassiz. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (file #2409028): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5969

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
9	Cantelon-Yola Creeks Hydroelectric Project	Approximately 20 km south of Hope.	Pamawed Resources Ltd.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 23, 2012.	Proposed hydroelectric project on Cantelon and Yola creeks, approximately 20 km south of Hope. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409049): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5958
10	Airplane Creek Hydroelectric Project	Approximately 15 km east-southeast of Chilliwack.	Chilliwack Power Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 22, 2012.	Proposed hydroelectric project on Airplane Creek, approximately 15 km east-southeast of Chilliwack. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409114): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=6672
	Chipmunk Creek Hydroelectric Project	Approximately 10 km east of Chilliwack.	Chilliwack Power Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on November 23, 2012.	Proposed hydroelectric project on Chipmunk Creek, approximately 10 km east of Chilliwack. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409115): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=6671
11	Deneau Creek Hydroelectric Project	Approximately 10 km northeast of Hope.	Trigen Renewable Energy	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 29, 2012.	Proposed 3 MW hydroelectric project on Deneau Creek, approximately 10 km northeast of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409645): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8907
12	Emory Creek Hydroelectric Project	Approximately 15 km north of Hope.	Highwater Power Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on September 25, 2012.	Proposed 19 MW hydroelectric project on Emory Creek, approximately 15 km north of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408337): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4074
13	Fir Creek Hydroelectric Project	Approximately 55 km north of Agassiz.	Innergex Renewable Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 1, 2012.	Proposed 5.3 MW hydroelectric project on Fir Creek, approximately 55 km north of Agassiz.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409694): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9081
14	Florence Lake Pumped Storage Hydroelectric Project	Approximately 18 km north of Mission.	Clean Balance Power Inc.	Pumped Storage Hydro Power Project	Investigative use permit issued by BC MFLNRO on October 19, 2012.	Proposed 25 MW capacity pumped storage hydro power system located on Florence Lake, approximately 18 km north of Mission.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409767): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9277
15	Hoover Lake Pumped Storage Hydroelectric Project	Approximately 8 km northeast of Mission.	Clean Balance Power Inc.	Pumped Storage Hydro Power Project	Investigative use permit issued by BC MFLNRO on October 18, 2012.	Proposed 26 MW capacity pumped storage hydro power system located on Hoover Lake, approximately 8 km northeast of Mission.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409695): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9085
16	Hunter Creek Hydroelectric Project	Approximately 10 km southwest of Hope.	Princeton Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on September 27, 2012.	Proposed 2.64 MW hydroelectric project on Hunter Creek, approximately 10 km southwest of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408242): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=3882
17	Isabel and Pitt Lake Pumped Storage Hydroelectric Project	Approximately 30 km north of Maple Ridge.	6167047 Canada Ltd.	Pumped Storage Hydro Power Project	Investigative use permit issued by BC MFLNRO on October 22, 2012.	Proposed 225 MW capacity pumped storage hydro power system on Isabel and Pitt lakes, approximately 30 km north of Maple Ridge.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409743): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9170
18	Kenyon Lake Pumped Storage Hydroelectric Project	Approximately 25 km north-northeast of Mission.	Clean Balance Power Inc.	Pumped Storage Hydro Power Project	Investigative use permit issued by BC MFLNRO on November 27, 2012.	Proposed 50 MW capacity pumped storage hydro power system on Kenyon Lake, approximately 25 km north-northeast of Mission.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409710): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9144
19	Kwoiek Creek Water Power Project	Approximately 22 km south of Lytton.	Kwoiek Creek Resources and Innergex II Inc.	Run-of-River Hydroelectric Project	BC EAO Certificate issued.	Proposed 50 MW, run-of-river project located on the lower reaches of Kwoiek Creek, a tributary to the Fraser River. The project will include an approximately 80 km long, 138 kV transmission line to the BC Hydro substation at Highland Valley.	$180 million	Currently under construction with completion scheduled for fall 2013.	TLRU RSA HORU RSA	BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_125.html Kwoiek Creek Resources Website: http://www.kwoiekcreekhydro.com/
20	Kookipi Creek Water Power Project	Approximately 15 km northwest of Boston Bar.	Highwater Power Corporation	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on July 23, 2012.	Proposed 10 MW run-of-river hydro project on Kookipi Creek located approximately 15 km northwest of Boston Bar.	$20 million	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=28589 BC MFLNRO Transmission Line Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8288
	Log Creek Water Power Project	Approximately 30 km northwest of Boston Bar.	Highwater Power Corporation	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on July 23, 2012.	Proposed 10 MW run-of-river hydro project on Log Creek located approximately 30 km northwest of Boston Bar.	$20 million	Undetermined.	TLRU RSA Socio-Economic HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=28588 BC MFLNRO Transmission Line Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8288
21	Lookout Mountain Pumped Storage Hydroelectric Project	Approximately 20 km north-northeast of Agassiz.	Clean Balance Power Inc.	Pumped Storage Hydroelectric Project	Investigative use permit issued by BC MFLNRO on March 19, 2013.	Proposed pumped storage hydroelectric project at unnamed lakes east of Harrison Lake, approximately 20 km north-northeast of Agassiz.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2410808): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=34686

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
22	Maselpanik Creek Hydroelectric Project	Approximately 40 km southeast of Hope.	Pamawed Resources Ltd.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 9, 2012.	Proposed hydroelectric project on Maselpanik Creek, approximately 40 km southeast of Hope. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409047): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5956
23	Nasakwatch Creek Hydroelectric Project	Approximately 30 km southeast of Chilliwack.	Link Power Management Ltd.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 15, 2012.	Proposed hydroelectric project on Nasakwatch Creek, approximately 30 km southeast of Chilliwack. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408594): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4184
24	Patterson Creek Nano Hydro Project	Approximately 7 km southeast of Agassiz.	Lizabet Patheiger / Eric Redmond	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 10, 2012.	Proposed 0.4 MW hydroelectric project on Patterson Creek, approximately 7 km southeast of Agassiz.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409394): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=7848
25	Peers Creek Hydroelectric Project	Approximately 10 km east of Hope.	Princeton Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 15, 2012.	Proposed 1.75 MW hydroelectric project on Peers Creek, approximately 10 km east of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408245): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4160
26	Pierce Creek Hydroelectric Project	Approximately 20 km southeast of Chilliwack.	Larson Farms Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 15, 2012.	Proposed 0.76 MW hydroelectric project on Pierce Creek, approximately 20 km southeast of Chilliwack.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2407992): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=3884
27	Potter Creek Hydroelectric Project	Approximately 20 km southeast of Hope.	Princeton Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 2, 2012.	Proposed 1.75 MW hydroelectric project on Potter Creek, approximately 20 km southeast of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408243): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4163
28	Roaring Creek Hydroelectric Project	Approximately 40 km north-northeast of Mission.	Alpine Power and Transmission Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 23, 2012.	Proposed 6.6 MW hydroelectric project on Roaring Creek, approximately 40 km north-northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408255): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4130 BC MFLNRO Application Amendment: http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8106
29	Sakwi Creek Hydroelectric Project	Approximately 40 km northeast of Mission.	Sakwi Creek Power Corporation	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on March 28, 2013.	Proposed 5.5 MW hydroelectric project on Sakwi Creek, approximately 40 km northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2410820): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=33305
30	Salsbury Creek Hydroelectric Project	Approximately 40 km north-northeast of Mission.	Alpine Power and Transmission Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 22, 2012.	Proposed 7.8 MW hydroelectric project on Salsbury Creek, approximately 40 km north-northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408256): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4140 BC MFLNRO Application Amendment: http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8112
31	Sawmill Creek Hydroelectric Project	Approximately 25 km north of Hope.	Jim Dent Construction Ltd.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 9, 2012.	Proposed 7.5 MW run of river hydro project on Sawmill Creek located approximately 25 km north of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409806): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9474
32	Shovel Creek Hydroelectric Project	Approximately 55 km north-northwest of Agassiz.	Innergex Renewable Energy Inc.	Run-of-River Hydroelectric Project	BC EAO Certificate Issued on August 17, 2012.	The project collectively consists of three hydroelectric projects: a 23 MW hydroelectric project on Tretheway Creek, a 13 MW hydroelectric project on Shovel Creek; and a 36 MW hydroelectric project on Big Silver Creek. The area of development is approximately 55 km north-northwest of Agassiz.	$ unknown	In-service date planned for December 2015 for Tretheway Creek and November 2016 for Shovel Creek and Big Silver Creek.	TLRU RSA HORU RSA	BC EAO Application File for Tretheway Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_325.html BC EAO Application File for Shovel Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_327.html BC EAO Application File for Big Silver Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_325.html
33	Siwash Creek Hydroelectric Project	Approximately 15 km south of Lytton.	Morehead Valley Hydro Inc.	Run-of-River Hydroelectric Project	Under review for tenure by BC MFLNRO.	Proposed 2.2 MW run of river hydro project on Siwash Creek located approximately 15 km south of Lytton.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Project Scope (File #3412485): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=27246
34	Skwellepil Creek Hydroelectric Project	Approximately 40 km north-northeast of Mission.	Alpine Power and Transmission Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 23, 2012.	Proposed 6.3 MW hydroelectric project on Skwellepil Creek, approximately 40 km north-northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408254): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4127 BC MFLNRO Application Amendment: http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8101
35	Slollicum Lake Pumped Storage Hydroelectric Project	Approximately 18 km west-northwest of Hope.	Clean Balance Power Inc.	Pumped Storage Hydro Power Project	Investigative use permit issued by BC MFLNRO on November 1, 2012.	Proposed 22.5 MW capacity pumped storage hydro power system located on Slollicum Lake, approximately 18 km west-northwest of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409765): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9270
36	Snowshoe Creek Hydroelectric Project	Approximately 60 km north of Agassiz.	Innergex Renewable Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on September 25, 2012.	Proposed 4.2 MW hydroelectric project on Snowshoe Creek, approximately 60 km north of Agassiz.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409689): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8998

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
37	Statlu Creek Hydroelectric Project	Approximately 30 km northeast of Mission.	Innergex Renewable Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 10, 2012.	Proposed 22.5 MW hydroelectric project on Statlu Creek, approximately 30 km northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409277): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=7323
38	Statlu Lake Hydroelectric Project	Approximately 40 km north-northeast of Mission.	Alpine Power and Transmission Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 22, 2012.	Proposed 9.6 MW hydroelectric project on Statlu Lake, approximately 40 km north-northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408253): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4131 BC MFLNRO Application Amendment: http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8017
39	Tamihi Creek Hydroelectric Project	Approximately 15 km southeast of Chilliwack.	KMC Energy Corp.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on February 18, 2013.	Proposed 9.9 MW hydroelectric project on Tamihi Creek, approximately 15 km southeast of Chilliwack.	$20 million	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408854): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5977
40	Thretheway Creek Hydroelectric Project	Approximately 55 km north-northwest of Agassiz.	Innergex Renewable Energy Inc.	Run-of-River Hydroelectric Project	BC EAO Certificate Issued on August 17, 2012.	The project collectively consists of three hydroelectric projects: a 23 MW hydroelectric project on Tretheway Creek, a 13 MW hydroelectric project on Shovel Creek; and a 36 MW hydroelectric project on Big Silver Creek. The area of development is approximately 55 km north-northwest of Agassiz.	$ unknown	In-service date planned for December 2015 for Tretheway Creek and November 2016 for Shovel Creek and Big Silver Creek.	TLRU RSA HORU RSA	BC EAO Application File for Tretheway Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_325.html BC EAO Application File for Shovel Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_327.html BC EAO Application File for Big Silver Creek: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_325.html
41	Tributary to Nicolum Creek Hydroelectric Project	Approximately 5 km southeast of Hope.	Princeton Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 16, 2012.	Proposed 1.17 MW hydroelectric project on a tributary to Nicolum Creek, approximately 5 km southeast of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408247): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4161
42	Trio Creek Hydroelectric Project	Approximately 40 km north-northwest of Agassiz.	Second Reality Effects Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 31, 2012.	Proposed hydroelectric project on Trio Creek, approximately 40 km north-northwest of Agassiz. The number of MW generated by the project is unavailable.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2409027): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5992

TABLE 8A.1-1 Cont'd

Mapping Number	Title	Location	Proponent	Type	Application Status	Description	Capital Cost	Construction Schedule	Element RSA	Sources
43	Upper Pitt River Waterpower Project	Approximately 45 km north of Coquitlam.	Run-of-River Power Inc.	Run-of-River Hydroelectric Project	Investigative use permits issued by BC MFLNRO on November 19, 2012 and March 5, 2013. Pre-application (draft Application Terms of Reference submitted to BC EAO on February 14, 2008).	The project collectively consists of eight hydroelectric projects generating a combined 180 MW on Buklin Creek, Steve Creek, Pinecone Creek, Homer Creek, East Corbold Creek, Corbold Creek, Boise Creek and Shale Creek. The area of development is approximately 45 km north of Coquitlam.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision for Buklin Creek (File #2409042): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5950 BC MFLNRO Investigative Use Application and Reasons for Decision for Steve Creek (File #2409037): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=10625 BC MFLNRO Investigative Use Application and Reasons for Decision for Pinecone Creek (File #2409040): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=6022 BC MFLNRO Investigative Use Application and Reasons for Decision for Homer Creek (File #2409038): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5989 BC MFLNRO Investigative Use Application and Reasons for Decision for East Corbold Creek (File #2409036): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5994 BC MFLNRO Investigative Use Application and Reasons for Decision for Corbold Creek (File #2409043): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5991 BC MFLNRO Investigative Use Application and Reasons for Decision for Boise Creek (File #2409041): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5993 BC MFLNRO Investigative Use Application and Reasons for Decision for Shale Creek (File #2409039): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=5954 BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_291.html
44	Winslow Creek Hydroelectric Project	Approximately 40 km north-northeast of Mission.	Alpine Power and Transmission Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 23, 2012.	Proposed 5.4 MW hydroelectric project on Winslow Creek, approximately 40 km north-northeast of Mission.	$ unknown	Undetermined.	TLRU RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (File #2408257): http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4128 BC MFLNRO Application Amendment: http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=8671
45	Wray Creek Hydroelectric Project	Approximately 15 km southeast of Hope.	Princeton Energy Inc.	Run-of-River Hydroelectric Project	Investigative use permit issued by BC MFLNRO on October 15, 2012.	Proposed 2.29 MW hydroelectric project on Wray Creek, approximately 15 km southeast of Hope.	$ unknown	Undetermined.	TLRU RSA Socio-Economic RSA HORU RSA	BC MFLNRO Investigative Use Application and Reasons for Decision (#2408246): http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4162
Additional Proposed Developments										
46	Ajax Project	Kamloops (partially within southwest city limits and located on the existing Trans Mountain pipeline right-of-way).	KGHM Ajax Mining Inc.	Open Pit Copper-Gold Mine	Pre-application (Ajax submitted draft Application Information Requirements to BC EAO on January 11, 2012).	Ajax. proposes to develop a new copper and gold mine with a production capacity of 21.9 million tonnes of ore per year. The mine's life expectancy is 23 years. Project application review will be conducted collaboratively between BC EAO and CEA Agency.	$795 million	Commencement in 2014, with production beginning by 2016 (original forecast was 2015).	TLRU RSA Socio-Economic RSA HORU RSA	BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_362.html KGHM Ajax Mining Inc. Website: http://ajaxmine.ca/index.php
47	Gateway Program - Port Mann Bridge/ Highway 1 Improvements - Golden Ears Connector	Surrey.	BC MTI	Upgrade to existing roadway	Approved.	Upgrade to existing Daly Road between 104th Avenue /176th Street and Golden Ears Way/96 Avenue intersections.	Part of $3.3 billion project	Under construction/February 2009 to late 2013.	TLRU RSA Socio-Economic RSA HORU RSA	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Port Mann Bridge/Hwy 1 Improvements Website: http://www.pmh1project.com/in-your-community/surrey/Pages/Project-Designs.aspx

TABLE 8A.1-2

REASONABLY FORESEEABLE PIPELINE DEVELOPMENTS WITHIN THE TRANS MOUNTAIN EXPANSION PROJECT RSA OF VARIOUS ELEMENTS

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
ACCESS PIPELINE INC.	01-09-056-21 W4M	TO	05-04-056-21 W4M	√	√
ACCESS PIPELINE INC.	05-04-056-21 W4M	TO	01-09-056-21 W4M	√	√
ACCESS PIPELINE INC.	15-32-059-19 W4M	TO	05-18-056-21 W4M	√	√
ALBERTA OIL SANDS PIPELINE LTD.	08-20-053-23 W4M	TO	02-20-053-20 W4M	√	√
ALBERTA OIL SANDS PIPELINE LTD.	08-20-053-23 W4M	TO	02-20-053-23 W4M	√	√
ALBERTA OIL SANDS PIPELINE LTD.	16-20-053-23 W4M	TO	09-20-053-23 W4M	√	√
ALBERTA PRODUCTS PIPE LINE LTD.	UNAVAILABLE	TO	UNAVAILABLE	√	√
ALBERTA PRODUCTS PIPE LINE LTD.	01-19-052-23 W4M	TO	01-19-052-23 W4M	√	√
ALBERTA PRODUCTS PIPE LINE LTD.	03-14-050-25 W4M	TO	14-11-050-25 W4M	√	√
ALBERTA PRODUCTS PIPE LINE LTD.	04-25-051-24 W4M	TO	13-24-051-24 W4M	√	√
ALEXANDER ENERGY LTD.	UNAVAILABLE	TO	UNAVAILABLE	√	√
ALEXANDER ENERGY LTD.	09-12-056-27 W4M	TO	11-07-056-26 W4M	√	√
ALEXANDER ENERGY LTD.	10-07-056-26 W4M	TO	10-07-056-26 W4M	√	√
ALEXANDER ENERGY LTD.	14-12-056-27 W4M	TO	09-12-056-27 W4M	√	√
ALEXANDER ENERGY LTD.	15-12-056-27 W4M	TO	09-12-056-27 W4M	√	√
ALTAGAS UTILITIES INC.	14-23-056-25 W4M	TO	01-02-056-25 W4M	√	√
ANTERRA ENERGY INC.	09-18-045-05 W5M	TO	01-18-045-05 W5M		√
APACHE CANADA LTD.	01-29-057-20 W5M	TO	11-20-057-20 W5M	√	√
APACHE CANADA LTD.	02-22-057-19 W5M	TO	01-22-057-19 W5M	√	
APACHE CANADA LTD.	04-23-058-19 W5M	TO	05-23-058-19 W5M	√	
APACHE CANADA LTD.	05-18-057-19 W5M	TO	05-18-057-19 W5M	√	
APACHE CANADA LTD.	11-11-057-20 W5M	TO	10-13-057-20 W5M	√	√
APACHE CANADA LTD.	13-02-057-20 W5M	TO	11-11-057-20 W5M	√	√
APACHE CANADA LTD.	13-08-057-19 W5M	TO	09-08-057-19 W5M	√	
APACHE CANADA LTD.	13-09-057-19 W5M	TO	09-08-057-19 W5M	√	
ARC RESOURCES LTD.	UNAVAILABLE	TO	UNAVAILABLE	√	√
ARC RESOURCES LTD.	01-14-056-21 W4M	TO	04-13-056-21 W4M	√	√
ARC RESOURCES LTD.	03-03-049-07 W5M	TO	12-34-048-07 W5M	√	√
ARC RESOURCES LTD.	03-03-049-07 W5M	TO	13-34-048-07 W5M	√	√
ARC RESOURCES LTD.	03-03-049-07 W5M	TO	14-34-048-07 W5M	√	√
ARC RESOURCES LTD.	04-03-049-08 W5M	TO	06-03-049-08 W5M	√	√
ARC RESOURCES LTD.	04-23-049-08 W5M	TO	11-23-049-08 W5M	√	√
ARC RESOURCES LTD.	05-09-048-07 W5M	TO	12-09-048-07 W5M	√	√
ARC RESOURCES LTD.	05-20-056-20 W4M	TO	11-19-056-20 W4M	√	√
ARC RESOURCES LTD.	08-09-049-05 W5M	TO	15-09-049-05 W5M	√	√
ARC RESOURCES LTD.	08-32-048-08 W5M	TO	05-32-048-08 W5M	√	
ARC RESOURCES LTD.	10-19-056-20 W4M	TO	11-19-056-20 W4M	√	√
ARC RESOURCES LTD.	10-32-047-10 W5M	TO	06-05-048-10 W5M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
ARC RESOURCES LTD.	12-34-048-07 W5M	TO	03-03-049-07 W5M	√	√
ARC RESOURCES LTD.	13-04-049-07 W5M	TO	13-04-049-07 W5M	√	√
ARC RESOURCES LTD.	13-26-048-05 W5M	TO	16-03-049-05 W5M	√	√
ARC RESOURCES LTD.	14-22-048-06 W5M	TO	16-22-048-06 W5M	√	√
ARC RESOURCES LTD.	14-28-048-06 W5M	TO	14-29-048-06 W5M	√	√
ARC RESOURCES LTD.	15-09-049-05 W5M	TO	11-31-049-05 W5M	√	√
ARC RESOURCES LTD.	16-03-049-05 W5M	TO	16-10-049-05 W5M	√	√
ARC RESOURCES LTD.	16-10-049-05 W5M	TO	15-09-049-05 W5M	√	√
ARC RESOURCES LTD.	16-18-049-07 W5M	TO	12-17-049-07 W5M	√	√
ARC RESOURCES LTD.	16-18-056-21 W4M	TO	05-18-056-21 W4M	√	√
ARC RESOURCES LTD.	16-22-048-06 W5M	TO	08-22-048-06 W5M	√	√
ARC RESOURCES LTD.	16-22-048-06 W5M	TO	16-27-048-06 W5M	√	√
ARC RESOURCES LTD.	16-27-048-06 W5M	TO	14-28-048-06 W5M	√	√
ARC RESOURCES LTD.	16-28-048-06 W5M	TO	16-27-048-06 W5M	√	√
ARC RESOURCES LTD.	16-33-048-07 W5M	TO	16-33-048-07 W5M	√	√
ACCESS PIPELINE INC.	01-09-056-21 W4M	TO	05-04-056-21 W4M	√	√
ARTEK EXPLORATION LTD.	01-34-048-26 W4M	TO	04-35-048-26 W4M	√	√
ARTEK EXPLORATION LTD.	04-35-048-26 W4M	TO	01-34-048-26 W4M	√	√
ARTEK EXPLORATION LTD.	05-25-048-26 W4M	TO	11-26-048-26 W4M	√	√
ARTEK EXPLORATION LTD.	06-25-048-26 W4M	TO	05-25-048-26 W4M	√	√
ARTISAN ENERGY CORPORATION	UNAVAILABLE	TO	UNAVAILABLE	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	01-07-049-27 W5M	TO	16-06-049-27 W5M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	01-07-060-05 W5M	TO	13-05-060-05 W5M		√
ATCO GAS AND PIPELINES LTD. (SOUTH)	01-20-051-24 W4M	TO	01-20-051-24 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	01-20-051-24 W4M	TO	09-17-051-24 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	01-26-054-01 W5M	TO	16-23-054-01 W5M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	03-08-053-25 W4M	TO	03-08-053-25 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	04-33-054-22 W4M	TO	04-33-054-22 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	05-02-048-08 W5M	TO	05-02-048-08 W5M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	08-17-051-24 W4M	TO	01-17-051-24 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	08-30-052-21 W4M	TO	01-30-052-21 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	08-33-052-26 W4M	TO	01-33-052-26 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	09-36-054-03 W5M	TO	15-36-054-03 W5M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	10-33-054-22 W4M	TO	07-33-054-22 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	12-01-054-24 W4M	TO	16-02-054-24 W4M	√	√
ATCO GAS AND PIPELINES LTD. (SOUTH)	12-01-056-05 W5M	TO	12-01-056-05 W5M	√	√
BACCALIEU ENERGY INC.	UNAVAILABLE	TO	UNAVAILABLE	√	√
BACCALIEU ENERGY INC.	01-15-050-12 W5M	TO	02-13-050-12 W5M	√	
BACCALIEU ENERGY INC.	01-20-049-11 W5M	TO	05-21-049-11 W5M	√	
BACCALIEU ENERGY INC.	02-13-050-12 W5M	TO	01-15-050-12 W5M	√	
BACCALIEU ENERGY INC.	02-17-047-11 W5M	TO	12-08-047-11 W5M	√	
BACCALIEU ENERGY INC.	04-27-050-12 W5M	TO	16-15-050-12 W5M	√	
BACCALIEU ENERGY INC.	04-28-049-11 W5M	TO	05-21-049-11 W5M	√	
BACCALIEU ENERGY INC.	05-21-049-11 W5M	TO	01-20-049-11 W5M	√	
BACCALIEU ENERGY INC.	13-03-047-11 W5M	TO	11-03-047-11 W5M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
BACCALIEU ENERGY INC.	13-34-050-12 W5M	TO	04-27-050-12 W5M	√	
BACCALIEU ENERGY INC.	16-15-050-12 W5M	TO	01-15-050-12 W5M	√	
BAYTEX ENERGY LTD.	05-21-057-22 W4M	TO	05-21-057-22 W4M	√	√
BAYTEX ENERGY LTD.	07-30-056-21 W4M	TO	10-30-056-21 W4M	√	√
BAYTEX ENERGY LTD.	10-08-057-22 W4M	TO	13-09-057-22 W4M	√	√
BAYTEX ENERGY LTD.	10-17-057-22 W4M	TO	02-20-057-22 W4M	√	√
BAYTEX ENERGY LTD.	15-04-057-22 W4M	TO	15-09-057-22 W4M	√	√
BAYTEX ENERGY LTD.	15-09-057-22 W4M	TO	01-16-057-22 W4M	√	√
BAYTEX ENERGY LTD.	16-04-057-22 W4M	TO	15-04-057-22 W4M	√	√
BELLATRIX EXPLORATION LTD.	01-01-045-11 W5M	TO	08-01-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	01-05-045-10 W5M	TO	06-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	02-02-045-11 W5M	TO	03-02-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	02-10-045-11 W5M	TO	07-10-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	02-10-045-11 W5M	TO	10-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	03-06-045-10 W5M	TO	05-06-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	03-26-047-07 W5M	TO	15-24-047-07 W5M	√	√
BELLATRIX EXPLORATION LTD.	04-05-045-10 W5M	TO	05-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	05-05-045-10 W5M	TO	13-09-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	07-10-045-11 W5M	TO	02-10-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	10-05-045-10 W5M	TO	02-10-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	10-05-045-10 W5M	TO	11-04-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	10-09-045-08 W5M	TO	10-05-046-06 W5M		√
BELLATRIX EXPLORATION LTD.	11-04-045-10 W5M	TO	10-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	11-04-045-10 W5M	TO	16-23-044-10 W5M	√	
BELLATRIX EXPLORATION LTD.	11-24-044-10 W5M	TO	13-05-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	13-03-045-11 W5M	TO	15-03-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	13-05-045-09 W5M	TO	04-08-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	13-11-045-09 W5M	TO	04-14-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	13-23-047-07 W5M	TO	03-26-047-07 W5M	√	√
BELLATRIX EXPLORATION LTD.	13-26-045-11 W5M	TO	15-23-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	13-33-044-09 W5M	TO	13-05-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	14-22-045-09 W5M	TO	11-22-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	14-35-044-11 W5M	TO	03-02-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	16-23-044-10 W5M	TO	11-04-045-10 W5M	√	
BLAZE ENERGY LTD.	02-07-048-14 W5M	TO	11-31-047-14 W5M	√	
BLAZE ENERGY LTD.	04-04-048-13 W5M	TO	05-08-048-13 W5M	√	
BLAZE ENERGY LTD.	05-08-048-13 W5M	TO	04-04-048-13 W5M	√	
BONAVISTA ENERGY CORPORATION	UNAVAILABLE	TO	UNAVAILABLE	√	√
BONAVISTA ENERGY CORPORATION	01-05-042-06 W5M	TO	11-04-042-06 W5M		√
BONAVISTA ENERGY CORPORATION	02-30-056-19 W5M	TO	07-19-056-19 W5M	√	
BONAVISTA ENERGY CORPORATION	03-04-053-15 W5M	TO	03-04-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	03-04-053-15 W5M	TO	06-04-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	03-25-054-16 W5M	TO	02-25-054-16 W5M	√	√
BONAVISTA ENERGY CORPORATION	03-26-050-17 W5M	TO	10-23-050-17 W5M	√	√
BONAVISTA ENERGY CORPORATION	12-04-042-06 W5M	TO	01-05-042-06 W5M		√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
BONAVISTA ENERGY CORPORATION	13-15-057-19 W5M	TO	01-21-057-19 W5M	√	
BONAVISTA ENERGY CORPORATION	13-30-057-18 W5M	TO	05-30-057-18 W5M	√	
BONTERRA ENERGY CORP.	UNAVAILABLE	TO	UNAVAILABLE	√	√
BONTERRA ENERGY CORP.	01-14-049-04 W5M	TO	16-11-049-04 W5M	√	√
BONTERRA ENERGY CORP.	01-15-048-07 W5M	TO	01-15-048-07 W5M	√	√
BONTERRA ENERGY CORP.	01-24-049-05 W5M	TO	08-19-049-04 W5M	√	√
BONTERRA ENERGY CORP.	02-35-048-04 W5M	TO	07-35-048-04 W5M	√	√
BONTERRA ENERGY CORP.	04-04-049-04 W5M	TO	16-32-048-04 W5M	√	√
BONTERRA ENERGY CORP.	04-25-046-09 W5M	TO	16-26-046-09 W5M		√
BONTERRA ENERGY CORP.	04-26-047-10 W5M	TO	16-22-047-10 W5M	√	
BONTERRA ENERGY CORP.	04-28-048-04 W5M	TO	06-28-048-04 W5M	√	√
BONTERRA ENERGY CORP.	06-03-049-04 W5M	TO	04-03-049-04 W5M	√	√
BONTERRA ENERGY CORP.	06-06-047-07 W5M	TO	08-06-047-07 W5M		√
BONTERRA ENERGY CORP.	06-10-049-04 W5M	TO	06-03-049-04 W5M	√	√
BONTERRA ENERGY CORP.	07-22-049-04 W5M	TO	13-15-049-04 W5M	√	√
BONTERRA ENERGY CORP.	07-25-046-08 W5M	TO	14-25-046-08 W5M		√
BONTERRA ENERGY CORP.	07-28-046-09 W5M	TO	08-28-046-09 W5M	√	√
BONTERRA ENERGY CORP.	07-32-048-04 W5M	TO	07-32-048-04 W5M	√	√
BONTERRA ENERGY CORP.	08-02-049-04 W5M	TO	06-01-049-04 W5M	√	√
BONTERRA ENERGY CORP.	08-14-049-04 W5M	TO	16-11-049-04 W5M	√	√
BONTERRA ENERGY CORP.	08-21-046-09 W5M	TO	16-21-046-09 W5M	√	√
BONTERRA ENERGY CORP.	08-28-046-09 W5M	TO	16-28-046-09 W5M	√	√
BONTERRA ENERGY CORP.	09-07-047-08 W5M	TO	08-07-047-08 W5M		√
BONTERRA ENERGY CORP.	10-34-049-09 W5M	TO	06-03-050-09 W5M	√	
BONTERRA ENERGY CORP.	11-03-048-05 W5M	TO	16-33-047-05 W5M	√	√
BONTERRA ENERGY CORP.	11-07-047-08 W5M	TO	03-06-047-08 W5M		√
BONTERRA ENERGY CORP.	11-22-048-04 W5M	TO	12-22-048-04 W5M	√	√
BONTERRA ENERGY CORP.	12-17-048-04 W5M	TO	16-17-048-04 W5M	√	√
BONTERRA ENERGY CORP.	12-22-048-04 W5M	TO	11-22-048-04 W5M	√	√
BONTERRA ENERGY CORP.	13-05-051-04 W5M	TO	01-07-051-04 W5M	√	√
BONTERRA ENERGY CORP.	13-08-048-04 W5M	TO	12-17-048-04 W5M	√	√
BONTERRA ENERGY CORP.	13-13-047-07 W5M	TO	15-13-047-07 W5M		√
BONTERRA ENERGY CORP.	13-13-049-04 W5M	TO	16-11-049-04 W5M	√	√
BONTERRA ENERGY CORP.	13-18-048-03 W5M	TO	06-13-048-04 W5M	√	√
BONTERRA ENERGY CORP.	15-08-049-04 W5M	TO	05-08-049-04 W5M	√	√
BONTERRA ENERGY CORP.	15-08-049-04 W5M	TO	07-08-049-04 W5M	√	√
BONTERRA ENERGY CORP.	15-13-047-07 W5M	TO	10-13-047-07 W5M		√
BONTERRA ENERGY CORP.	15-18-048-03 W5M	TO	13-18-048-03 W5M	√	√
BONTERRA ENERGY CORP.	16-10-048-04 W5M	TO	08-10-048-04 W5M	√	√
BONTERRA ENERGY CORP.	16-11-049-04 W5M	TO	13-01-049-04 W5M	√	√
BONTERRA ENERGY CORP.	16-18-048-03 W5M	TO	15-18-048-03 W5M	√	√
BONTERRA ENERGY CORP.	16-21-046-09 W5M	TO	07-28-046-09 W5M	√	√
BONTERRA ENERGY CORP.	16-28-046-09 W5M	TO	08-28-046-09 W5M	√	√
BONTERRA ENERGY CORP.	16-32-048-04 W5M	TO	04-04-049-04 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	01-04-054-23 W5M	TO	16-33-053-23 W5M	√	√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
CANADIAN NATURAL RESOURCES LIMITED	01-14-053-23 W5M	TO	02-13-053-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	03-06-054-22 W5M	TO	12-01-054-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	03-30-052-19 W5M	TO	02-30-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	04-16-054-20 W5M	TO	04-20-054-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	04-22-053-23 W5M	TO	13-27-053-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	07-20-054-20 W5M	TO	04-20-054-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	13-27-053-23 W5M	TO	12-01-054-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	14-15-053-21 W5M	TO	16-04-053-21 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	15-15-058-23 W5M	TO	10-15-058-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	16-33-053-23 W5M	TO	07-33-053-23 W5M	√	√
CANEXUS CORPORATION	02-34-055-20 W4M	TO	09-06-056-20 W4M	√	√
CANEXUS CORPORATION	09-06-056-20 W4M	TO	02-34-055-20 W4M	√	√
CELTIC EXPLORATION ULC	01-26-058-01 W6M	TO	05-25-058-01 W6M		√
CELTIC EXPLORATION ULC	04-14-057-27 W5M	TO	04-11-057-27 W5M	√	√
CELTIC EXPLORATION ULC	05-25-058-01 W6M	TO	01-26-058-01 W6M		√
CELTIC EXPLORATION ULC	11-03-060-01 W6M	TO	02-10-060-01 W6M		√
CHEVRON CANADA LIMITED	06-15-056-18 W5M	TO	03-34-055-18 W5M	√	√
CHEVRON CANADA LIMITED	06-32-055-18 W5M	TO	13-28-055-18 W5M	√	√
COLD CREEK RESOURCES LTD.	09-04-060-27 W5M	TO	13-03-060-27 W5M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	01-01-046-13 W5M	TO	11-06-046-12 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	01-11-058-19 W5M	TO	12-12-058-19 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	04-01-048-12 W5M	TO	11-02-048-12 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	04-18-050-09 W5M	TO	04-18-050-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	05-22-060-26 W5M	TO	01-27-060-26 W5M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	06-24-059-01 W6M	TO	15-25-059-01 W6M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	08-21-046-09 W5M	TO	04-21-046-09 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	08-21-046-09 W5M	TO	05-21-046-09 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	08-25-050-13 W5M	TO	16-25-050-13 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	08-30-055-12 W5M	TO	13-20-055-12 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	10-25-050-12 W5M	TO	13-25-050-12 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	11-02-048-12 W5M	TO	11-02-048-12 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	11-06-046-12 W5M	TO	09-06-046-12 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	12-02-047-10 W5M	TO	06-02-047-10 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	12-12-054-15 W5M	TO	01-03-054-15 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	16-16-045-09 W5M	TO	16-16-045-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	16-28-049-15 W5M	TO	08-33-049-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	01-12-049-17 W5M	TO	15-01-049-17 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	01-23-062-06 W6M	TO	07-23-062-06 W6M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	13-11-045-07 W5M	TO	08-22-045-07 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	14-15-062-06 W6M	TO	16-15-062-06 W6M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	16-28-049-16 W5M	TO	15-27-049-16 W5M	√	√
CROCOTTA ENERGY INC.	UNAVAILABLE	TO	UNAVAILABLE	√	√
CROCOTTA ENERGY INC.	01-19-054-17 W5M	TO	03-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	01-25-054-18 W5M	TO	13-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	03-01-055-18 W5M	TO	08-35-054-18 W5M	√	√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
CROCOTTA ENERGY INC.	03-19-054-17 W5M	TO	13-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	07-35-054-18 W5M	TO	01-35-054-18 W5M	√	√
CROCOTTA ENERGY INC.	08-02-054-18 W5M	TO	15-12-054-18 W5M	√	√
CROCOTTA ENERGY INC.	13-08-054-17 W5M	TO	10-18-054-17 W5M	√	√
CROCOTTA ENERGY INC.	13-17-054-17 W5M	TO	02-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	13-18-054-17 W5M	TO	03-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	14-22-054-18 W5M	TO	03-22-054-18 W5M	√	√
CROCOTTA ENERGY INC.	16-15-054-18 W5M	TO	13-14-054-18 W5M	√	√
CROCOTTA ENERGY INC.	16-22-054-18 W5M	TO	05-23-054-18 W5M	√	√
CROCOTTA ENERGY INC.	16-26-054-18 W5M	TO	01-35-054-18 W5M	√	√
CROCOTTA ENERGY INC.	16-29-053-18 W5M	TO	09-29-053-18 W5M	√	√
CROCOTTA ENERGY INC.	16-29-053-18 W5M	TO	16-29-053-18 W5M	√	√
DEETHREE EXPLORATION LTD.	05-27-047-14 W5M	TO	08-28-047-14 W5M	√	
DEVON CANADA CORPORATION	02-07-060-05 W6M	TO	07-07-060-05 W6M		√
DEVON CANADA CORPORATION	03-22-056-27 W5M	TO	14-15-056-27 W5M	√	√
DEVON CANADA CORPORATION	04-03-065-09 W6M	TO	03-03-065-09 W6M		√
DEVON CANADA CORPORATION	04-23-056-27 W5M	TO	09-22-056-27 W5M	√	√
DEVON CANADA CORPORATION	07-07-060-05 W6M	TO	03-07-060-05 W6M		√
DEVON CANADA CORPORATION	11-07-060-05 W6M	TO	07-07-060-05 W6M		√
DEVON CANADA CORPORATION	12-22-047-17 W5M	TO	09-21-047-17 W5M	√	
DEVON CANADA CORPORATION	16-14-061-08 W6M	TO	16-14-061-08 W6M		√
DIRECT ENERGY MARKETING LIMITED	15-31-053-13 W5M	TO	06-31-053-13 W5M	√	√
DIRECT ENERGY MARKETING LIMITED	16-36-053-14 W5M	TO	10-36-053-14 W5M	√	√
ENBRIDGE PIPELINES (WOODLAND) INC.	07-24-059-20 W4M	TO	05-04-053-23 W4M	√	√
ENCANA CORPORATION	UNAVAILABLE	TO	UNAVAILABLE		√
ENCANA CORPORATION	01-14-047-03 W5M	TO	04-13-047-03 W5M		√
ENCANA CORPORATION	04-11-060-04 W6M	TO	04-01-060-04 W6M		√
ENCANA CORPORATION	07-27-062-07 W6M	TO	06-27-062-07 W6M		√
ENCANA CORPORATION	14-22-047-03 W5M	TO	13-22-047-03 W5M	√	√
ENCANA CORPORATION	15-19-061-06 W6M	TO	15-32-061-06 W6M		√
ENCANA CORPORATION	16-26-047-03 W5M	TO	16-26-047-03 W5M	√	√
ENCANA CORPORATION	16-31-062-07 W6M	TO	06-27-062-07 W6M		√
ENERPLUS CORPORATION	UNAVAILABLE	TO	UNAVAILABLE		√
ENERPLUS CORPORATION	01-18-050-19 W5M	TO	14-08-050-19 W5M	√	√
ENERPLUS CORPORATION	02-15-046-15 W5M	TO	02-15-046-15 W5M	√	
ENERPLUS CORPORATION	02-31-049-21 W4M	TO	02-31-049-21 W4M	√	√
ENERPLUS CORPORATION	02-31-049-21 W4M	TO	07-31-049-21 W4M	√	√
ENERPLUS CORPORATION	04-25-046-07 W5M	TO	08-26-046-07 W5M		√
ENERPLUS CORPORATION	04-31-049-21 W4M	TO	04-31-049-21 W4M	√	√
ENERPLUS CORPORATION	04-31-049-21 W4M	TO	12-31-049-21 W4M	√	√
ENERPLUS CORPORATION	07-31-049-21 W4M	TO	08-31-049-21 W4M	√	√
ENERPLUS CORPORATION	07-31-049-21 W4M	TO	10-31-049-21 W4M	√	√
ENERPLUS CORPORATION	10-30-049-21 W4M	TO	02-31-049-21 W4M	√	√
ENERPLUS CORPORATION	10-30-049-21 W4M	TO	10-30-049-21 W4M	√	
ENERPLUS CORPORATION	10-30-049-21 W4M	TO	12-29-049-21 W4M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
ENERPLUS CORPORATION	10-36-049-22 W4M	TO	10-36-049-22 W4M	√	√
ENERPLUS CORPORATION	12-29-049-21 W4M	TO	13-29-049-21 W4M		√
ENERPLUS CORPORATION	16-29-046-07 W5M	TO	02-32-046-07 W5M		√
ENERPLUS CORPORATION	16-33-046-07 W5M	TO	05-05-047-06 W5M		√
EOG RESOURCES CANADA INC.	12-15-049-08 W5M	TO	09-16-049-08 W5M	√	√
EXORO ENERGY INC.	08-27-049-07 W5M	TO	08-28-049-07 W5M	√	√
EXORO ENERGY INC.	08-28-049-07 W5M	TO	13-26-049-07 W5M	√	√
GIBSON ENERGY ULC	01-03-049-10 W5M	TO	06-02-049-10 W5M	√	
HARVEST OPERATIONS CORP.	01-31-054-16 W5M	TO	10-32-054-16 W5M	√	√
HARVEST OPERATIONS CORP.	02-01-044-08 W5M	TO	09-25-043-08 W5M		√
HARVEST OPERATIONS CORP.	08-33-061-06 W6M	TO	02-34-061-06 W6M		√
HARVEST OPERATIONS CORP.	15-17-043-07 W5M	TO	14-16-043-07 W5M		√
HUSKY OIL OPERATIONS LIMITED	01-29-049-18 W5M	TO	12-20-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	01-34-055-20 W4M	TO	16-34-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	02-22-051-19 W5M	TO	02-22-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-06-049-18 W5M	TO	16-02-049-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-20-049-18 W5M	TO	12-20-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-20-050-18 W5M	TO	06-20-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-23-049-19 W5M	TO	01-23-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	04-09-049-18 W5M	TO	15-05-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	04-13-050-19 W5M	TO	04-18-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	05-14-050-19 W5M	TO	04-13-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	06-35-049-20 W5M	TO	03-35-049-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	08-15-049-18 W5M	TO	04-22-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	08-17-050-18 W5M	TO	08-17-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	08-26-055-20 W4M	TO	08-26-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	08-26-055-20 W4M	TO	16-27-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	11-29-049-18 W5M	TO	12-20-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	12-19-055-19 W4M	TO	14-24-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	12-20-049-18 W5M	TO	03-06-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	13-01-049-20 W5M	TO	14-01-049-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	13-04-050-18 W5M	TO	06-09-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	13-22-049-18 W5M	TO	16-21-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	14-24-055-20 W4M	TO	14-24-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	14-24-055-20 W4M	TO	16-23-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	15-05-049-18 W5M	TO	03-08-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	15-27-049-18 W5M	TO	16-21-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	15-35-048-20 W5M	TO	14-01-049-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	16-12-049-20 W5M	TO	14-01-049-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	16-23-055-20 W4M	TO	08-26-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	16-23-055-20 W4M	TO	16-23-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	16-27-055-20 W4M	TO	01-34-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	16-27-055-20 W4M	TO	08-26-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	16-27-055-20 W4M	TO	16-27-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	16-28-050-19 W5M	TO	03-32-050-19 W5M	√	√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
HUSKY OIL OPERATIONS LIMITED	16-30-050-19 W5M	TO	03-32-050-19 W5M	√	√
HYPERION EXPLORATION CORP.	03-11-056-14 W5M	TO	10-02-056-14 W5M	√	√
HYPERION EXPLORATION CORP.	03-30-055-13 W5M	TO	13-30-055-13 W5M	√	√
IMPERIAL OIL RESOURCES LIMITED	02-14-050-11 W5M	TO	04-14-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	05-11-049-11 W5M	TO	14-21-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	06-04-050-11 W5M	TO	13-03-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	08-02-050-11 W5M	TO	14-02-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	08-03-049-11 W5M	TO	04-11-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	12-01-049-11 W5M	TO	05-11-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	12-11-050-11 W5M	TO	12-11-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	16-03-050-11 W5M	TO	16-03-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	16-10-050-11 W5M	TO	16-10-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	16-11-050-10 W5M	TO	02-14-050-10 W5M	√	
INSIGNIA ENERGY LTD.	16-20-048-05 W5M	TO	06-29-048-05 W5M	√	√
JOURNEY ENERGY INC.	04-06-049-04 W5M	TO	12-31-048-04 W5M	√	√
JOURNEY ENERGY INC.	04-06-049-04 W5M	TO	13-06-049-04 W5M	√	√
JOURNEY ENERGY INC.	04-31-048-04 W5M	TO	08-36-048-05 W5M	√	√
JOURNEY ENERGY INC.	08-36-048-05 W5M	TO	04-31-048-04 W5M	√	√
JOURNEY ENERGY INC.	09-25-048-05 W5M	TO	09-25-048-05 W5M	√	√
JOURNEY ENERGY INC.	12-31-048-04 W5M	TO	04-06-049-04 W5M	√	√
JOURNEY ENERGY INC.	12-31-048-04 W5M	TO	13-31-048-04 W5M	√	√
JOURNEY ENERGY INC.	13-06-049-04 W5M	TO	04-06-049-04 W5M	√	√
JOURNEY ENERGY INC.	13-19-048-04 W5M	TO	04-30-048-04 W5M	√	√
JOURNEY ENERGY INC.	13-31-048-04 W5M	TO	12-31-048-04 W5M	√	√
KEYERA ENERGY LTD.	14-05-045-09 W5M	TO	01-10-044-10 W5M	√	
KEYERA ENERGY LTD.	16-25-055-22 W4M	TO	04-18-055-21 W4M	√	√
KINGSMERE RESOURCES LTD.	01-09-048-05 W5M	TO	10-09-048-05 W5M	√	√
KINGSMERE RESOURCES LTD.	15-03-047-03 W5M	TO	16-03-047-03 W5M		√
KINGSMERE RESOURCES LTD.	16-03-047-03 W5M	TO	16-03-047-03 W5M		√
KM CANADA TERMINALS ULC	UNAVAILABLE	TO	UNAVAILABLE	√	√
LONG RUN EXPLORATION LTD.	01-26-057-23 W4M	TO	09-26-057-23 W4M	√	
LONG RUN EXPLORATION LTD.	01-29-057-22 W4M	TO	09-29-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	01-36-055-21 W4M	TO	02-36-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	02-24-055-21 W4M	TO	07-24-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	02-27-054-05 W5M	TO	07-27-054-05 W5M	√	√
LONG RUN EXPLORATION LTD.	03-08-056-20 W4M	TO	06-08-056-20 W4M		√
LONG RUN EXPLORATION LTD.	07-05-058-22 W4M	TO	09-32-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	07-32-057-22 W4M	TO	09-32-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	07-34-056-21 W4M	TO	08-34-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	09-32-057-22 W4M	TO	06-33-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	13-19-055-04 W5M	TO	11-30-055-04 W5M	√	√
LONG RUN EXPLORATION LTD.	13-30-057-22 W4M	TO	15-25-057-23 W4M	√	
LONG RUN EXPLORATION LTD.	13-31-057-22 W4M	TO	14-36-057-23 W4M	√	
LONG RUN EXPLORATION LTD.	13-36-057-23 W4M	TO	06-01-058-23 W4M	√	
LONG RUN EXPLORATION LTD.	16-26-057-23 W4M	TO	14-25-057-23 W4M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
LONGVIEW OIL CORP.	16-32-046-03 W5M	TO	03-04-047-03 W5M		√
MADALENA VENTURES INC.	02-12-055-09 W5M	TO	10-01-055-09 W5M	√	√
MADALENA VENTURES INC.	04-05-056-07 W5M	TO	04-05-056-07 W5M	√	√
MADALENA VENTURES INC.	04-05-056-07 W5M	TO	15-32-055-07 W5M	√	√
MADALENA VENTURES INC.	04-26-056-12 W5M	TO	14-23-056-12 W5M		√
MADALENA VENTURES INC.	08-05-056-07 W5M	TO	15-32-055-07 W5M	√	√
MADALENA VENTURES INC.	09-30-055-07 W5M	TO	14-29-055-07 W5M	√	√
MADALENA VENTURES INC.	16-31-055-07 W5M	TO	04-05-056-07 W5M	√	√
MALAK ENERGY INC.	03-14-050-26 W4M	TO	07-14-050-26 W4M	√	√
MANCAL ENERGY INC.	01-02-049-12 W5M	TO	16-35-048-12 W5M	√	
MANCAL ENERGY INC.	02-13-057-22 W4M	TO	11-07-057-21 W4M	√	
MANCAL ENERGY INC.	06-08-057-21 W4M	TO	07-08-057-21 W4M	√	
MANCAL ENERGY INC.	08-02-057-22 W4M	TO	09-02-057-22 W4M	√	√
MANCAL ENERGY INC.	09-02-057-22 W4M	TO	15-02-057-22 W4M	√	√
MANCAL ENERGY INC.	10-01-049-12 W5M	TO	01-02-049-12 W5M	√	
MANCAL ENERGY INC.	16-10-049-12 W5M	TO	11-02-049-12 W5M	√	
MANITOK ENERGY INC.	02-29-042-15 W5M	TO	06-29-042-15 W5M		√
MANITOK ENERGY INC.	02-29-042-15 W5M	TO	14-18-042-15 W5M		√
MANITOK ENERGY INC.	06-29-042-15 W5M	TO	02-29-042-15 W5M		√
MANITOK ENERGY INC.	09-01-042-15 W5M	TO	15-01-042-15 W5M		√
MANITOK ENERGY INC.	09-11-042-15 W5M	TO	15-01-042-15 W5M		√
MANITOK ENERGY INC.	15-01-042-15 W5M	TO	05-01-042-15 W5M		√
MANITOK ENERGY INC.	15-01-042-15 W5M	TO	09-11-042-15 W5M		√
MOSAIC ENERGY LTD.	05-29-057-22 W4M	TO	09-30-057-22 W4M	√	
MOSAIC ENERGY LTD.	09-22-057-22 W4M	TO	07-21-057-22 W4M	√	√
MOSAIC ENERGY LTD.	10-30-057-22 W4M	TO	09-30-057-22 W4M	√	
MOSAIC ENERGY LTD.	13-25-061-07 W6M	TO	12-25-061-07 W6M		√
NEP CANADA ULC	03-20-050-26 W4M	TO	03-20-050-26 W4M	√	√
NEP CANADA ULC	03-30-050-26 W4M	TO	03-30-050-26 W4M	√	√
NEP CANADA ULC	03-35-050-26 W4M	TO	14-26-050-26 W4M	√	√
NEP CANADA ULC	05-15-050-26 W4M	TO	05-15-050-26 W4M	√	√
NEP CANADA ULC	07-05-051-26 W4M	TO	06-04-051-26 W4M	√	√
NEP CANADA ULC	10-34-049-26 W4M	TO	11-34-049-26 W4M	√	√
NEP CANADA ULC	11-20-050-26 W4M	TO	11-20-050-26 W4M	√	√
NEP CANADA ULC	11-21-050-26 W4M	TO	08-21-050-26 W4M	√	√
NEP CANADA ULC	13-35-049-26 W4M	TO	11-35-049-26 W4M	√	√
NEP CANADA ULC	14-20-050-26 W4M	TO	14-20-050-26 W4M	√	√
NEW STAR ENERGY LTD.	01-07-051-04 W5M	TO	10-04-051-04 W5M	√	√
NEW STAR ENERGY LTD.	01-28-050-04 W5M	TO	01-28-050-04 W5M	√	√
NEW STAR ENERGY LTD.	01-28-050-04 W5M	TO	13-22-050-04 W5M	√	√
NEW STAR ENERGY LTD.	04-05-051-04 W5M	TO	13-32-050-04 W5M	√	√
NEW STAR ENERGY LTD.	09-31-050-04 W5M	TO	12-32-050-04 W5M	√	√
NEW STAR ENERGY LTD.	10-04-051-04 W5M	TO	01-07-051-04 W5M	√	√
NEW STAR ENERGY LTD.	10-28-050-04 W5M	TO	10-28-050-04 W5M	√	√
NEW STAR ENERGY LTD.	13-22-050-04 W5M	TO	01-28-050-04 W5M	√	√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
NEW STAR ENERGY LTD.	14-08-051-04 W5M	TO	16-08-051-04 W5M	√	√
NEW STAR ENERGY LTD.	15-08-051-04 W5M	TO	16-08-051-04 W5M	√	√
NEW STAR ENERGY LTD.	16-06-051-04 W5M	TO	13-05-051-04 W5M	√	√
NEW STAR ENERGY LTD.	16-08-051-04 W5M	TO	08-07-051-04 W5M	√	√
NEW STAR ENERGY LTD.	16-08-051-04 W5M	TO	12-09-051-04 W5M	√	√
NEWALTA CORPORATION	02-09-054-12 W5M	TO	12-23-054-12 W5M	√	√
NORTH WEST UPGRADING INC.	07-18-056-21 W4M	TO	15-08-056-21 W4M	√	√
NORTH WEST UPGRADING INC.	10-11-056-21 W4M	TO	15-08-056-21 W4M	√	√
NORTH WEST UPGRADING INC.	15-08-056-21 W4M	TO	07-18-056-21 W4M	√	√
NORTH WEST UPGRADING INC.	15-08-056-21 W4M	TO	10-11-056-21 W4M	√	√
OMERS ENERGY INC.	13-34-050-13 W5M	TO	02-03-051-13 W5M	√	
PANTERRA RESOURCE CORP.	08-12-053-13 W5M	TO	12-12-053-13 W5M	√	√
PANTERRA RESOURCE CORP.	16-01-053-13 W5M	TO	08-12-053-13 W5M	√	√
PARAMOUNT RESOURCES LTD.	14-29-059-03 W6M	TO	13-29-059-03 W6M		√
PEMBINA GAS SERVICES LTD.	08-09-058-23 W5M	TO	12-36-057-23 W5M	√	
PEMBINA GAS SERVICES LTD.	10-28-061-09 W6M	TO	15-28-061-09 W6M		√
PEMBINA GAS SERVICES LTD.	12-36-057-23 W5M	TO	14-36-057-23 W5M	√	
PEMBINA GAS SERVICES LTD.	14-28-059-22 W5M	TO	12-36-057-23 W5M	√	
PEMBINA GAS SERVICES LTD.	14-36-057-23 W5M	TO	12-36-057-23 W5M	√	
PEMBINA PIPELINE CORPORATION	UNAVAILABLE	TO	UNAVAILABLE	√	√
PEMBINA PIPELINE CORPORATION	UNAVAILABLE	TO	UNAVAILABLE	√	√
PEMBINA PIPELINE CORPORATION	02-03-049-10 W5M	TO	13-34-048-10 W5M	√	
PEMBINA PIPELINE CORPORATION	03-26-047-11 W5M	TO	02-26-047-11 W5M	√	
PEMBINA PIPELINE CORPORATION	04-14-044-05 W5M	TO	10-24-044-07 W5M		√
PEMBINA PIPELINE CORPORATION	04-32-053-23 W4M	TO	04-32-053-23 W4M	√	√
PEMBINA PIPELINE CORPORATION	06-13-048-04 W5M	TO	06-13-048-04 W5M	√	√
PEMBINA PIPELINE CORPORATION	07-13-048-04 W5M	TO	08-13-048-04 W5M	√	√
PEMBINA PIPELINE CORPORATION	07-25-049-11 W5M	TO	07-25-049-11 W5M	√	
PEMBINA PIPELINE CORPORATION	08-07-047-12 W5M	TO	08-07-047-12 W5M	√	
PEMBINA PIPELINE CORPORATION	08-25-047-11 W5M	TO	05-30-047-10 W5M	√	
PEMBINA PIPELINE CORPORATION	08-25-047-11 W5M	TO	05-30-047-11 W5M	√	
PEMBINA PIPELINE CORPORATION	10-24-044-07 W5M	TO	10-24-044-07 W5M		√
PEMBINA PIPELINE CORPORATION	12-19-049-09 W5M	TO	12-19-049-09 W5M	√	
PEMBINA PIPELINE CORPORATION	12-36-057-23 W5M	TO	06-18-058-22 W5M	√	
PEMBINA PIPELINE CORPORATION	13-21-046-09 W5M	TO	16-20-046-09 W5M	√	√
PEMBINA PIPELINE CORPORATION	13-32-053-23 W4M	TO	12-32-053-23 W4M	√	√
PEMBINA PIPELINE CORPORATION	13-34-048-10 W5M	TO	01-05-049-09 W5M	√	
PEMBINA PIPELINE CORPORATION	14-07-043-06 W5M	TO	13-27-042-08 W5M		√
PEMBINA PIPELINE CORPORATION	15-35-048-04 W5M	TO	08-13-048-04 W5M	√	√
PEMBINA PIPELINE CORPORATION	16-20-046-09 W5M	TO	01-28-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	UNAVAILABLE	TO	UNAVAILABLE	√	√
PENN WEST PETROLEUM LTD.	01-08-050-07 W5M	TO	06-07-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	01-09-050-09 W5M	TO	01-07-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	01-20-045-06 W5M	TO	01-21-045-06 W5M		√
PENN WEST PETROLEUM LTD.	01-21-045-06 W5M	TO	04-26-045-06 W5M		√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	02-09-047-03 W5M	TO	01-04-047-03 W5M		√
PENN WEST PETROLEUM LTD.	02-30-046-03 W5M	TO	08-19-046-03 W5M		√
PENN WEST PETROLEUM LTD.	02-30-047-10 W5M	TO	09-19-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	02-31-047-10 W5M	TO	07-31-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	03-11-051-10 W5M	TO	14-02-051-10 W5M	√	
PENN WEST PETROLEUM LTD.	04-34-048-14 W5M	TO	16-28-048-14 W5M	√	
PENN WEST PETROLEUM LTD.	05-10-045-06 W5M	TO	16-09-045-06 W5M		√
PENN WEST PETROLEUM LTD.	06-07-050-07 W5M	TO	01-08-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	07-30-047-10 W5M	TO	02-30-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	07-31-047-09 W5M	TO	02-31-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	07-35-055-04 W5M	TO	15-35-055-14 W5M	√	√
PENN WEST PETROLEUM LTD.	09-19-047-10 W5M	TO	13-17-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	12-01-048-08 W5M	TO	08-02-048-08 W5M	√	√
PENN WEST PETROLEUM LTD.	13-20-047-10 W5M	TO	13-17-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	13-21-048-10 W5M	TO	14-21-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	14-02-051-10 W5M	TO	14-02-051-10 W5M	√	
PENN WEST PETROLEUM LTD.	14-14-052-26 W4M	TO	14-14-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	14-17-045-06 W5M	TO	01-20-045-06 W5M		√
PENN WEST PETROLEUM LTD.	15-18-050-09 W5M	TO	05-17-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	16-09-045-06 W5M	TO	01-21-045-06 W5M		√
PENN WEST PETROLEUM LTD.	16-16-047-10 W5M	TO	15-16-047-10 W5M	√	√
PENN WEST PETROLEUM LTD.	16-16-047-10 W5M	TO	16-16-047-10 W5M	√	√
PENN WEST PETROLEUM LTD.	16-23-048-09 W5M	TO	16-26-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	16-28-047-10 W5M	TO	13-27-047-10 W5M	√	
PERPETUAL ENERGY OPERATING CORP.	01-32-050-08 W4M	TO	04-33-050-08 W4M	√	
PERPETUAL ENERGY OPERATING CORP.	01-34-051-18 W5M	TO	16-27-051-18 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	04-20-051-18 W5M	TO	01-34-051-18 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	05-27-051-16 W5M	TO	07-33-051-16 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	09-07-051-18 W5M	TO	04-20-051-18 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	16-31-050-18 W5M	TO	11-08-051-18 W5M	√	√
PETROBAKKEN ENERGY LTD.	01-05-046-11 W5M	TO	01-05-046-11 W5M	√	
PETROBAKKEN ENERGY LTD.	01-05-046-11 W5M	TO	03-05-046-11 W5M	√	
PETROBAKKEN ENERGY LTD.	01-06-049-11 W5M	TO	07-05-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	01-10-049-12 W5M	TO	01-10-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	01-15-046-12 W5M	TO	04-15-046-12 W5M	√	
PETROBAKKEN ENERGY LTD.	01-19-045-11 W5M	TO	03-19-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	01-29-045-11 W5M	TO	02-29-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	01-29-045-11 W5M	TO	08-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	01-29-050-12 W5M	TO	01-29-050-12 W5M	√	
PETROBAKKEN ENERGY LTD.	01-32-045-11 W5M	TO	04-05-046-11 W5M	√	
PETROBAKKEN ENERGY LTD.	02-01-049-12 W5M	TO	03-01-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	02-02-049-11 W5M	TO	04-02-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	02-18-049-13 W5M	TO	11-18-049-13 W5M	√	
PETROBAKKEN ENERGY LTD.	02-27-048-11 W5M	TO	16-22-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	02-29-045-11 W5M	TO	08-30-045-11 W5M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
PETROBAKKEN ENERGY LTD.	03-12-050-12 W5M	TO	04-12-050-12 W5M	√	
PETROBAKKEN ENERGY LTD.	03-19-045-11 W5M	TO	11-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	03-31-048-10 W5M	TO	06-31-048-10 W5M	√	
PETROBAKKEN ENERGY LTD.	04-05-046-11 W5M	TO	14-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	04-06-049-12 W5M	TO	05-06-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	04-15-049-11 W5M	TO	04-10-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	04-25-045-12 W5M	TO	05-25-045-12 W5M	√	
PETROBAKKEN ENERGY LTD.	04-28-049-12 W5M	TO	07-28-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	04-30-049-11 W5M	TO	08-25-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	04-31-048-11 W5M	TO	05-01-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	05-11-048-11 W5M	TO	05-11-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	05-23-045-11 W5M	TO	10-22-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	05-25-048-12 W5M	TO	06-26-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	06-22-045-11 W5M	TO	06-22-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	06-26-048-12 W5M	TO	14-26-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	08-07-049-11 W5M	TO	14-05-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	08-30-045-11 W5M	TO	11-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	09-26-048-12 W5M	TO	12-25-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	10-22-045-11 W5M	TO	16-16-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	11-06-046-11 W5M	TO	04-05-046-11 W5M	√	
PETROBAKKEN ENERGY LTD.	11-06-046-11 W5M	TO	14-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	11-26-045-11 W5M	TO	10-22-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	11-30-045-11 W5M	TO	11-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	11-30-045-11 W5M	TO	14-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	12-24-048-12 W5M	TO	16-23-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	12-25-048-12 W5M	TO	05-25-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	12-30-045-11 W5M	TO	11-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	13-03-049-12 W5M	TO	15-03-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	13-11-048-11 W5M	TO	13-11-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	13-12-050-13 W5M	TO	11-12-050-13 W5M	√	
PETROBAKKEN ENERGY LTD.	13-21-049-12 W5M	TO	07-20-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	13-23-045-11 W5M	TO	16-22-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	13-26-048-12 W5M	TO	14-26-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	14-05-049-11 W5M	TO	07-05-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	14-07-049-11 W5M	TO	07-12-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	14-26-048-12 W5M	TO	06-12-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	14-30-045-11 W5M	TO	05-29-044-12 W5M	√	
PETROBAKKEN ENERGY LTD.	15-03-049-12 W5M	TO	01-10-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	15-13-049-12 W5M	TO	11-13-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	15-23-048-12 W5M	TO	06-26-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	15-25-045-12 W5M	TO	14-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	16-06-049-11 W5M	TO	03-08-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	16-09-047-05 W5M	TO	16-09-047-05 W5M		√
PETROBAKKEN ENERGY LTD.	16-16-045-11 W5M	TO	02-29-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	16-22-048-11 W5M	TO	05-23-048-11 W5M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
PETROBAKKEN ENERGY LTD.	16-23-048-12 W5M	TO	15-23-048-12 W5M	√	
PETROBAKKEN ENERGY LTD.	16-32-045-11 W5M	TO	09-32-045-11 W5M	√	
PETRUS RESOURCES LTD.	UNAVAILABLE	TO	UNAVAILABLE		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-05-053-20 W5M	TO	04-04-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-07-051-19 W5M	TO	01-06-051-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-13-055-22 W5M	TO	05-18-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-17-051-19 W5M	TO	03-18-051-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-27-054-20 W5M	TO	04-27-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-29-054-22 W5M	TO	08-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	02-18-056-21 W5M	TO	02-18-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	02-21-054-22 W5M	TO	15-16-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	03-03-052-19 W5M	TO	02-26-052-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	03-11-056-21 W5M	TO	09-10-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	03-26-052-19 W5M	TO	11-10-053-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-01-054-20 W5M	TO	15-36-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-04-053-20 W5M	TO	16-05-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-10-053-20 W5M	TO	14-04-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-17-054-21 W5M	TO	02-18-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-17-054-22 W5M	TO	14-08-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-18-056-21 W5M	TO	03-18-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-19-054-21 W5M	TO	08-24-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-27-054-20 W5M	TO	04-27-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-28-055-21 W5M	TO	14-21-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-29-054-22 W5M	TO	08-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-30-052-19 W5M	TO	14-24-052-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	05-32-053-21 W5M	TO	13-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	06-02-051-20 W5M	TO	07-18-051-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	07-18-051-19 W5M	TO	14-34-051-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	07-20-053-20 W5M	TO	08-29-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	07-24-055-23 W5M	TO	03-21-055-23 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	08-05-054-19 W5M	TO	12-31-053-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	08-05-054-19 W5M	TO	16-02-054-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	08-29-053-20 W5M	TO	12-27-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	08-29-054-22 W5M	TO	05-28-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	08-31-055-21 W5M	TO	08-31-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	09-13-058-04 W6M	TO	01-19-058-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	11-08-058-03 W6M	TO	05-09-058-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	11-10-053-19 W5M	TO	08-05-054-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	11-23-057-03 W6M	TO	04-36-057-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	12-27-053-20 W5M	TO	09-34-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	12-31-053-19 W5M	TO	08-05-054-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	12-32-055-21 W5M	TO	08-31-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-01-054-20 W5M	TO	15-36-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-17-054-22 W5M	TO	04-17-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-20-053-21 W5M	TO	13-30-053-21 W5M	√	√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-21-052-18 W5M	TO	13-21-052-18 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-23-052-20 W5M	TO	01-27-052-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-24-052-20 W5M	TO	04-25-052-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-28-054-22 W5M	TO	16-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-29-054-22 W5M	TO	04-32-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-30-053-21 W5M	TO	13-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-32-053-21 W5M	TO	13-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-32-053-21 W5M	TO	15-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	14-04-053-20 W5M	TO	16-05-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	14-05-054-21 W5M	TO	10-05-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	14-17-055-21 W5M	TO	10-17-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	14-19-054-22 W5M	TO	15-19-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	14-35-054-21 W5M	TO	16-27-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	15-13-053-19 W5M	TO	10-15-053-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	15-19-054-22 W5M	TO	04-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	15-30-054-21 W5M	TO	02-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	15-32-053-21 W5M	TO	10-05-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	15-33-055-21 W5M	TO	10-33-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	15-36-053-20 W5M	TO	12-31-053-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-05-053-20 W5M	TO	07-20-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-05-055-21 W5M	TO	01-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-05-056-19 W5M	TO	06-05-056-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-07-054-22 W5M	TO	13-08-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-08-055-21 W5M	TO	10-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-08-056-21 W5M	TO	13-10-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-09-053-20 W5M	TO	12-09-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-17-056-21 W5M	TO	05-16-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-18-054-21 W5M	TO	08-24-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-18-055-21 W5M	TO	13-17-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-28-055-21 W5M	TO	08-28-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-29-054-22 W5M	TO	16-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-31-055-21 W5M	TO	12-32-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-32-053-21 W5M	TO	15-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-32-055-19 W5M	TO	06-05-056-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-33-055-21 W5M	TO	15-33-055-21 W5M	√	√
PIPELINE MANAGEMENT INC.	UNAVAILABLE	TO	UNAVAILABLE	√	√
PIPELINE MANAGEMENT INC.	09-11-056-21 W4M	TO	07-16-076-06 W4M	√	√
POTTS PETROLEUM INC.	14-13-055-21 W4M	TO	02-14-055-21 W4M	√	√
QUESTFIRE ENERGY CORP.	10-27-048-02 W5M	TO	15-22-048-02 W5M	√	√
RAVENWOOD ENERGY CORP.	02-06-049-01 W5M	TO	03-06-049-01 W5M	√	√
RAVENWOOD ENERGY CORP.	03-26-049-01 W5M	TO	15-23-049-01 W5M	√	√
RAVENWOOD ENERGY CORP.	14-25-048-02 W5M	TO	14-25-048-02 W5M	√	√
REDWATER WATER DISPOSAL COMPANY LIMITED	07-12-057-21 W4M	TO	09-11-057-21 W4M	√	
RIMFIRE ENERGY INC.	05-21-056-11 W5M	TO	05-21-056-11 W5M		√
SANTONIA ENERGY INC.	03-16-044-15 W5M	TO	16-16-044-15 W5M		√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
SECURE ENERGY SERVICES INC.	03-05-049-06 W5M	TO	10-05-049-06 W5M	√	√
SHELL CANADA LIMITED	UNAVAILABLE	TO	UNAVAILABLE	√	
SHELL CANADA LIMITED	02-07-055-23 W5M	TO	11-09-055-23 W5M	√	√
SHELL CANADA LIMITED	04-17-054-22 W5M	TO	11-19-054-22 W5M	√	√
SHELL CANADA LIMITED	12-32-055-21 W4M	TO	15-29-060-21 W4M	√	√
SHELL CANADA LIMITED	14-19-056-20 W5M	TO	07-24-056-21 W5M	√	√
SHELL CANADA LIMITED	14-22-055-24 W5M	TO	02-27-055-24 W5M	√	
SHELL CANADA LIMITED	15-08-053-22 W5M	TO	05-09-053-22 W5M	√	√
SHELL CANADA LIMITED	15-36-053-24 W5M	TO	09-36-053-24 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	01-09-048-05 W5M	TO	04-16-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	01-12-047-11 W5M	TO	01-12-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	01-14-047-04 W5M	TO	08-14-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	01-14-047-04 W5M	TO	10-11-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	01-30-047-11 W5M	TO	04-29-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	01-36-046-12 W5M	TO	05-05-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	02-03-048-05 W5M	TO	01-09-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	02-04-050-05 W5M	TO	08-04-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	02-04-050-06 W5M	TO	08-04-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	04-16-048-05 W5M	TO	13-16-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	04-26-054-23 W5M	TO	09-23-054-23 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	04-29-047-11 W5M	TO	01-30-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	04-29-047-11 W5M	TO	05-29-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	04-29-047-11 W5M	TO	06-29-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	05-07-048-03 W5M	TO	08-07-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	06-08-048-03 W5M	TO	06-16-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	06-15-048-03 W5M	TO	06-16-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	06-16-048-03 W5M	TO	06-15-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	08-32-046-09 W5M	TO	06-32-046-09 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	09-09-048-05 W5M	TO	01-09-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	10-11-047-04 W5M	TO	01-14-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	12-03-050-06 W5M	TO	12-03-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	12-06-048-03 W5M	TO	05-07-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	12-14-047-04 W5M	TO	10-14-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	12-17-052-21 W5M	TO	06-17-052-21 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	13-07-048-03 W5M	TO	05-07-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	13-17-048-05 W5M	TO	12-17-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	13-23-047-05 W5M	TO	02-03-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	14-11-046-11 W5M	TO	08-28-046-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	14-28-047-05 W5M	TO	02-03-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	16-08-048-03 W5M	TO	16-08-048-03 W5M	√	√
SPUR RESOURCES LTD.	12-06-049-01 W5M	TO	12-06-049-01 W5M	√	√
SUNCOR ENERGY INC.	01-13-045-06 W5M	TO	16-12-045-06 W5M		√
SUNCOR ENERGY INC.	02-13-045-06 W5M	TO	02-13-045-06 W5M		√
SUNCOR ENERGY INC.	05-01-045-06 W5M	TO	08-11-045-06 W5M		√
SUNCOR ENERGY INC.	13-05-045-05 W5M	TO	04-03-045-05 W5M		√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
SUNCOR ENERGY INC.	16-12-045-06 W5M	TO	13-05-045-05 W5M		√
TALISMAN ENERGY INC.	01-13-056-24 W5M	TO	07-13-056-24 W5M	√	
TALISMAN ENERGY INC.	02-09-057-21 W5M	TO	06-09-057-21 W5M	√	√
TALISMAN ENERGY INC.	03-02-057-24 W5M	TO	02-02-057-24 W5M	√	
TALISMAN ENERGY INC.	03-23-056-24 W5M	TO	06-23-056-24 W5M	√	
TALISMAN ENERGY INC.	07-14-064-14 W6M	TO	13-09-064-13 W6M		√
TALISMAN ENERGY INC.	08-18-056-20 W5M	TO	13-13-056-21 W5M	√	√
TALISMAN ENERGY INC.	09-09-056-23 W5M	TO	09-09-056-23 W5M	√	
TALISMAN ENERGY INC.	10-22-056-24 W5M	TO	13-13-056-24 W5M	√	
TALISMAN ENERGY INC.	11-32-056-24 W5M	TO	11-32-056-24 W5M	√	√
TALISMAN ENERGY INC.	12-22-056-24 W5M	TO	10-22-056-24 W5M	√	√
TALISMAN ENERGY INC.	13-13-056-24 W5M	TO	14-20-056-23 W5M	√	
TAQA NORTH LTD.	01-20-046-09 W5M	TO	04-21-046-09 W5M	√	√
TAQA NORTH LTD.	01-24-053-20 W5M	TO	12-13-053-20 W5M	√	√
TAQA NORTH LTD.	01-29-046-09 W5M	TO	13-21-046-09 W5M	√	√
TAQA NORTH LTD.	02-30-046-09 W5M	TO	06-29-046-09 W5M	√	√
TAQA NORTH LTD.	04-01-047-10 W5M	TO	06-07-047-09 W5M	√	√
TAQA NORTH LTD.	04-08-047-09 W5M	TO	16-20-046-09 W5M	√	√
TAQA NORTH LTD.	04-21-046-09 W5M	TO	12-21-046-09 W5M	√	√
TAQA NORTH LTD.	04-31-046-09 W5M	TO	14-29-046-09 W5M	√	√
TAQA NORTH LTD.	05-16-046-09 W5M	TO	04-21-046-09 W5M	√	√
TAQA NORTH LTD.	05-16-046-09 W5M	TO	05-16-046-09 W5M	√	√
TAQA NORTH LTD.	05-29-046-09 W5M	TO	05-29-046-09 W5M	√	√
TAQA NORTH LTD.	06-29-046-09 W5M	TO	01-29-046-09 W5M	√	√
TAQA NORTH LTD.	09-20-046-09 W5M	TO	12-21-046-09 W5M	√	√
TAQA NORTH LTD.	12-07-045-09 W5M	TO	10-18-045-09 W5M	√	
TAQA NORTH LTD.	12-16-046-09 W5M	TO	05-16-046-09 W5M	√	√
TAQA NORTH LTD.	12-21-046-09 W5M	TO	16-20-046-09 W5M	√	√
TAQA NORTH LTD.	14-29-046-09 W5M	TO	06-29-046-09 W5M	√	√
TAQA NORTH LTD.	16-20-046-09 W5M	TO	06-29-046-09 W5M	√	√
TORC OIL & GAS LTD.	01-33-054-16 W5M	TO	07-34-054-16 W5M	√	√
TORC OIL & GAS LTD.	02-26-054-16 W5M	TO	13-24-054-16 W5M	√	√
TORC OIL & GAS LTD.	02-34-054-16 W5M	TO	07-34-054-16 W5M	√	√
TORC OIL & GAS LTD.	03-25-054-18 W5M	TO	02-25-054-18 W5M	√	√
TORC OIL & GAS LTD.	04-10-045-11 W5M	TO	02-09-045-11 W5M	√	
TORC OIL & GAS LTD.	05-15-052-13 W5M	TO	14-10-052-13 W5M	√	√
TORC OIL & GAS LTD.	05-34-045-12 W5M	TO	16-34-045-12 W5M	√	
TORC OIL & GAS LTD.	06-25-054-16 W5M	TO	13-24-054-16 W5M	√	√
TORC OIL & GAS LTD.	08-35-054-16 W5M	TO	04-25-054-16 W5M	√	√
TORC OIL & GAS LTD.	14-10-052-13 W5M	TO	05-15-052-13 W5M	√	√
TORC OIL & GAS LTD.	14-18-045-11 W5M	TO	03-19-045-11 W5M	√	
TORC OIL & GAS LTD.	14-25-054-16 W5M	TO	06-25-054-16 W5M	√	√
TORC OIL & GAS LTD.	15-12-054-18 W5M	TO	16-14-054-18 W5M	√	√
TORC OIL & GAS LTD.	16-12-054-18 W5M	TO	01-13-054-18 W5M	√	√
TORC OIL & GAS LTD.	16-34-045-12 W5M	TO	05-34-045-12 W5M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
TOURMALINE OIL CORP.	UNAVAILABLE	TO	UNAVAILABLE	√	√
TOURMALINE OIL CORP.	01-13-058-02 W6M	TO	05-13-058-01 W6M		√
TOURMALINE OIL CORP.	01-27-057-01 W6M	TO	07-06-058-27 W5M		√
TOURMALINE OIL CORP.	02-02-057-27 W5M	TO	02-02-057-27 W5M	√	√
TOURMALINE OIL CORP.	02-05-050-20 W5M	TO	11-05-050-20 W5M	√	√
TOURMALINE OIL CORP.	02-17-056-02 W6M	TO	16-18-056-02 W6M		√
TOURMALINE OIL CORP.	02-21-057-27 W5M	TO	10-16-057-27 W5M	√	√
TOURMALINE OIL CORP.	03-32-051-18 W5M	TO	12-21-051-18 W5M	√	√
TOURMALINE OIL CORP.	04-02-050-20 W5M	TO	03-35-049-20 W5M	√	√
TOURMALINE OIL CORP.	04-11-062-06 W6M	TO	13-02-062-06 W6M		√
TOURMALINE OIL CORP.	04-20-055-24 W5M	TO	02-20-055-24 W5M	√	
TOURMALINE OIL CORP.	05-10-051-20 W5M	TO	15-09-051-20 W5M	√	√
TOURMALINE OIL CORP.	05-13-058-01 W6M	TO	07-06-058-27 W5M		√
TOURMALINE OIL CORP.	06-08-054-01 W6M	TO	03-07-054-01 W6M	√	√
TOURMALINE OIL CORP.	06-23-057-01 W6M	TO	02-26-057-01 W6M		√
TOURMALINE OIL CORP.	07-21-049-20 W5M	TO	09-22-049-20 W5M	√	√
TOURMALINE OIL CORP.	08-13-062-06 W6M	TO	09-13-062-06 W6M		√
TOURMALINE OIL CORP.	08-17-048-20 W5M	TO	14-09-048-20 W5M	√	√
TOURMALINE OIL CORP.	09-13-062-06 W6M	TO	08-13-062-06 W6M		√
TOURMALINE OIL CORP.	10-17-049-20 W5M	TO	11-09-049-20 W5M	√	√
TOURMALINE OIL CORP.	10-34-057-27 W5M	TO	04-35-057-27 W5M		√
TOURMALINE OIL CORP.	11-21-050-22 W5M	TO	13-34-050-22 W5M	√	√
TOURMALINE OIL CORP.	13-01-058-01 W6M	TO	01-13-058-01 W6M		√
TOURMALINE OIL CORP.	13-11-058-27 W5M	TO	04-14-058-27 W5M		√
TOURMALINE OIL CORP.	13-26-054-02 W6M	TO	08-27-054-02 W6M	√	√
TOURMALINE OIL CORP.	14-09-048-20 W5M	TO	08-17-048-20 W5M	√	√
TOURMALINE OIL CORP.	14-15-049-21 W5M	TO	03-22-049-21 W5M	√	√
TOURMALINE OIL CORP.	14-21-057-27 W5M	TO	13-10-057-27 W5M	√	√
TOURMALINE OIL CORP.	15-16-051-23 W5M	TO	10-20-051-23 W5M	√	√
TOURMALINE OIL CORP.	16-19-046-17 W5M	TO	13-21-046-17 W5M	√	
TOURMALINE OIL CORP.	16-24-050-22 W5M	TO	09-19-050-21 W5M	√	√
TRL GAS CO-OP LTD.	01-05-057-09 W5M	TO	04-01-057-10 W5M	√	√
TRL GAS CO-OP LTD.	05-29-054-07 W5M	TO	08-30-054-07 W5M	√	√
TRL GAS CO-OP LTD.	08-17-057-13 W5M	TO	08-17-057-13 W5M	√	√
TRL GAS CO-OP LTD.	09-20-057-13 W5M	TO	09-20-057-13 W5M	√	√
TRL GAS CO-OP LTD.	09-29-057-13 W5M	TO	09-29-057-13 W5M	√	√
VELVET ENERGY LTD.	01-08-051-14 W5M	TO	02-08-051-14 W5M	√	√
VELVET ENERGY LTD.	01-08-051-14 W5M	TO	08-09-051-14 W5M	√	√
VELVET ENERGY LTD.	01-09-053-14 W5M	TO	06-09-053-14 W5M	√	√
VELVET ENERGY LTD.	05-20-055-16 W5M	TO	03-20-055-16 W5M	√	√
VELVET ENERGY LTD.	08-30-055-16 W5M	TO	05-20-055-16 W5M	√	√
VELVET ENERGY LTD.	10-11-054-15 W5M	TO	10-11-054-15 W5M	√	√
VELVET ENERGY LTD.	15-32-052-14 W5M	TO	01-05-053-14 W5M	√	√
VERMILION ENERGY INC.	01-12-051-13 W5M	TO	09-12-051-13 W5M	√	
VERMILION ENERGY INC.	01-23-051-12 W5M	TO	04-18-051-11 W5M	√	

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
VERMILION ENERGY INC.	01-25-050-13 W5M	TO	16-28-050-12 W5M	√	
VERMILION ENERGY INC.	02-16-050-11 W5M	TO	10-16-050-11 W5M	√	
VERMILION ENERGY INC.	02-19-050-12 W5M	TO	04-19-050-12 W5M	√	
VERMILION ENERGY INC.	02-36-050-13 W5M	TO	13-25-050-13 W5M	√	
VERMILION ENERGY INC.	03-32-050-11 W5M	TO	10-29-050-11 W5M	√	
VERMILION ENERGY INC.	04-12-050-12 W5M	TO	05-01-050-12 W5M	√	
VERMILION ENERGY INC.	04-19-050-12 W5M	TO	01-25-050-13 W5M	√	
VERMILION ENERGY INC.	05-16-051-12 W5M	TO	04-14-051-12 W5M	√	
VERMILION ENERGY INC.	08-33-050-13 W5M	TO	07-34-050-13 W5M	√	
VERMILION ENERGY INC.	09-12-051-13 W5M	TO	01-12-051-13 W5M	√	
VERMILION ENERGY INC.	09-12-051-13 W5M	TO	13-12-051-13 W5M	√	
VERMILION ENERGY INC.	09-21-050-13 W5M	TO	05-22-050-13 W5M	√	
VERMILION ENERGY INC.	09-29-050-11 W5M	TO	10-29-050-11 W5M	√	
VERMILION ENERGY INC.	10-03-050-15 W5M	TO	04-22-050-15 W5M	√	√
VERMILION ENERGY INC.	10-16-050-11 W5M	TO	02-21-050-11 W5M	√	
VERMILION ENERGY INC.	10-16-051-11 W5M	TO	15-16-051-11 W5M	√	
VERMILION ENERGY INC.	11-12-051-13 W5M	TO	11-12-051-13 W5M	√	
VERMILION ENERGY INC.	11-12-051-13 W5M	TO	13-12-051-13 W5M	√	
VERMILION ENERGY INC.	12-12-050-12 W5M	TO	04-12-050-12 W5M	√	
VERMILION ENERGY INC.	13-14-050-13 W5M	TO	12-14-050-13 W5M	√	
VERMILION ENERGY INC.	13-22-049-12 W5M	TO	13-22-049-12 W5M	√	
VERMILION ENERGY INC.	14-05-051-11 W5M	TO	12-05-051-11 W5M	√	
VERMILION ENERGY INC.	14-32-050-11 W5M	TO	03-32-050-11 W5M	√	
VERMILION ENERGY INC.	15-35-050-13 W5M	TO	13-25-050-13 W5M	√	
VERMILION ENERGY INC.	16-28-050-12 W5M	TO	06-01-051-12 W5M	√	
VERMILION ENERGY INC.	UNAVAILABLE	TO	UNAVAILABLE	√	√
VERMILION ENERGY INC.	10-35-048-27 W4M	TO	13-35-048-27 W4M	√	√
WESTBRICK ENERGY LTD.	03-09-045-09 W5M	TO	14-05-045-09 W5M	√	
WESTBRICK ENERGY LTD.	14-05-045-09 W5M	TO	04-09-045-09 W5M	√	
WESTBRICK ENERGY LTD.	15-25-045-12 W5M	TO	10-25-045-12 W5M	√	
WESTBRICK ENERGY LTD.	16-04-045-09 W5M	TO	03-09-045-09 W5M	√	
WESTBRICK ENERGY LTD.	16-07-045-09 W5M	TO	14-05-045-09 W5M	√	
WHITECAP RESOURCES INC.	01-28-047-05 W5M	TO	04-22-047-05 W5M	√	√
WHITECAP RESOURCES INC.	03-04-045-05 W5M	TO	11-04-045-05 W5M		√
WHITECAP RESOURCES INC.	04-19-048-04 W5M	TO	12-19-048-04 W5M	√	√
WHITECAP RESOURCES INC.	04-22-047-05 W5M	TO	04-22-047-05 W5M	√	√
WHITECAP RESOURCES INC.	04-28-048-05 W5M	TO	01-29-048-05 W5M	√	√
WHITECAP RESOURCES INC.	05-03-048-03 W5M	TO	05-03-048-03 W5M	√	√
WHITECAP RESOURCES INC.	05-03-048-03 W5M	TO	12-03-048-03 W5M	√	√
WHITECAP RESOURCES INC.	10-21-048-05 W5M	TO	10-21-048-05 W5M	√	√
WHITECAP RESOURCES INC.	12-03-048-03 W5M	TO	05-03-048-03 W5M	√	√
WHITECAP RESOURCES INC.	12-22-048-05 W5M	TO	12-22-048-05 W5M	√	√
WHITECAP RESOURCES INC.	13-19-049-04 W5M	TO	09-19-049-04 W5M	√	√
WHITECAP RESOURCES INC.	13-21-047-05 W5M	TO	01-28-047-05 W5M	√	√
WHITECAP RESOURCES INC.	14-20-049-04 W5M	TO	11-20-049-04 W5M	√	√

TABLE 8A.1-2 Cont'd

Primary Applicant	Legal Location			Socio-Economic RSA	HORU/TLRU RSA
WHITECAP RESOURCES INC.	14-21-049-04 W5M	TO	14-21-049-04 W5M	√	√
WHITECAP RESOURCES INC.	15-21-049-04 W5M	TO	15-21-049-04 W5M	√	√
WHITECAP RESOURCES INC.	16-19-049-04 W5M	TO	09-19-049-04 W5M	√	√
WILD ROSE ENERGY LTD.	02-10-048-12 W5M	TO	16-10-048-12 W5M	√	
WILD ROSE ENERGY LTD.	04-31-048-12 W5M	TO	16-25-048-13 W5M	√	
WILD ROSE ENERGY LTD.	06-25-045-10 W5M	TO	13-20-047-11 W5M	√	√
WILD ROSE ENERGY LTD.	07-34-047-12 W5M	TO	09-03-048-12 W5M	√	
WILD ROSE ENERGY LTD.	09-03-048-12 W5M	TO	02-10-048-12 W5M	√	
WILD ROSE ENERGY LTD.	13-20-047-11 W5M	TO	07-34-047-12 W5M	√	
WILD ROSE ENERGY LTD.	16-10-048-12 W5M	TO	16-25-048-13 W5M	√	
WILD ROSE ENERGY LTD.	16-25-048-13 W5M	TO	04-31-048-12 W5M	√	
WILD ROSE ENERGY LTD.	16-25-048-13 W5M	TO	07-31-048-12 W5M	√	
WILD ROSE ENERGY LTD.	16-25-048-13 W5M	TO	11-31-048-12 W5M	√	
WILD ROSE ENERGY LTD.	16-25-048-13 W5M	TO	13-30-048-12 W5M	√	
WRANGLER WEST ENERGY CORP.	05-08-060-03 W5M	TO	13-08-060-03 W5M		√
WRANGLER WEST ENERGY CORP.	11-02-055-27 W4M	TO	07-02-055-27 W4M	√	√
TOTAL				712	573

Sources: ERCB 2013, Information Handling Services (IHS) Inc. 2013

TABLE 8A.1-3

REASONABLY FORESEEABLE OIL AND GAS FACILITY DEVELOPMENTS WITHIN THE TRANS MOUNTAIN EXPANSION PROJECT RSA OF VARIOUS ELEMENTS

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
155725 CANADA LTD.	Battery	UNAVAILABLE	√	√
3075704 NOVA SCOTIA COMPANY	Battery	05-36-056-24 W5M	√	
3075704 NOVA SCOTIA COMPANY	Battery	10-26-056-24 W5M	√	
3075704 NOVA SCOTIA COMPANY	Battery	11-21-056-23 W5M	√	
3075704 NOVA SCOTIA COMPANY	Battery	15-36-056-24 W5M	√	
925011 ALBERTA LTD.	Satellite	12-18-056-04 W5M	√	√
ADVANTAGE OIL & GAS LTD.	Battery	01-04-047-03 W5M		√
ADVANTAGE OIL & GAS LTD.	Battery	01-05-047-08 W5M		√
ADVANTAGE OIL & GAS LTD.	Battery	03-26-051-27 W4M	√	√
ADVANTAGE OIL & GAS LTD.	Battery	08-15-053-10 W5M	√	√
ADVANTAGE OIL & GAS LTD.	Battery	11-15-042-06 W5M		√
ADVANTAGE OIL & GAS LTD.	Satellite	06-23-051-27 W4M	√	√
ADVANTAGE OIL & GAS LTD.	Satellite	07-20-042-06 W5M		√
ADVANTAGE OIL & GAS LTD.	Satellite	14-30-052-25 W4M	√	√
ALEXANDER ENERGY LTD.	Battery	09-33-055-26 W4M	√	√
ALEXANDER ENERGY LTD.	Battery	11-27-055-26 W4M	√	√
ALEXANDER ENERGY LTD.	Battery	UNAVAILABLE	√	√
ALEXANDER ENERGY LTD.	Battery	UNAVAILABLE	√	√
ALEXANDER ENERGY LTD.	Gas Processing Plant	03-07-056-26 W4M	√	√
ALEXANDER ENERGY LTD.	Satellite	09-12-056-27 W4M	√	√
ALEXANDER ENERGY LTD.	Satellite	11-07-056-26 W4M	√	√
ALTAGAS LTD.	Battery	04-29-046-08 W5M		√
ALVOPETRO INC.	Satellite	10-31-055-20 W4M	√	√
ANDERSON ENERGY LTD.	Battery	02-11-055-02 W5M	√	√
ANDERSON ENERGY LTD.	Battery	04-28-059-06 W5M		√
ANDERSON ENERGY LTD.	Battery	06-32-059-06 W5M		√
ANDERSON ENERGY LTD.	Battery	08-02-055-02 W5M	√	√
ANDERSON ENERGY LTD.	Battery	08-21-052-14 W5M	√	√
ANDERSON ENERGY LTD.	Battery	10-16-059-06 W5M	√	√
ANDERSON ENERGY LTD.	Battery	13-17-052-19 W4M		√
ANDERSON ENERGY LTD.	Satellite	05-29-051-11 W5M	√	
ANTELOPE LAND SERVICES LTD.	Battery	UNAVAILABLE	√	√
ANTERRA ENERGY INC.	Battery	11-35-047-04 W5M	√	√
ANTERRA ENERGY INC.	Satellite	02-26-047-04 W5M	√	√
ANTERRA ENERGY INC.	Satellite	12-36-047-04 W5M	√	√
APACHE CANADA LTD.	Battery	01-17-056-21 W5M	√	√
APACHE CANADA LTD.	Battery	02-04-057-22 W5M	√	
APACHE CANADA LTD.	Battery	02-17-057-19 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
APACHE CANADA LTD.	Battery	02-22-057-19 W5M	√	
APACHE CANADA LTD.	Battery	04-11-056-22 W5M	√	√
APACHE CANADA LTD.	Battery	04-28-057-22 W4M	√	
APACHE CANADA LTD.	Battery	05-02-047-14 W5M	√	
APACHE CANADA LTD.	Battery	05-10-055-26 W4M	√	√
APACHE CANADA LTD.	Battery	06-08-057-22 W5M	√	
APACHE CANADA LTD.	Battery	07-09-057-19 W5M	√	
APACHE CANADA LTD.	Battery	07-18-057-22 W5M	√	
APACHE CANADA LTD.	Battery	09-08-057-19 W5M	√	
APACHE CANADA LTD.	Battery	10-05-056-22 W5M	√	√
APACHE CANADA LTD.	Battery	10-34-057-20 W5M	√	√
APACHE CANADA LTD.	Battery	11-03-047-14 W5M	√	
APACHE CANADA LTD.	Battery	11-08-056-22 W5M	√	√
APACHE CANADA LTD.	Battery	11-14-057-20 W5M	√	√
APACHE CANADA LTD.	Battery	11-25-056-22 W5M	√	√
155725 CANADA LTD.	Battery	UNAVAILABLE	√	√
APACHE CANADA LTD.	Battery	12-10-047-14 W5M	√	
APACHE CANADA LTD.	Battery	13-02-057-20 W5M	√	√
APACHE CANADA LTD.	Battery	13-07-057-22 W5M	√	
APACHE CANADA LTD.	Battery	14-02-047-15 W5M	√	
APACHE CANADA LTD.	Battery	15-17-056-21 W5M	√	√
APACHE CANADA LTD.	Battery	15-30-056-21 W5M	√	√
APACHE CANADA LTD.	Gas Gathering System	10-21-058-19 W5M	√	
APACHE CANADA LTD.	Satellite	08-27-048-26 W4M	√	√
APL OIL & GAS (1998) LTD.	Battery	03-30-056-23 W5M	√	
ARC RESOURCES LTD.	Battery	01-22-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	02-01-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	02-35-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	03-02-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	03-25-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	04-32-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	05-14-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	05-24-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	05-26-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	05-31-056-20 W4M	√	√
ARC RESOURCES LTD.	Battery	05-35-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	05-36-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	06-03-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	06-11-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	06-13-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	06-15-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	06-19-056-20 W4M	√	√
ARC RESOURCES LTD.	Battery	06-21-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	07-02-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	07-10-057-21 W4M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
ARC RESOURCES LTD.	Battery	07-22-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	07-23-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	07-28-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	07-32-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	08-29-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	08-36-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	09-11-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	09-16-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	10-12-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	10-29-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	11-20-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	11-32-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	12-28-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	12-29-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	14-09-057-21 W4M	√	
ARC RESOURCES LTD.	Battery	14-27-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	14-29-048-08 W5M	√	
ARC RESOURCES LTD.	Battery	15-23-056-21 W4M	√	√
ARC RESOURCES LTD.	Battery	15-31-049-06 W5M	√	√
ARC RESOURCES LTD.	Battery	15-31-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	01-08-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	01-21-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	01-28-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	02-01-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	02-13-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	02-19-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	02-25-049-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	02-30-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-03-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-22-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-29-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-30-047-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-31-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-35-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	03-35-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	04-02-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-08-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-08-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-09-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	04-13-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-14-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-14-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-21-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-31-047-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	04-31-056-20 W4M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
ARC RESOURCES LTD.	Satellite	04-34-047-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	05-03-047-09 W5M	√	√
ARC RESOURCES LTD.	Satellite	05-07-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	05-10-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	05-20-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	05-22-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	05-26-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	05-29-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	06-03-049-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-03-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	06-04-050-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-05-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-05-050-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-06-048-10 W5M	√	
ARC RESOURCES LTD.	Satellite	06-07-049-04 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-11-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-14-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	06-15-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-15-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	06-16-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-20-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-25-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-27-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	06-31-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	06-32-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	06-33-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	06-35-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	07-02-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	07-09-047-08 W5M		√
ARC RESOURCES LTD.	Satellite	07-13-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	07-23-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	07-24-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	07-25-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	07-28-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	07-30-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	07-30-056-20 W4M	√	√
ARC RESOURCES LTD.	Satellite	07-36-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	08-01-049-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-05-047-09 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-05-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-07-049-04 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-10-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-13-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-17-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-17-049-06 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
ARC RESOURCES LTD.	Satellite	08-20-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-22-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	08-32-048-08 W5M	√	
ARC RESOURCES LTD.	Satellite	08-35-047-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	09-07-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	09-07-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	09-11-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	09-16-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	09-16-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	09-19-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	09-22-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	09-24-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	09-28-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	09-34-048-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-05-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-07-047-09 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-09-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	10-10-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	10-26-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-27-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-27-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-28-047-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-28-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-29-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	10-29-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	10-30-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	10-32-047-10 W5M	√	
ARC RESOURCES LTD.	Satellite	11-11-049-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	11-14-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	11-17-048-08 W5M	√	
ARC RESOURCES LTD.	Satellite	11-19-056-20 W4M	√	√
ARC RESOURCES LTD.	Satellite	11-22-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	11-23-049-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	11-23-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	11-33-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	11-35-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	11-36-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	12-01-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	12-05-049-08 W5M	√	
ARC RESOURCES LTD.	Satellite	12-09-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	12-14-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	12-18-048-08 W5M	√	
ARC RESOURCES LTD.	Satellite	12-19-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	12-25-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	12-27-048-06 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
ARC RESOURCES LTD.	Satellite	13-13-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	13-13-049-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	13-27-049-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	13-36-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	14-03-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	14-04-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-07-049-04 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-09-057-21 W4M	√	
ARC RESOURCES LTD.	Satellite	14-17-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-18-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-18-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-27-047-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-28-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-29-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	14-30-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	15-09-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	15-34-048-08 W5M	√	√
ARC RESOURCES LTD.	Satellite	15-36-056-21 W4M	√	√
ARC RESOURCES LTD.	Satellite	16-03-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-07-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-08-048-07 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-08-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-10-049-05 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-20-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-21-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-22-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-23-049-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-28-048-06 W5M	√	√
ARC RESOURCES LTD.	Satellite	16-32-049-06 W5M	√	√
ARTEK EXPLORATION LTD.	Battery	15-12-049-26 W4M	√	√
ARTEK EXPLORATION LTD.	Satellite	02-27-048-26 W4M	√	√
ARTEMIS EXPLORATION INC.	Battery	15-10-048-23 W4M	√	
ATCO PIPELINES (NORTH TN8263923)	Battery	06-29-051-25 W5M	√	√
ATCO PIPELINES (NORTH TN8263923)	Gas Processing Plant	03-12-056-22 W4M	√	√
ATCO PIPELINES (NORTH TN8263923)	Injection Plant	16-29-048-09 W5M	√	
ATCO PIPELINES (NORTH TN8263923)	Satellite	07-34-050-26 W4M	√	√
BACCALIEU ENERGY INC.	Battery	02-17-047-11 W5M	√	
BACCALIEU ENERGY INC.	Satellite	01-20-049-11 W5M	√	
BACCALIEU ENERGY INC.	Satellite	13-34-050-12 W5M	√	
BACCALIEU ENERGY INC.	Satellite	16-15-050-12 W5M	√	
BARRICK ENERGY INC.	Battery	14-03-053-17 W5M	√	√
BAYTEX ENERGY LTD.	Battery	05-16-057-24 W4M	√	
BAYTEX ENERGY LTD.	Battery	09-01-048-11 W5M	√	
BAYTEX ENERGY LTD.	Battery	10-24-058-12 W5M		√
BAYTEX ENERGY LTD.	Battery	10-25-057-25 W4M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
BAYTEX ENERGY LTD.	Battery	10-30-056-21 W4M	√	√
BAYTEX ENERGY LTD.	Injection Plant	16-34-048-09 W5M	√	
BAYTEX ENERGY LTD.	Satellite	01-20-057-24 W4M	√	
BAYTEX ENERGY LTD.	Satellite	02-10-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	02-19-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	02-20-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	02-21-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	05-21-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	05-28-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	06-10-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	06-19-049-09 W5M	√	
BAYTEX ENERGY LTD.	Satellite	07-10-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	07-31-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	09-35-057-23 W4M	√	
BAYTEX ENERGY LTD.	Satellite	11-24-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	13-09-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	14-03-056-24 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	15-04-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	15-09-057-22 W4M	√	√
BAYTEX ENERGY LTD.	Satellite	16-21-056-24 W4M	√	√
BEATTON ENERGY INC.	Battery	06-33-048-16 W5M	√	√
BELLATRIX EXPLORATION LTD.	Battery	01-06-044-07 W5M		√
BELLATRIX EXPLORATION LTD.	Battery	03-06-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	Battery	04-14-044-07 W5M		√
BELLATRIX EXPLORATION LTD.	Battery	09-25-048-09 W5M	√	
BELLATRIX EXPLORATION LTD.	Battery	13-23-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	Battery	13-26-043-07 W5M		√
BELLATRIX EXPLORATION LTD.	Battery	13-26-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	Battery	14-13-049-09 W5M	√	
BELLATRIX EXPLORATION LTD.	Battery	15-36-044-07 W5M		√
BELLATRIX EXPLORATION LTD.	Battery	16-29-047-03 W5M	√	√
BELLATRIX EXPLORATION LTD.	Battery	16-33-048-08 W5M	√	√
BELLATRIX EXPLORATION LTD.	Satellite	01-01-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	01-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	01-32-048-08 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	01-36-048-09 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	04-11-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	05-26-050-11 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	05-28-048-08 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	05-29-048-08 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	10-28-048-08 W5M	√	√
BELLATRIX EXPLORATION LTD.	Satellite	10-33-048-08 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	12-20-048-11 W5M	√	
BELLATRIX EXPLORATION LTD.	Satellite	16-28-048-08 W5M	√	√
BENJAKA EXPLORATION INC.	Battery	11-27-052-16 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
BLAZE ENERGY LTD.	Battery	07-10-048-12 W5M	√	
BLAZE ENERGY LTD.	Battery	08-14-048-12 W5M	√	
BLAZE ENERGY LTD.	Battery	10-02-048-12 W5M	√	
BLAZE ENERGY LTD.	Battery	10-09-048-12 W5M	√	
BLAZE ENERGY LTD.	Battery	12-19-048-12 W5M	√	
BLAZE ENERGY LTD.	Battery	13-12-048-12 W5M	√	
BLAZE ENERGY LTD.	Satellite	11-24-048-10 W5M	√	
BONAVISTA ENERGY CORPORATION	Battery	01-03-054-16 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	01-10-054-16 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	01-33-053-16 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	02-25-055-20 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	03-19-055-06 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	03-29-056-19 W5M	√	
BONAVISTA ENERGY CORPORATION	Battery	04-02-054-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	04-11-054-16 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	04-13-047-03 W5M		√
BONAVISTA ENERGY CORPORATION	Battery	06-04-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	06-13-044-08 W5M		√
BONAVISTA ENERGY CORPORATION	Battery	07-23-043-07 W5M		√
BONAVISTA ENERGY CORPORATION	Battery	09-32-055-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	09-36-055-20 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	10-03-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	10-13-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	11-19-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	12-19-057-18 W5M	√	
BONAVISTA ENERGY CORPORATION	Battery	12-20-057-15 W5M	√	
BONAVISTA ENERGY CORPORATION	Battery	13-25-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	13-26-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	13-30-057-18 W5M	√	
BONAVISTA ENERGY CORPORATION	Battery	13-36-055-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	14-12-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	14-34-055-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	15-04-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	15-17-055-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	15-28-055-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	16-01-054-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	16-07-056-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	16-25-053-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	Battery	16-25-055-20 W5M	√	√
BONAVISTA ENERGY CORPORATION	Satellite	05-22-048-04 W5M	√	√
BONAVISTA ENERGY CORPORATION	Satellite	06-22-048-04 W5M	√	√
BONAVISTA ENERGY CORPORATION	Satellite	08-06-042-06 W5M		√
BONTERRA ENERGY CORP.	Battery	01-28-050-12 W5M	√	
BONTERRA ENERGY CORP.	Battery	03-01-050-05 W5M	√	√
BONTERRA ENERGY CORP.	Battery	05-20-048-04 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
BONTERRA ENERGY CORP.	Battery	08-13-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Battery	08-27-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Battery	12-06-048-08 W5M	√	
BONTERRA ENERGY CORP.	Battery	16-34-046-09 W5M		√
BONTERRA ENERGY CORP.	Gas Gathering System	04-25-047-03 W5M	√	√
BONTERRA ENERGY CORP.	Injection Plant	08-17-048-09 W5M	√	
BONTERRA ENERGY CORP.	Satellite	01-15-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	01-24-049-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	02-09-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	02-13-047-09 W5M		√
BONTERRA ENERGY CORP.	Satellite	02-24-047-07 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	02-33-046-09 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	02-34-046-09 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	03-12-047-07 W5M		√
BONTERRA ENERGY CORP.	Satellite	03-19-046-07 W5M		√
BONTERRA ENERGY CORP.	Satellite	04-03-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	04-04-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	04-28-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	04-31-046-07 W5M		√
BONTERRA ENERGY CORP.	Satellite	04-33-050-12 W5M	√	
BONTERRA ENERGY CORP.	Satellite	05-08-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	05-20-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	05-23-048-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-01-047-09 W5M		√
BONTERRA ENERGY CORP.	Satellite	06-01-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-03-048-06 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-10-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-11-056-20 W4M		√
BONTERRA ENERGY CORP.	Satellite	06-14-048-07 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-15-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-18-048-03 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-18-048-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-19-048-03 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-28-046-09 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-28-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-31-048-03 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-32-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	06-34-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	07-18-046-07 W5M		√
BONTERRA ENERGY CORP.	Satellite	07-25-046-08 W5M		√
BONTERRA ENERGY CORP.	Satellite	07-36-047-09 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-02-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-04-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-07-047-08 W5M		√
BONTERRA ENERGY CORP.	Satellite	08-11-047-09 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
BONTERRA ENERGY CORP.	Satellite	08-11-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-13-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-14-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-15-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-16-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-17-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-19-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-22-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-24-047-07 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-25-047-03 W5M	√	
BONTERRA ENERGY CORP.	Satellite	08-26-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-28-046-09 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-33-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	08-36-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	09-30-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	09-36-047-07 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	10-25-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	10-25-048-07 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	10-32-047-06 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	11-07-047-08 W5M		√
BONTERRA ENERGY CORP.	Satellite	11-27-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	12-01-048-09 W5M	√	
BONTERRA ENERGY CORP.	Satellite	12-05-047-08 W5M		√
BONTERRA ENERGY CORP.	Satellite	12-06-048-08 W5M	√	
BONTERRA ENERGY CORP.	Satellite	12-22-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	13-06-048-08 W5M	√	
BONTERRA ENERGY CORP.	Satellite	13-07-047-06 W5M		√
BONTERRA ENERGY CORP.	Satellite	13-13-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	13-15-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	13-18-048-03 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	13-22-048-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-05-048-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-06-047-09 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-09-048-06 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-10-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-12-048-06 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-14-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-14-050-12 W5M	√	
BONTERRA ENERGY CORP.	Satellite	14-16-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-18-047-08 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-18-048-03 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-21-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-29-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	14-34-046-08 W5M		√
BONTERRA ENERGY CORP.	Satellite	14-34-050-12 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
BONTERRA ENERGY CORP.	Satellite	15-22-047-08 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	15-26-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-02-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-02-056-20 W4M		√
BONTERRA ENERGY CORP.	Satellite	16-06-048-06 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-09-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-11-049-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-16-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-16-048-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-17-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-21-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-23-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-24-047-03 W5M	√	
BONTERRA ENERGY CORP.	Satellite	16-24-048-04 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-26-047-03 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-28-047-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-33-047-05 W5M	√	√
BONTERRA ENERGY CORP.	Satellite	16-36-048-04 W5M	√	√
BP CANADA ENERGY GROUP ULC	Battery	07-28-057-19 W5M	√	
BP CANADA ENERGY GROUP ULC	Battery	10-11-051-15 W5M	√	√
BP CANADA ENERGY GROUP ULC	Battery	11-25-058-18 W5M	√	
BP CANADA ENERGY GROUP ULC	Battery	14-01-057-19 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	01-28-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	01-35-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	02-19-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	04-19-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	05-20-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	05-27-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	07-03-049-09 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	07-27-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	10-26-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	10-27-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	11-25-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	11-36-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	15-18-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	15-21-047-14 W5M	√	
BP CANADA ENERGY GROUP ULC	Satellite	16-16-047-08 W5M	√	√
BP CANADA ENERGY GROUP ULC	Satellite	16-21-048-10 W5M	√	
BP CANADA ENERGY RESOURCES COMPANY	Satellite	02-08-048-02 W5M	√	√
BP CANADA ENERGY RESOURCES COMPANY	Satellite	10-33-048-10 W5M	√	
BP CANADA ENERGY RESOURCES COMPANY	Satellite	14-32-047-02 W5M	√	√
BUCK MOUNTAIN GAS CO-OP LTD.	Satellite	08-34-048-05 W5M	√	√
BUMPER DEVELOPMENT CORPORATION LTD.	Satellite	08-13-045-07 W5M		√
BUMPER DEVELOPMENT CORPORATION LTD.	Satellite	14-03-046-07 W5M		√
BUNKER ENERGY INC.	Battery	02-13-058-24 W4M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
BURLINGTON RESOURCES CANADA LTD.	Satellite	08-11-048-06 W5M	√	√
BURLINGTON RESOURCES CANADA LTD.	Satellite	16-10-048-06 W5M	√	√
CALCRUDE OILS LIMITED	Satellite	06-30-056-04 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-05-056-21 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-14-055-22 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-14-057-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-17-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-22-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-23-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-25-054-21 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-29-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-31-051-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-36-051-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	01-36-056-24 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-08-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-12-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-18-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-19-058-02 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-21-059-08 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-32-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	02-34-053-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-01-055-18 W4M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-10-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-14-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-17-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-19-055-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-23-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-27-053-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	03-29-051-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	04-09-058-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	04-22-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	04-27-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	04-28-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	05-01-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	05-14-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	05-34-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-09-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-13-052-21 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-15-055-18 W4M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-22-053-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-26-057-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-28-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-33-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-34-057-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	06-36-057-23 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-02-058-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-08-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-12-057-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-14-057-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-23-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-27-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	07-30-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	08-06-057-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	08-20-058-02 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	08-32-051-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	08-34-045-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	08-35-052-25 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	09-09-057-24 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	09-11-057-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	09-16-056-26 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	09-24-058-03 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	09-29-058-03 W5M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-01-057-24 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-02-055-01 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-05-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-06-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-09-058-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-10-054-10 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-16-053-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-21-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-29-054-24 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	10-30-051-03 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	11-07-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	11-20-057-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	11-24-054-22 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	11-29-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-01-054-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-04-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-15-055-18 W4M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-22-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-25-058-03 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-28-053-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-30-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-31-056-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-33-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	12-34-057-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-01-056-18 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-09-058-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-17-058-02 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-24-056-23 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-26-054-22 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-27-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-30-057-22 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	13-34-049-18 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	14-06-055-22 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	14-22-058-04 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	14-28-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	14-30-051-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	14-31-052-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	14-34-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	15-09-058-04 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	15-12-053-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	15-23-058-03 W6M		√
CANADIAN NATURAL RESOURCES LIMITED	Battery	15-29-056-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	16-06-052-19 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	16-08-053-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	16-09-053-20 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	16-22-055-25 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Battery	16-28-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Battery	16-34-053-16 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Compressor Station	15-15-058-23 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Satellite	01-07-059-08 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Satellite	04-14-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Satellite	04-15-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Satellite	05-09-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Satellite	07-23-050-22 W4M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Satellite	08-25-055-06 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	Satellite	13-03-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Satellite	13-10-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	Satellite	14-18-042-06 W5M		√
CANADIAN NATURAL RESOURCES LIMITED	Satellite	16-07-042-06 W5M		√
CANCEN OIL PROCESSORS CORP.	Central Treating Plants	02-31-052-23 W4M	√	√
CELTIC EXPLORATION ULC	Battery	01-13-060-09 W6M		√
CELTIC EXPLORATION ULC	Battery	05-17-058-27 W5M		√
CELTIC EXPLORATION ULC	Battery	12-24-061-10 W6M		√
CELTIC EXPLORATION ULC	Battery	12-36-059-08 W6M		√
CELTIC EXPLORATION ULC	Gas Gathering System	02-19-058-19 W5M	√	
CEQUEL ENERGY INC.	Battery	04-09-051-02 W5M	√	√
CEQUENCE ENERGY LTD.	Battery	12-06-058-11 W5M		√
CHEVRON CANADA LIMITED	Battery	14-26-051-09 W5M	√	
CHEVRON CANADA LIMITED	Satellite	02-26-052-26 W4M	√	√
CHEVRON CANADA LIMITED	Satellite	08-10-053-26 W4M	√	√
CHINOOK ENERGY INC.	Battery	01-17-054-20 W4M	√	√
CHINOOK ENERGY INC.	Battery	05-32-057-22 W4M	√	
CHINOOK ENERGY LTD.	Battery	06-09-057-08 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
CHINOOK ENERGY LTD.	Battery	06-34-056-08 W5M	√	√
CHINOOK ENERGY LTD.	Satellite	16-33-048-01 W5M	√	√
CHINOOK ENERGY PARTNERSHIP	Satellite	06-24-042-07 W5M		√
COASTAL RESOURCES LIMITED	Satellite	09-04-052-26 W4M	√	√
COLD LAKE PIPELINE LTD.	Central Treating Plants	09-06-053-23 W4M	√	√
COMPTON PETROLEUM CORPORATION	Battery	01-35-053-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	06-16-054-15 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	08-04-051-09 W5M	√	
COMPTON PETROLEUM CORPORATION	Battery	10-01-055-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	11-29-053-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	12-07-054-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	12-27-054-13 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	13-11-054-13 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	14-12-054-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	14-24-054-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	Battery	16-09-054-14 W5M	√	√
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	01-06-055-22 W5M	√	√
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	01-31-047-14 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	01-31-047-14 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	09-30-047-14 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	09-30-047-14 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	09-30-047-14 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	10-24-046-09 W5M		√
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Battery	13-29-047-14 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Satellite	08-10-050-09 W5M	√	
CONOCOPHILLIPS CANADA (BRC) PARTNERSHIP	Satellite	16-35-047-06 W5M	√	√
CONOCOPHILLIPS CANADA ENERGY PARTNERSHIP	Battery	15-21-055-12 W5M	√	√
CONOCOPHILLIPS CANADA ENERGY PARTNERSHIP	Satellite	02-10-055-13 W5M	√	√
CONOCOPHILLIPS CANADA ENERGY PARTNERSHIP	Satellite	14-18-054-12 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	01-19-045-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	02-08-045-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	02-19-045-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	02-27-049-14 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	03-11-045-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	03-15-052-15 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	03-34-064-09 W6M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	04-15-045-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	04-18-050-09 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	05-04-065-09 W6M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	05-10-046-09 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	06-30-046-13 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	07-03-057-19 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	07-13-047-13 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	08-11-051-15 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	08-25-050-13 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	08-29-063-11 W6M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	10-14-046-14 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	11-08-046-13 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	12-02-047-10 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	13-15-049-14 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	14-02-057-25 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	14-26-045-09 W5M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	14-31-052-14 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	15-29-049-13 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	15-33-049-14 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	16-07-047-06 W5M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Battery	16-25-050-13 W5M	√	
CONOCOPHILLIPS CANADA OPERATIONS LTD.	Satellite	10-25-050-12 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	01-12-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	01-13-046-09 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	01-21-052-14 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	01-28-044-07 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	01-31-059-12 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	01-34-044-06 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	02-26-046-09 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	02-29-056-24 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	03-33-056-20 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	04-03-046-14 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	04-08-046-10 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	04-22-047-15 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	04-24-045-11 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	04-30-058-11 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	05-14-051-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	05-23-047-15 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	05-29-046-14 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	05-32-045-09 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	06-02-047-13 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	06-04-046-09 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	06-08-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	06-11-045-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	06-21-048-16 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	06-29-059-08 W6M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	07-02-059-12 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	07-05-057-20 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	07-13-047-07 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	07-17-057-17 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	07-20-051-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	07-33-050-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	09-04-048-14 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	09-07-052-16 W4M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	09-14-046-09 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-01-059-13 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-11-048-14 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-18-056-10 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-19-050-14 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-23-046-09 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-24-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	10-24-047-14 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	11-04-056-23 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	11-25-049-16 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	11-25-058-12 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	11-28-056-20 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	11-35-058-12 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	12-11-052-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	12-13-046-09 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	12-16-051-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	13-10-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	13-11-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	13-18-045-09 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	14-02-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	14-07-047-13 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	14-11-063-08 W6M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	14-15-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	14-18-046-08 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	15-03-054-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	15-35-047-13 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-05-053-01 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-12-047-14 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-15-046-09 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-21-046-11 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-25-063-08 W6M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-28-050-16 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-34-045-09 W5M		√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	16-35-048-10 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	UNAVAILABLE	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Battery	UNAVAILABLE	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	02-02-055-13 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	06-02-049-10 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	06-25-054-13 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	07-24-047-15 W5M	√	
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	14-20-047-06 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	14-25-048-02 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	16-24-048-02 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	Satellite	16-35-048-10 W5M	√	
CONOCOPHILLIPS WESTERN CANADA PARTNERSHIP	Battery	UNAVAILABLE	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
CREW ENERGY INC.	Battery	01-04-052-15 W5M	√	√
CREW ENERGY INC.	Battery	03-34-051-15 W5M	√	√
CREW ENERGY INC.	Battery	04-15-056-18 W5M	√	√
CREW ENERGY INC.	Battery	07-27-051-15 W5M	√	√
CREW ENERGY INC.	Battery	12-17-060-26 W5M		√
CREW ENERGY INC.	Battery	13-27-051-15 W5M	√	√
CREW ENERGY INC.	Battery	14-10-052-15 W5M	√	√
CREW ENERGY INC.	Battery	14-34-052-16 W5M	√	√
CROCOTTA ENERGY INC.	Battery	01-13-054-19 W5M	√	√
CROCOTTA ENERGY INC.	Battery	02-06-054-18 W5M	√	√
CROCOTTA ENERGY INC.	Battery	09-18-054-18 W5M	√	√
CROCOTTA ENERGY INC.	Battery	14-15-054-18 W5M	√	√
CROCOTTA ENERGY INC.	Satellite	01-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	Satellite	07-11-053-18 W5M	√	√
CROCOTTA ENERGY INC.	Satellite	08-02-054-19 W5M	√	√
CROCOTTA ENERGY INC.	Satellite	13-18-054-17 W5M	√	√
CROCOTTA ENERGY INC.	Satellite	16-26-054-18 W5M	√	√
DEETHREE EXPLORATION LTD.	Battery	03-26-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	05-13-046-13 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	06-31-046-14 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	06-36-045-13 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	07-12-046-13 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	11-12-045-12 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	11-21-045-13 W5M	√	
DEETHREE EXPLORATION LTD.	Battery	12-28-045-12 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	01-29-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	03-29-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	06-28-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	07-26-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	09-20-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	09-28-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	10-28-047-13 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	11-20-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	13-22-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	13-25-047-14 W5M	√	
DEETHREE EXPLORATION LTD.	Satellite	14-21-047-14 W5M	√	
DELPHI ENERGY CORP.	Battery	13-28-045-14 W5M	√	
DELPHI ENERGY CORP.	Battery	13-28-045-14 W5M	√	
DELPHI ENERGY CORP.	Battery	13-28-045-14 W5M	√	
DESMARAIS ENERGY CORPORATION	Battery	09-36-058-05 W5M		√
DESMARAIS ENERGY CORPORATION	Battery	15-26-058-05 W5M		√
DEVON ARL CORPORATION	Battery	03-34-057-06 W6M		√
DEVON ARL CORPORATION	Battery	11-06-051-03 W5M	√	√
DEVON ARL CORPORATION	Battery	15-24-045-14 W5M	√	
DEVON CANADA	Battery	05-26-055-22 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
DEVON CANADA	Battery	10-08-050-03 W5M	√	√
DEVON CANADA	Battery	14-03-057-26 W5M	√	√
DEVON CANADA	Satellite	02-29-056-19 W5M	√	
DEVON CANADA	Satellite	07-29-046-03 W5M		√
DEVON CANADA	Satellite	08-11-046-04 W5M		√
DEVON CANADA CORPORATION	Battery	02-24-062-11 W6M		√
DEVON CANADA CORPORATION	Battery	02-25-052-15 W5M	√	√
DEVON CANADA CORPORATION	Battery	07-06-058-06 W6M		√
DEVON CANADA CORPORATION	Battery	07-26-055-22 W5M	√	√
DEVON CANADA CORPORATION	Battery	08-03-065-09 W6M		√
DEVON CANADA CORPORATION	Battery	08-14-043-18 W5M		√
DEVON CANADA CORPORATION	Battery	11-31-060-09 W6M		√
DEVON CANADA CORPORATION	Battery	15-23-047-17 W5M	√	
DEVON CANADA CORPORATION	Gas Gathering System	07-02-059-26 W5M		√
DIRECT ENERGY MARKETING LIMITED	Battery	01-36-052-14 W5M	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	02-05-048-26 W4M	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	03-20-051-14 W5M	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	14-13-048-25 W4M	√	
DIRECT ENERGY MARKETING LIMITED	Battery	14-18-051-14 W5M	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	16-21-056-21 W4M	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	16-36-050-15 W5M	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	UNAVAILABLE	√	√
DIRECT ENERGY MARKETING LIMITED	Battery	UNAVAILABLE	√	√
DOW CHEMICAL CANADA ULC	Battery	12-11-055-22 W4M	√	√
ECLIPSE RESOURCES LTD.	Satellite	16-33-049-05 W5M	√	√
ENCANA CORPORATION	Battery	01-14-047-03 W5M		√
ENCANA CORPORATION	Battery	02-08-062-06 W6M		√
ENCANA CORPORATION	Battery	02-17-063-08 W6M		√
ENCANA CORPORATION	Battery	05-10-059-26 W5M		√
ENCANA CORPORATION	Battery	08-22-063-08 W6M		√
ENCANA CORPORATION	Battery	09-07-062-06 W6M		√
ENCANA CORPORATION	Battery	11-15-059-26 W5M		√
ENCANA CORPORATION	Battery	11-18-059-02 W6M		√
ENCANA CORPORATION	Battery	11-23-048-01 W5M	√	√
ENCANA CORPORATION	Battery	13-36-050-15 W5M	√	√
ENCANA CORPORATION	Battery	14-22-047-03 W5M	√	√
ENCANA CORPORATION	Gas Gathering System	01-35-060-05 W6M		√
ENCANA CORPORATION	Satellite	06-04-049-01 W5M	√	√
ENCANA CORPORATION	Satellite	09-18-053-13 W5M	√	√
ENCOR ENERGY CORPORATION INC.	Gas Processing Plant	06-16-054-18 W5M	√	√
ENERPLUS CORPORATION	Battery	06-24-053-20 W5M	√	√
ENERPLUS CORPORATION	Battery	07-28-046-07 W5M		√
ENERPLUS CORPORATION	Injection Plant	08-32-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	01-06-051-11 W5M	√	
ENERPLUS CORPORATION	Satellite	02-21-055-05 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
ENERPLUS CORPORATION	Satellite	02-24-050-22 W4M	√	√
ENERPLUS CORPORATION	Satellite	04-18-047-07 W5M		√
ENERPLUS CORPORATION	Satellite	04-25-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	06-09-047-07 W5M		√
ENERPLUS CORPORATION	Satellite	06-11-047-07 W5M		√
ENERPLUS CORPORATION	Satellite	06-15-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	06-19-055-05 W5M	√	√
ENERPLUS CORPORATION	Satellite	06-24-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	08-19-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	08-21-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	08-27-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	08-30-046-07 W5M		√
ENERPLUS CORPORATION	Satellite	10-14-047-07 W5M		√
ENERPLUS CORPORATION	Satellite	10-16-047-07 W5M		√
ENERPLUS CORPORATION	Satellite	10-36-049-22 W4M	√	√
ENERPLUS CORPORATION	Satellite	11-27-054-05 W5M	√	√
ENERPLUS CORPORATION	Satellite	11-31-049-21 W4M	√	√
ENERPLUS CORPORATION	Satellite	13-31-049-21 W4M	√	√
ENERPLUS CORPORATION	Satellite	13-33-047-03 W5M	√	√
ENERPLUS CORPORATION	Satellite	14-31-049-21 W4M	√	√
ENERPLUS CORPORATION	Satellite	15-12-050-22 W4M	√	√
ENERPLUS CORPORATION	Satellite	15-30-049-21 W4M	√	
ENHANCE ENERGY INC.	Compressor Station	12-17-056-21 W4M	√	√
ENHANCE ENERGY INC.	Pump Station	01-25-055-21 W4M	√	√
EOG RESOURCES CANADA INC.	Battery	07-31-048-09 W5M	√	
EOG RESOURCES CANADA INC.	Battery	15-30-048-09 W5M	√	
EOG RESOURCES CANADA INC.	Satellite	02-24-050-05 W5M	√	√
EQUAL ENERGY LTD.	Battery	10-14-050-22 W5M	√	√
ESCALADE ENERGY INC.	Battery	10-20-053-02 W5M	√	√
EXORO ENERGY INC.	Injection Plant	13-22-049-07 W5M	√	√
EXXONMOBIL CANADA LTD. & EXXONMOBIL RESOURCES COMP	Satellite	08-27-048-05 W5M	√	√
GAMET RESOURCES LTD.	Battery	14-07-050-08 W5M	√	
GAMET RESOURCES LTD.	Battery	14-07-050-08 W5M	√	
GAMET RESOURCES LTD.	Satellite	08-23-050-04 W5M	√	√
GIBSON ENERGY ULC	Central Treating Plants	01-03-049-10 W5M	√	
GIBSON ENERGY ULC	Injection Plant	10-18-057-05 W6M		√
GULF CANADA LIMITED	Satellite	12-07-050-21 W4M	√	√
HANSEN DRILLING VENTURES LTD.	Battery	07-11-053-09 W5M	√	√
HARVEST OPERATIONS CORP.	Battery	01-02-047-05 W5M		√
HARVEST OPERATIONS CORP.	Battery	02-01-044-07 W5M		√
HARVEST OPERATIONS CORP.	Battery	02-04-062-10 W6M		√
HARVEST OPERATIONS CORP.	Battery	02-15-055-21 W4M	√	√
HARVEST OPERATIONS CORP.	Battery	02-17-041-17 W5M		√
HARVEST OPERATIONS CORP.	Battery	03-20-043-06 W5M		√
HARVEST OPERATIONS CORP.	Battery	04-01-044-08 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
HARVEST OPERATIONS CORP.	Battery	06-12-057-10 W5M		√
HARVEST OPERATIONS CORP.	Battery	06-33-062-06 W6M		√
HARVEST OPERATIONS CORP.	Battery	07-30-043-06 W5M		√
HARVEST OPERATIONS CORP.	Battery	08-33-061-06 W6M		√
HARVEST OPERATIONS CORP.	Battery	09-35-042-06 W5M		√
HARVEST OPERATIONS CORP.	Battery	10-12-055-16 W5M	√	√
HARVEST OPERATIONS CORP.	Battery	10-14-063-08 W6M		√
HARVEST OPERATIONS CORP.	Battery	10-15-044-07 W5M		√
HARVEST OPERATIONS CORP.	Battery	10-18-043-06 W5M		√
HARVEST OPERATIONS CORP.	Battery	10-36-063-08 W6M		√
HARVEST OPERATIONS CORP.	Battery	11-21-046-12 W5M	√	
HARVEST OPERATIONS CORP.	Battery	12-19-043-06 W5M		√
HARVEST OPERATIONS CORP.	Battery	13-07-057-09 W5M	√	√
HARVEST OPERATIONS CORP.	Battery	13-11-055-21 W4M	√	√
HARVEST OPERATIONS CORP.	Battery	14-15-044-07 W5M		√
HARVEST OPERATIONS CORP.	Battery	15-35-061-06 W6M		√
HARVEST OPERATIONS CORP.	Battery	UNAVAILABLE		√
HARVEST OPERATIONS CORP.	Satellite	01-31-054-16 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	02-15-055-21 W4M	√	√
HARVEST OPERATIONS CORP.	Satellite	04-14-055-21 W4M	√	√
HARVEST OPERATIONS CORP.	Satellite	05-36-055-05 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	06-10-055-16 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	07-06-056-04 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	09-36-055-05 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	10-32-054-16 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	12-15-055-21 W4M	√	√
HARVEST OPERATIONS CORP.	Satellite	14-11-055-21 W4M	√	√
HARVEST OPERATIONS CORP.	Satellite	14-31-055-04 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	15-33-054-16 W5M	√	√
HARVEST OPERATIONS CORP.	Satellite	16-26-048-11 W5M	√	
HARVEST OPERATIONS CORP.	Satellite	16-26-055-05 W5M	√	√
HORSESHOE BAY RESOURCES LIMITED	Battery	16-22-056-05 W5M	√	√
HUNT OIL COMPANY OF CANADA, INC.	Battery	06-27-061-06 W6M		√
HUSKY OIL OPERATIONS LIMITED	Battery	01-02-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	01-10-060-27 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	01-23-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	01-34-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	02-02-043-16 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	02-03-055-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	02-28-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	02-28-050-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	03-04-042-14 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	03-08-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	03-12-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	03-16-051-19 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
HUSKY OIL OPERATIONS LIMITED	Battery	03-18-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	04-09-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	04-11-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	04-13-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	04-18-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-03-055-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-05-050-06 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-08-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-32-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-32-053-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-33-053-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	05-36-042-16 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	05-36-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	06-03-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-06-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-08-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-15-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-16-047-13 W5M	√	
HUSKY OIL OPERATIONS LIMITED	Battery	06-19-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-22-057-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-23-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-25-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-26-045-15 W5M	√	
HUSKY OIL OPERATIONS LIMITED	Battery	06-33-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	06-33-054-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-02-043-16 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	07-03-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-03-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-16-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-18-043-17 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	07-18-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-20-053-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-20-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	07-24-045-17 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-27-041-16 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	07-28-053-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-32-048-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	07-35-053-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	08-03-043-16 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	08-06-051-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	08-11-054-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	08-16-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	08-18-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	08-29-053-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	08-30-053-20 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
HUSKY OIL OPERATIONS LIMITED	Battery	09-05-043-17 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	09-09-045-16 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	09-19-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	09-19-056-20 W4M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	09-25-050-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	09-30-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	10-09-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	10-12-050-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	10-12-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	10-13-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	10-18-052-17 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	10-20-054-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	10-28-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-02-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-09-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	11-10-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-13-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-18-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-22-053-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-33-053-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	11-33-054-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	12-10-043-16 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	12-19-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	12-19-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	12-27-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	12-28-054-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	12-35-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	13-01-060-10 W6M		√
HUSKY OIL OPERATIONS LIMITED	Battery	13-08-057-02 W6M		√
HUSKY OIL OPERATIONS LIMITED	Battery	13-10-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	13-21-054-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	13-25-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	13-27-050-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	14-01-049-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	14-07-051-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	14-16-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	14-21-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	14-31-045-15 W5M	√	
HUSKY OIL OPERATIONS LIMITED	Battery	14-33-042-17 W5M		√
HUSKY OIL OPERATIONS LIMITED	Battery	15-01-054-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	15-12-050-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	15-17-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	15-19-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	15-24-053-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	15-27-050-19 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
HUSKY OIL OPERATIONS LIMITED	Battery	15-28-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	15-30-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	15-31-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-03-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-17-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-20-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-20-053-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-22-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-27-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Battery	16-29-049-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	16-33-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Battery	UNAVAILABLE		√
HUSKY OIL OPERATIONS LIMITED	Battery	UNAVAILABLE		√
HUSKY OIL OPERATIONS LIMITED	Gas Gathering System	10-17-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Injection Plant	08-30-055-19 W4M		√
HUSKY OIL OPERATIONS LIMITED	Pump station and tank farm	SE 28-055-21 W4M	√	√
HUSKY OIL OPERATIONS LIMITED	Satellite	01-30-047-06 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Satellite	02-20-047-07 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Satellite	05-15-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	06-36-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	07-16-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	08-16-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	08-26-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	09-08-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	10-16-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	11-04-049-01 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Satellite	13-19-055-20 W4M	√	√
HUSKY OIL OPERATIONS LIMITED	Satellite	14-09-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	Satellite	14-29-047-07 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	Satellite	16-36-045-04 W5M		√
HYPERION EXPLORATION CORP.	Battery	06-16-045-05 W5M		√
IMPERIAL OIL RESOURCES	Battery	15-22-051-27 W4M	√	√
IMPERIAL OIL RESOURCES	Injection Plant	09-17-057-21 W4M	√	
IMPERIAL OIL RESOURCES	Satellite	01-11-049-11 W5M	√	
IMPERIAL OIL RESOURCES	Satellite	01-34-049-11 W5M	√	
IMPERIAL OIL RESOURCES	Satellite	04-21-049-07 W5M	√	√
IMPERIAL OIL RESOURCES	Satellite	06-03-050-11 W5M	√	
IMPERIAL OIL RESOURCES	Satellite	06-20-057-21 W4M	√	
IMPERIAL OIL RESOURCES	Satellite	08-26-050-11 W5M	√	
IMPERIAL OIL RESOURCES	Satellite	11-17-042-06 W5M		√
IMPERIAL OIL RESOURCES	Satellite	11-35-049-26 W4M	√	√
IMPERIAL OIL RESOURCES	Satellite	13-35-046-16 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Battery	01-04-045-18 W5M	√	√
IMPERIAL OIL RESOURCES LIMITED	Battery	08-08-045-18 W5M	√	√
IMPERIAL OIL RESOURCES LIMITED	Battery	10-01-046-20 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
IMPERIAL OIL RESOURCES LIMITED	Battery	13-34-045-20 W5M	√	√
IMPERIAL OIL RESOURCES LIMITED	Battery	16-11-046-20 W5M	√	√
IMPERIAL OIL RESOURCES LIMITED	Injection Plant	07-23-050-28 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Injection Plant	08-01-053-24 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Injection Plant	09-01-053-24 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	01-03-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	01-22-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	02-05-051-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	02-14-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	02-16-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	03-17-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	04-03-051-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	04-32-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	06-04-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	06-04-051-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	06-09-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	06-15-051-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	06-19-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	06-27-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	07-19-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	07-36-049-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	08-02-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	08-03-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	08-09-050-10 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	09-03-051-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	09-06-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	10-03-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	10-04-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	11-06-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	11-07-049-10 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	11-18-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	11-21-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	11-29-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	12-01-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	12-14-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	13-21-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	Satellite	15-25-049-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	15-31-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	16-19-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	16-34-049-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	Satellite	16-36-050-26 W4M	√	√
ISH ENERGY LTD.	Battery	09-07-056-16 W5M	√	√
JACO ENERGY LIMITED	Injection Plant	02-12-057-21 W4M	√	
JAYHAWK RESOURCES LTD.	Battery	03-14-044-07 W5M		√
JAYHAWK RESOURCES LTD.	Battery	04-17-044-07 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
JAYHAWK RESOURCES LTD.	Battery	05-13-044-07 W5M		√
JAYHAWK RESOURCES LTD.	Battery	06-17-044-06 W5M		√
JAYHAWK RESOURCES LTD.	Battery	06-18-044-06 W5M		√
JAYHAWK RESOURCES LTD.	Battery	06-22-044-07 W5M		√
JAYHAWK RESOURCES LTD.	Battery	06-23-044-07 W5M		√
JAYHAWK RESOURCES LTD.	Battery	10-07-044-06 W5M		√
JAYHAWK RESOURCES LTD.	Battery	11-10-044-07 W5M		√
JAYHAWK RESOURCES LTD.	Battery	11-16-044-07 W5M		√
JAYHAWK RESOURCES LTD.	Battery	15-24-044-07 W5M		√
JOURNEY ENERGY INC.	Battery	03-12-059-02 W5M		√
JOURNEY ENERGY INC.	Battery	06-28-057-19 W5M	√	
JOURNEY ENERGY INC.	Battery	11-19-058-02 W5M		√
JOURNEY ENERGY INC.	Battery	13-22-060-03 W5M		√
JOURNEY ENERGY INC.	Satellite	04-06-049-04 W5M	√	√
JOURNEY ENERGY INC.	Satellite	04-31-048-04 W5M	√	√
JOURNEY ENERGY INC.	Satellite	06-06-049-04 W5M	√	√
JOURNEY ENERGY INC.	Satellite	09-25-048-05 W5M	√	√
JOURNEY ENERGY INC.	Satellite	11-07-059-02 W5M		√
JOURNEY ENERGY INC.	Satellite	14-29-059-02 W5M		√
JOURNEY ENERGY INC.	Satellite	14-30-048-04 W5M	√	√
JOURNEY ENERGY INC.	Satellite	14-31-048-04 W5M	√	√
JOURNEY ENERGY INC.	Satellite	15-26-059-03 W5M		√
KANATI ENERGY INCORPORATED	Battery	UNAVAILABLE	√	
KARON RESOURCES INC.	Satellite	08-35-046-04 W5M		√
KEEPER RESOURCES INC.	Battery	06-01-055-12 W5M	√	√
KEYERA ENERGY LTD.	Battery	06-20-045-05 W5M		√
KEYERA ENERGY LTD.	Battery	10-08-045-05 W5M		√
KEYERA ENERGY LTD.	Battery	10-18-045-05 W5M		√
KEYERA ENERGY LTD.	Battery	14-21-046-06 W5M		√
KEYERA ENERGY LTD.	Battery	15-09-046-06 W5M		√
KEYERA ENERGY LTD.	Injection Plant	11-04-051-09 W5M	√	
KEYERA ENERGY LTD.	Injection Plant	14-22-049-12 W5M	√	
KEYERA ENERGY LTD.	Injection Plant	16-07-051-09 W5M	√	
KEYERA ENERGY LTD.	Satellite	15-09-046-06 W5M		√
KINGSMERE RESOURCES LTD.	Battery	12-07-056-20 W5M	√	√
KINGSMERE RESOURCES LTD.	Battery	13-15-048-27 W4M	√	√
KINGSMERE RESOURCES LTD.	Satellite	03-02-053-26 W4M	√	√
KNOWLEDGE ENERGY INC.	Battery	04-31-043-06 W5M		√
LEDDY EXPLORATION LIMITED	Satellite	02-30-052-25 W4M	√	√
LONE PINE RESOURCES CANADA LTD.	Battery	10-22-051-08 W5M	√	
LONG RUN EXPLORATION LTD.	Battery	03-25-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Battery	04-25-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Battery	09-09-059-05 W5M		√
LONG RUN EXPLORATION LTD.	Injection Plant	14-22-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	01-26-057-23 W4M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
LONG RUN EXPLORATION LTD.	Satellite	01-29-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	02-31-055-20 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	02-33-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	02-36-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	03-36-055-05 W5M	√	√
LONG RUN EXPLORATION LTD.	Satellite	04-25-055-05 W5M	√	√
LONG RUN EXPLORATION LTD.	Satellite	05-18-057-21 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	06-08-056-20 W4M		√
LONG RUN EXPLORATION LTD.	Satellite	06-25-055-05 W5M	√	√
LONG RUN EXPLORATION LTD.	Satellite	06-33-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	06-34-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	07-07-056-20 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	07-22-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	07-24-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	07-25-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	07-31-055-20 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	07-34-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	08-16-057-22 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	08-23-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	08-34-056-06 W5M	√	√
LONG RUN EXPLORATION LTD.	Satellite	09-26-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	09-36-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	10-29-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	10-36-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	11-34-056-21 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	12-18-057-21 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	12-28-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	13-21-057-22 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	13-30-057-22 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	13-36-057-23 W4M	√	
LONG RUN EXPLORATION LTD.	Satellite	14-22-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	15-13-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	15-21-057-22 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	15-23-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	15-36-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	16-23-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	Satellite	16-26-057-23 W4M	√	
LONGVIEW OIL CORP.	Battery	UNAVAILABLE		√
LONGVIEW OIL CORP.	Satellite	03-12-053-10 W5M	√	√
LONGVIEW OIL CORP.	Satellite	15-33-046-08 W5M		√
LONGVIEW OIL CORP.	Satellite	16-11-053-10 W5M	√	√
MADALENA VENTURES INC.	Battery	04-05-056-07 W5M	√	√
MADALENA VENTURES INC.	Battery	04-10-058-10 W5M		√
MADALENA VENTURES INC.	Battery	04-29-058-09 W5M	√	√
MADALENA VENTURES INC.	Battery	06-04-058-08 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
MADALENA VENTURES INC.	Battery	06-10-058-08 W5M	√	√
MADALENA VENTURES INC.	Battery	08-05-056-07 W5M	√	√
MADALENA VENTURES INC.	Battery	08-05-058-09 W5M	√	√
MADALENA VENTURES INC.	Battery	09-23-056-10 W5M		√
MADALENA VENTURES INC.	Battery	10-01-057-10 W5M		√
MADALENA VENTURES INC.	Battery	UNAVAILABLE	√	√
MANCAL ENERGY INC.	Battery	01-31-049-11 W5M	√	
MANCAL ENERGY INC.	Battery	02-07-049-11 W5M	√	
MANCAL ENERGY INC.	Battery	03-34-048-11 W5M	√	
MANCAL ENERGY INC.	Battery	05-03-049-11 W5M	√	
MANCAL ENERGY INC.	Battery	09-02-049-12 W5M	√	
MANCAL ENERGY INC.	Battery	09-28-050-12 W5M	√	
MANCAL ENERGY INC.	Battery	11-07-049-11 W5M	√	
MANCAL ENERGY INC.	Battery	12-12-055-19 W5M	√	√
MANCAL ENERGY INC.	Battery	12-24-051-10 W5M	√	
MANCAL ENERGY INC.	Battery	12-25-049-12 W5M	√	
MANCAL ENERGY INC.	Battery	14-01-050-12 W5M	√	
MANCAL ENERGY INC.	Satellite	02-07-049-11 W5M	√	
MANCAL ENERGY INC.	Satellite	02-13-057-22 W4M	√	
MANCAL ENERGY INC.	Satellite	06-08-057-21 W4M	√	
MANCAL ENERGY INC.	Satellite	07-05-057-21 W4M	√	
MANCAL ENERGY INC.	Satellite	09-02-057-22 W4M	√	√
MANCAL ENERGY INC.	Satellite	11-07-057-21 W4M	√	
MANCAL ENERGY INC.	Satellite	12-08-057-21 W4M	√	
MANCAL ENERGY INC.	Satellite	14-29-056-21 W4M	√	√
MANCAL ENERGY INC.	Satellite	15-30-056-21 W4M	√	√
MANITOK ENERGY INC.	Battery	06-29-042-15 W5M		√
MANITOK ENERGY INC.	Battery	16-30-050-23 W5M	√	√
MARQUEE ENERGY LTD.	Battery	12-28-047-07 W5M	√	√
MARQUEE ENERGY LTD.	Battery	UNAVAILABLE	√	√
MARQUEE ENERGY LTD.	Satellite	07-36-045-09 W5M		√
MARQUEE ENERGY LTD.	Satellite	09-07-052-12 W5M	√	√
MARQUEE ENERGY LTD.	Satellite	10-08-052-12 W5M	√	√
MARQUEE ENERGY LTD.	Satellite	12-28-047-07 W5M	√	√
MELAAR RESOURCES LTD	Satellite	06-29-049-25 W4M	√	√
MOSAIC ENERGY LTD.	Battery	05-34-054-17 W5M	√	√
MOSAIC ENERGY LTD.	Battery	07-24-052-15 W5M	√	√
MOSAIC ENERGY LTD.	Battery	10-19-052-14 W5M	√	√
MOSAIC ENERGY LTD.	Satellite	05-29-057-22 W4M	√	
MOSAIC ENERGY LTD.	Satellite	10-30-057-22 W4M	√	
MURPHY OIL COMPANY LTD.	Satellite	11-17-055-18 W5M	√	√
NAL RESOURCES LIMITED	Satellite	03-21-056-19 W5M	√	√
NAL RESOURCES LIMITED	Satellite	07-04-055-18 W5M	√	√
NEO EXPLORATION INC.	Battery	05-22-048-26 W4M	√	√
NEO EXPLORATION INC.	Battery	09-04-048-26 W4M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
NEO EXPLORATION INC.	Battery	10-34-048-26 W4M	√	√
NEO EXPLORATION INC.	Battery	13-19-048-25 W4M	√	√
NEP CANADA ULC	Battery	05-36-050-26 W4M	√	√
NEP CANADA ULC	Battery	15-03-051-26 W4M	√	√
NEP CANADA ULC	Satellite	01-16-050-26 W4M	√	√
NEP CANADA ULC	Satellite	01-35-050-26 W4M	√	√
NEP CANADA ULC	Satellite	03-14-050-26 W4M	√	√
NEP CANADA ULC	Satellite	06-33-050-26 W4M	√	√
NEP CANADA ULC	Satellite	07-15-050-26 W4M	√	√
NEP CANADA ULC	Satellite	07-16-051-26 W4M	√	√
NEP CANADA ULC	Satellite	07-21-051-26 W4M	√	√
NEP CANADA ULC	Satellite	07-24-053-18 W4M		√
NEP CANADA ULC	Satellite	08-21-050-26 W4M	√	√
NEP CANADA ULC	Satellite	09-14-053-18 W4M		√
NEP CANADA ULC	Satellite	09-16-050-26 W4M	√	√
NEP CANADA ULC	Satellite	09-16-051-26 W4M	√	√
NEP CANADA ULC	Satellite	10-08-050-26 W4M	√	√
NEP CANADA ULC	Satellite	10-09-051-26 W4M	√	√
NEP CANADA ULC	Satellite	10-32-049-26 W4M	√	√
NEP CANADA ULC	Satellite	11-04-051-26 W4M	√	√
NEP CANADA ULC	Satellite	11-24-053-18 W4M		√
NEP CANADA ULC	Satellite	11-34-049-26 W4M	√	√
NEP CANADA ULC	Satellite	13-13-053-18 W4M		√
NEP CANADA ULC	Satellite	14-13-053-18 W4M		√
NEW NORTH RESOURCES LTD.	Battery	02-12-047-09 W5M		√
NEW STAR ENERGY LTD.	Battery	12-32-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Battery	15-34-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Battery	15-36-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	01-28-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	04-04-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	04-22-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	05-21-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	06-32-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	08-14-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	08-30-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	08-36-050-05 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	10-09-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	10-30-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	11-16-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	12-04-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	12-10-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	13-22-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	14-17-051-03 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	14-18-051-03 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	14-20-050-04 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
NEW STAR ENERGY LTD.	Injection Plant	14-29-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	14-31-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	16-05-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	16-08-050-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	16-08-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	16-13-051-04 W5M	√	√
NEW STAR ENERGY LTD.	Injection Plant	16-25-050-05 W5M	√	√
NEWALTA CORPORATION	Injection Plant	05-07-043-06 W5M		√
NEWALTA CORPORATION	Satellite	14-07-043-06 W5M		√
NEXEN INC.	Satellite	06-03-049-04 W5M	√	√
NEXEN INC.	Satellite	06-23-048-04 W5M	√	√
NEXEN INC.	Satellite	14-13-048-04 W5M	√	√
NORDEGG RESOURCES INC.	Battery	08-16-052-11 W5M	√	√
NORDEGG RESOURCES INC.	Battery	14-16-052-11 W5M	√	√
NORDEGG RESOURCES INC.	Battery	15-03-052-11 W5M	√	
NORDEGG RESOURCES INC.	Satellite	11-26-049-10 W5M	√	
NORTHWESTERN UTILITIES LIMITED	Meter Station	11-08-052-24 W4M	√	√
NOVA CHEMICALS CORPORATION	Satellite	06-22-049-12 W5M	√	
NUVISTA ENERGY LTD.	Battery	01-36-050-13 W5M	√	
NUVISTA ENERGY LTD.	Battery	05-14-064-09 W6M		√
NUVISTA ENERGY LTD.	Battery	06-06-053-10 W5M	√	√
NUVISTA ENERGY LTD.	Battery	11-15-050-15 W5M	√	√
NUVISTA ENERGY LTD.	Battery	13-34-047-02 W5M	√	√
NUVISTA ENERGY LTD.	Battery	14-26-045-13 W5M	√	
NUVISTA ENERGY LTD.	Battery	14-33-050-13 W5M	√	
NUVISTA ENERGY LTD.	Satellite	01-02-048-09 W5M	√	
NUVISTA ENERGY LTD.	Satellite	12-35-047-09 W5M	√	
OMERS ENERGY INC.	Battery	01-24-055-04 W6M	√	√
OMERS ENERGY INC.	Battery	05-17-055-03 W6M	√	√
OMERS ENERGY INC.	Battery	06-20-055-18 W4M		√
OMERS ENERGY INC.	Injection Plant	12-16-049-10 W5M	√	
OMERS ENERGY INC.	Satellite	03-21-049-10 W5M	√	
OMERS ENERGY INC.	Satellite	16-16-049-10 W5M	√	
ONE EARTH OIL & GAS INC.	Satellite	15-33-054-25 W4M	√	√
PADDLE PETROLEUM LTD.	Satellite	16-15-048-07 W5M	√	√
PANTERRA RESOURCE CORP.	Battery	07-36-052-06 W5M	√	√
PARAMOUNT RESOURCES LTD.	Battery	11-04-055-19 W5M	√	√
PATH RESOURCES LTD.	Central Treating Plants	02-13-050-12 W5M	√	
PEMBINA GAS SERVICES LTD.	Gas Processing Plant	12-36-057-23 W5M	√	
PEMBINA PIPELINE CORPORATION	Battery	05-02-053-26 W4M	√	√
PEMBINA PIPELINE CORPORATION	Pump Station	13-19-055-24 W4M	√	√
PEMBINA PIPELINE CORPORATION	Satellite	05-02-053-26 W4M	√	√
PEMBINA PIPELINE CORPORATION	Satellite	15-35-048-04 W5M	√	√
PENGROWTH ENERGY CORPORATION	Battery	01-10-050-14 W5M	√	
PENGROWTH ENERGY CORPORATION	Battery	06-15-056-15 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENGROWTH ENERGY CORPORATION	Battery	12-10-045-16 W5M	√	√
PENGROWTH ENERGY CORPORATION	Battery	14-08-050-14 W5M	√	√
PENGROWTH ENERGY CORPORATION	Battery	UNAVAILABLE	√	√
PENGROWTH ENERGY CORPORATION	Battery	UNAVAILABLE	√	√
PENGROWTH ENERGY CORPORATION	Battery	UNAVAILABLE	√	√
PENGROWTH ENERGY CORPORATION	Injection Plant	05-15-055-11 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	04-02-046-06 W5M		√
PENN WEST PETROLEUM LTD.	Battery	04-17-058-03 W5M		√
PENN WEST PETROLEUM LTD.	Battery	04-20-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	04-20-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	04-28-057-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	04-31-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	06-03-045-09 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	06-08-050-23 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	06-18-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	06-23-057-10 W5M		√
PENN WEST PETROLEUM LTD.	Battery	06-24-048-04 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	06-24-050-04 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	06-36-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Battery	06-36-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	07-17-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	07-18-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	07-25-050-10 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	07-30-049-23 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	08-06-057-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	08-07-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	08-18-050-23 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	08-22-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	08-27-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	09-31-055-25 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	09-35-057-10 W5M		√
PENN WEST PETROLEUM LTD.	Battery	10-12-052-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	10-22-058-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	10-25-057-10 W5M		√
PENN WEST PETROLEUM LTD.	Battery	10-27-058-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	10-30-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	10-33-051-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	11-06-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	11-13-057-10 W5M		√
PENN WEST PETROLEUM LTD.	Battery	12-08-050-03 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	12-10-051-08 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	12-17-046-06 W5M		√
PENN WEST PETROLEUM LTD.	Battery	12-21-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	12-31-057-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	13-18-051-26 W4M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Battery	13-22-054-25 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	14-01-049-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	14-19-057-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	14-21-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Battery	14-27-048-25 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	14-34-045-05 W5M		√
PENN WEST PETROLEUM LTD.	Battery	15-16-052-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	15-30-057-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	15-34-051-09 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	16-06-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Battery	16-21-058-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	16-22-057-21 W4M	√	
PENN WEST PETROLEUM LTD.	Battery	16-27-058-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Battery	16-32-051-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Battery	UNAVAILABLE	√	√
PENN WEST PETROLEUM LTD.	Battery	UNAVAILABLE	√	√
PENN WEST PETROLEUM LTD.	Battery	UNAVAILABLE	√	√
PENN WEST PETROLEUM LTD.	Battery	UNAVAILABLE	√	
PENN WEST PETROLEUM LTD.	Battery	UNAVAILABLE	√	
PENN WEST PETROLEUM LTD.	Injection Plant	04-24-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Injection Plant	12-31-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Injection Plant	14-06-043-06 W5M		√
PENN WEST PETROLEUM LTD.	Injection Plant	16-07-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Injection Plant	16-28-042-06 W5M		√
PENN WEST PETROLEUM LTD.	Pump Station	09-06-046-03 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	01-05-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	01-07-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	01-08-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	01-09-049-11 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	01-09-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	01-11-052-12 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	01-17-047-10 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	01-22-049-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	01-24-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	01-24-052-12 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	01-33-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-01-048-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	02-05-052-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-06-047-15 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-06-048-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	02-08-045-05 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	02-10-047-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	02-10-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-13-047-04 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	02-16-047-03 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	02-16-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-16-049-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-21-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-24-050-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	02-25-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	02-34-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	02-35-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	03-03-048-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	03-07-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	03-09-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	03-12-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	03-14-047-10 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	03-24-056-05 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	03-35-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-04-048-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-05-048-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-06-048-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-07-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-08-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-10-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	04-11-047-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	04-13-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-13-051-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-13-052-12 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-16-046-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	04-16-049-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-17-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-18-045-05 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	04-20-046-03 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	04-21-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-25-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-26-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	04-26-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	04-35-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	04-36-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	05-12-042-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	05-13-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	05-14-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	05-17-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	05-18-047-14 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	05-27-052-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	05-36-052-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-05-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-05-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-06-046-06 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	06-06-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-06-050-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-07-046-03 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-07-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-07-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-09-047-03 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-11-051-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-12-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-13-042-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-13-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-13-056-05 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-15-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-15-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-15-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-16-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-17-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-18-048-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-18-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-18-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-19-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-21-051-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-21-052-12 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-21-056-23 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-22-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-23-045-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-23-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-24-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-25-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-25-050-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-25-051-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-26-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-27-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-28-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-29-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-29-049-03 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-30-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-31-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-31-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-31-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-32-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-32-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-32-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-34-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-34-049-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	06-35-042-07 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	06-35-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-35-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-36-045-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	06-36-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	06-36-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	07-04-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	07-05-043-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	07-08-049-04 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	07-26-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	07-30-048-05 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	07-34-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-01-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-01-050-04 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-02-046-04 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-03-047-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-03-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-04-047-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-05-047-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-05-048-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-05-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-06-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-07-049-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-08-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-08-057-21 W4M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-09-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-09-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-10-047-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-10-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-10-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-11-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-11-050-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-11-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-12-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-13-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-15-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-15-052-12 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-16-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-16-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-17-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-17-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-19-047-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-19-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-19-056-04 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-23-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-23-049-09 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	08-24-050-12 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-25-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-25-050-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-26-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-27-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-28-047-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-28-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-29-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	08-29-047-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-29-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-30-047-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	08-31-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-31-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-32-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-33-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-34-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-34-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-35-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-35-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	08-36-042-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	09-02-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-14-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-15-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-18-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-19-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-22-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	09-26-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	09-33-049-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	09-34-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-34-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	09-34-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-01-046-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	10-03-053-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-06-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-09-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	10-10-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	10-11-044-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	10-11-053-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-13-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	10-15-056-21 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-16-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	10-18-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-21-057-21 W4M	√	
PENN WEST PETROLEUM LTD.	Satellite	10-26-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-27-047-09 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	10-27-051-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	10-27-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-28-049-03 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-29-049-03 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-31-047-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-32-046-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	10-33-047-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	10-33-049-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-01-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-06-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-09-047-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	11-10-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-10-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	11-13-050-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-20-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	11-24-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	11-26-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	11-26-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	11-26-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-29-049-03 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-32-049-03 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	11-34-051-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	11-35-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	12-03-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	12-06-049-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-07-047-03 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	12-11-047-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	12-12-052-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	12-13-050-12 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-15-047-10 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	12-18-050-11 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-22-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-23-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	12-26-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	12-31-046-08 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	12-32-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-33-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-35-051-27 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	12-36-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	12-36-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	13-03-050-07 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	13-03-050-12 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	13-04-043-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	13-04-049-11 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	13-13-056-05 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	13-17-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	13-17-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	13-23-052-26 W4M	√	√
PENN WEST PETROLEUM LTD.	Satellite	13-29-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	13-34-049-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	13-36-055-04 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	14-01-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-01-050-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	14-03-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-04-049-11 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-05-049-06 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	14-10-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-15-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-18-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-19-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-20-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	14-21-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-24-045-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	14-26-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-27-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-28-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-29-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-30-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-30-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-31-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-32-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-34-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-35-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-35-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-36-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	14-36-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	15-01-043-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	15-05-043-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	15-21-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	15-29-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	15-31-047-08 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	15-32-042-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	15-35-045-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	16-01-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-03-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-04-047-03 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	16-05-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-06-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-07-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-07-050-09 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PENN WEST PETROLEUM LTD.	Satellite	16-09-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	16-09-047-09 W5M	√	√
PENN WEST PETROLEUM LTD.	Satellite	16-09-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-10-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-11-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-11-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-12-049-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-12-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-13-042-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	16-14-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-15-050-08 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-23-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-23-050-12 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-25-045-07 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	16-26-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-26-049-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-27-045-06 W5M		√
PENN WEST PETROLEUM LTD.	Satellite	16-27-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-28-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-28-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-31-047-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-31-048-09 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-32-048-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-34-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	Satellite	16-36-048-10 W5M	√	
PERPETUAL ENERGY INC.	Battery	12-27-051-14 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	02-36-052-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	04-14-052-17 W4M		√
PERPETUAL ENERGY OPERATING CORP.	Battery	06-22-049-18 W4M		√
PERPETUAL ENERGY OPERATING CORP.	Battery	08-02-052-16 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	09-18-052-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	10-04-052-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	10-26-051-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	13-04-052-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	13-33-051-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	16-11-049-18 W4M		√
PERPETUAL ENERGY OPERATING CORP.	Battery	16-27-051-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	Battery	16-32-051-15 W5M	√	√
PERSTA RESOURCES INC.	Battery	12-21-047-19 W5M	√	√
PETROBAKKEN ENERGY LTD.	Battery	01-10-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	01-35-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	04-14-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	04-18-050-13 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	04-28-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	04-31-048-11 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PETROBAKKEN ENERGY LTD.	Battery	05-23-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	06-31-057-09 W5M	√	√
PETROBAKKEN ENERGY LTD.	Battery	07-36-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	08-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	08-36-057-10 W5M		√
PETROBAKKEN ENERGY LTD.	Battery	11-26-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	12-12-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	13-10-047-05 W5M		√
PETROBAKKEN ENERGY LTD.	Battery	13-32-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	14-07-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	14-13-050-13 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	14-25-045-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	14-30-045-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Battery	15-08-056-11 W5M		√
PETROBAKKEN ENERGY LTD.	Gas Gathering System	04-19-049-13 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	01-07-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	01-18-050-09 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	04-01-050-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	04-02-046-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	04-05-055-20 W4M	√	√
PETROBAKKEN ENERGY LTD.	Satellite	04-08-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	04-10-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	04-15-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	05-11-046-05 W5M		√
PETROBAKKEN ENERGY LTD.	Satellite	05-11-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	07-36-049-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	08-09-046-05 W5M		√
PETROBAKKEN ENERGY LTD.	Satellite	08-13-050-10 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	11-02-047-08 W5M		√
PETROBAKKEN ENERGY LTD.	Satellite	11-12-055-21 W4M	√	√
PETROBAKKEN ENERGY LTD.	Satellite	14-03-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	14-04-046-05 W5M		√
PETROBAKKEN ENERGY LTD.	Satellite	14-28-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	14-35-045-12 W5M	√	
PETROBAKKEN ENERGY LTD.	Satellite	16-18-047-05 W5M		√
PETROBAKKEN ENERGY LTD.	Satellite	16-22-048-11 W5M	√	
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-05-056-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-06-051-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-07-051-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-07-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-10-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-20-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-28-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-28-063-10 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-29-054-22 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-32-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	01-33-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-02-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-03-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-03-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-04-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-04-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-06-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-10-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-11-056-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-12-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-16-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-22-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	02-34-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-04-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-04-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-16-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-23-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-23-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-23-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-27-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-28-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	03-33-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-05-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-11-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-12-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-14-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-15-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-17-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-22-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-26-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-27-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-27-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-28-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-35-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	04-36-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-05-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-13-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-18-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-21-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-25-053-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-25-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-30-054-21 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-32-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-34-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	05-35-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-05-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-05-056-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-15-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-20-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-20-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-21-063-10 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-22-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-22-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-25-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	06-28-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-04-059-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-07-056-17 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-13-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-21-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-22-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-27-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-28-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	07-30-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-03-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-03-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-09-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-14-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-15-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-16-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-16-059-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-21-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-28-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-28-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-31-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-33-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	08-34-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-05-056-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-06-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-10-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-12-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-16-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-18-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-20-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-22-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-25-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-26-054-22 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-27-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-30-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-34-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	09-34-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-12-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-13-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-15-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-16-059-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-23-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-23-063-10 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-29-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-31-055-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-33-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	10-34-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-01-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-13-056-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-18-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-21-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-21-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-25-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-27-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-27-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	11-27-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-05-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-13-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-14-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-15-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-23-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-25-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-25-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	12-30-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-01-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-05-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-20-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-20-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-23-052-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-27-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-28-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-32-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	13-33-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-04-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-05-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-16-055-20 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-17-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-17-057-02 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-21-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-28-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-31-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-31-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	14-35-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-03-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-05-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-14-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-15-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-17-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-18-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-21-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-22-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-28-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-30-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-33-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	15-35-059-04 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-05-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-06-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-08-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-08-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-15-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-18-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-18-055-24 W5M	√	
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-20-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-21-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-25-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-27-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-27-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-31-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Battery	16-34-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Central Treating Plants	11-21-055-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	Gas Processing Plant	06-18-054-21 W5M	√	√
PINE CLIFF ENERGY LTD.	Battery	01-16-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	Battery	01-21-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	Battery	03-21-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	Battery	08-09-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	Battery	10-25-051-14 W5M	√	
PINE CLIFF ENERGY LTD.	Battery	12-21-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	Battery	16-23-052-14 W5M	√	√
PROBE EXPLORATION INC.	Satellite	10-26-050-26 W4M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PROBE EXPLORATION INC.	Satellite	11-02-050-26 W4M	√	√
PROBE EXPLORATION INC.	Satellite	11-18-049-25 W4M	√	√
PROBE EXPLORATION INC.	Satellite	14-30-049-25 W4M	√	√
PROGRESS ENERGY CANADA LTD.	Battery	01-02-061-09 W6M		√
PROGRESS ENERGY CANADA LTD.	Battery	10-03-060-06 W6M		√
RAVENWOOD ENERGY CORP.	Battery	06-34-045-04 W5M		√
RAVENWOOD ENERGY CORP.	Battery	10-03-046-04 W5M		√
RAVENWOOD ENERGY CORP.	Battery	14-07-048-01 W5M	√	√
REDWATER ENERGY CORP.	Battery	01-33-054-21 W4M	√	√
RESPONSE ENERGY CORPORATION	Satellite	06-32-055-25 W4M	√	√
RESPONSE ENERGY CORPORATION	Satellite	15-07-051-25 W4M	√	√
REVIVE ENERGY CORP	Battery	12-33-049-26 W4M	√	√
REVIVE ENERGY CORP	Battery	12-33-049-26 W4M	√	√
RIFE RESOURCES LTD.	Battery	02-02-049-23 W4M	√	
RIFE RESOURCES LTD.	Battery	02-13-050-24 W4M	√	√
RIFE RESOURCES LTD.	Battery	07-12-049-23 W4M	√	
RIFE RESOURCES LTD.	Battery	10-33-049-23 W4M	√	√
RMP ENERGY INC.	Battery	04-35-054-20 W5M	√	√
RMP ENERGY INC.	Battery	10-35-054-20 W5M	√	√
SABRE ENERGY LTD.	Battery	14-12-048-25 W4M	√	
SANTONIA ENERGY INC.	Battery	03-03-046-15 W5M	√	
SANTONIA ENERGY INC.	Battery	03-17-045-15 W5M	√	√
SANTONIA ENERGY INC.	Battery	06-12-046-17 W5M	√	
SANTONIA ENERGY INC.	Battery	14-08-045-13 W5M	√	
SANTONIA ENERGY INC.	Battery	15-10-045-14 W5M	√	
SANTONIA ENERGY INC.	Battery	15-20-046-16 W5M	√	
SANTONIA ENERGY INC.	Satellite	04-02-045-15 W5M	√	
SCOLLARD ENERGY INC.	Battery	02-20-051-08 W5M	√	
SCOLLARD ENERGY INC.	Battery	07-08-051-08 W5M	√	
SCOLLARD ENERGY INC.	Battery	07-25-051-09 W5M	√	
SCOLLARD ENERGY INC.	Battery	08-21-051-09 W5M	√	
SCOLLARD ENERGY INC.	Battery	08-30-050-08 W5M	√	
SCOLLARD ENERGY INC.	Battery	10-24-051-09 W5M	√	
SCOLLARD ENERGY INC.	Battery	16-03-050-14 W5M	√	
SECOND WAVE PETROLEUM INC.	Satellite	06-23-052-26 W4M	√	√
SECURE ENERGY SERVICES INC.	Central Treating Plants	08-01-055-18 W5M	√	√
SECURE ENERGY SERVICES INC.	Central Treating Plants	11-12-047-11 W5M	√	
SECURE ENERGY SERVICES INC.	Central Treating Plants	16-26-052-23 W5M	√	√
SECURE ENERGY SERVICES INC.	Injection Plant	06-09-057-22 W5M	√	√
SECURE ENERGY SERVICES INC.	Injection Plant	08-01-055-18 W5M	√	√
SHANPET RESOURCES LTD.	Satellite	06-34-049-08 W5M	√	
SHELL CANADA ENERGY	Battery	01-25-055-24 W5M	√	
SHELL CANADA ENERGY	Battery	02-32-055-24 W5M	√	
SHELL CANADA ENERGY	Battery	04-13-056-21 W5M	√	√
SHELL CANADA ENERGY	Battery	04-17-054-22 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
SHELL CANADA ENERGY	Satellite	02-32-055-24 W5M	√	
SHELL CANADA LIMITED	Battery	01-01-057-21 W5M	√	√
SHELL CANADA LIMITED	Battery	01-11-054-23 W5M	√	√
SHELL CANADA LIMITED	Battery	01-14-054-23 W5M	√	√
SHELL CANADA LIMITED	Battery	01-30-055-24 W5M	√	
SHELL CANADA LIMITED	Battery	01-34-053-22 W5M	√	√
SHELL CANADA LIMITED	Battery	02-07-055-23 W5M	√	√
SHELL CANADA LIMITED	Battery	02-12-054-22 W5M	√	√
SHELL CANADA LIMITED	Battery	02-22-055-24 W5M	√	√
SHELL CANADA LIMITED	Battery	03-07-054-21 W5M	√	√
SHELL CANADA LIMITED	Battery	03-07-054-23 W5M	√	√
SHELL CANADA LIMITED	Battery	03-22-057-25 W5M	√	
SHELL CANADA LIMITED	Battery	03-32-053-21 W5M	√	√
SHELL CANADA LIMITED	Battery	04-14-057-21 W5M	√	√
SHELL CANADA LIMITED	Battery	05-25-057-22 W5M	√	
SHELL CANADA LIMITED	Battery	06-01-054-22 W5M	√	√
SHELL CANADA LIMITED	Battery	06-08-056-24 W5M	√	
SHELL CANADA LIMITED	Battery	06-19-055-17 W5M	√	√
SHELL CANADA LIMITED	Battery	06-23-053-22 W5M	√	√
SHELL CANADA LIMITED	Battery	06-23-056-25 W5M	√	√
SHELL CANADA LIMITED	Battery	06-33-055-24 W5M	√	
SHELL CANADA LIMITED	Battery	07-25-054-24 W5M	√	√
SHELL CANADA LIMITED	Battery	08-02-054-22 W5M	√	√
SHELL CANADA LIMITED	Battery	08-07-056-24 W5M	√	√
SHELL CANADA LIMITED	Battery	08-13-054-19 W5M	√	√
SHELL CANADA LIMITED	Battery	08-32-057-21 W5M	√	
SHELL CANADA LIMITED	Battery	09-23-056-21 W5M	√	√
SHELL CANADA LIMITED	Battery	09-30-055-24 W5M	√	
SHELL CANADA LIMITED	Battery	09-30-057-21 W5M	√	
SHELL CANADA LIMITED	Battery	11-11-054-22 W5M	√	√
SHELL CANADA LIMITED	Battery	11-24-056-25 W5M	√	√
SHELL CANADA LIMITED	Battery	12-07-057-20 W5M	√	√
SHELL CANADA LIMITED	Battery	12-08-054-21 W5M	√	√
SHELL CANADA LIMITED	Battery	12-14-057-25 W5M	√	
SHELL CANADA LIMITED	Battery	13-06-051-23 W5M	√	√
SHELL CANADA LIMITED	Battery	13-14-057-21 W5M	√	√
SHELL CANADA LIMITED	Battery	13-17-056-25 W5M	√	√
SHELL CANADA LIMITED	Battery	13-22-055-23 W5M	√	
SHELL CANADA LIMITED	Battery	13-28-054-23 W5M	√	√
SHELL CANADA LIMITED	Battery	13-33-055-24 W5M	√	
SHELL CANADA LIMITED	Battery	14-02-054-22 W5M	√	√
SHELL CANADA LIMITED	Battery	14-19-056-20 W5M	√	√
SHELL CANADA LIMITED	Battery	14-22-055-24 W5M	√	
SHELL CANADA LIMITED	Battery	14-35-053-22 W5M	√	√
SHELL CANADA LIMITED	Battery	14-35-053-22 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
SHELL CANADA LIMITED	Battery	15-35-053-22 W5M	√	√
SHELL CANADA LIMITED	Battery	15-36-053-24 W5M	√	√
SHELL CANADA LIMITED	Battery	16-11-054-22 W5M	√	√
SHELL CANADA LIMITED	Battery	16-15-056-25 W5M	√	√
SHELL CANADA LIMITED	Battery	16-34-056-25 W5M	√	
SIGNALTA RESOURCES LIMITED	Battery	09-15-055-25 W4M	√	√
SIGNALTA RESOURCES LIMITED	Battery	14-29-050-10 W4M	√	
SIGNALTA RESOURCES LIMITED	Battery	UNAVAILABLE	√	√
SILVER BAY RESOURCES LTD.	Battery	05-33-047-12 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	01-02-048-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	01-16-052-21 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	01-22-057-19 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	01-26-057-19 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	01-27-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	01-36-046-12 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	02-12-048-13 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	03-28-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	03-34-053-10 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	04-11-048-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	04-16-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	04-31-056-16 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	05-29-058-18 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	06-05-054-18 W4M		√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	06-20-056-16 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	06-28-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	07-17-056-23 W4M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	07-18-058-20 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	07-29-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	07-32-057-19 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	08-14-046-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	08-19-058-19 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	08-20-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	08-24-053-20 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	08-26-054-22 W4M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	08-28-046-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	09-11-058-19 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	09-31-047-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	10-17-056-16 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	10-30-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	11-21-055-17 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	11-28-058-12 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	12-01-058-07 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	12-09-052-21 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	12-10-049-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	12-26-047-11 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
SINOPEC DAYLIGHT ENERGY LTD.	Battery	13-01-056-20 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	13-23-052-21 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	14-04-055-18 W4M		√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	14-14-056-25 W4M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	14-28-048-08 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	14-32-056-09 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	15-19-055-19 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	15-29-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	15-30-056-16 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	16-11-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Battery	16-15-058-18 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	16-29-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Battery	UNAVAILABLE	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Gas Gathering System	03-20-048-10 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Gas Gathering System	05-19-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Injection Plant	03-20-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Injection Plant	10-15-050-04 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	01-06-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	01-06-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	01-08-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	01-09-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	01-10-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	01-34-047-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	02-21-047-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	02-26-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	03-26-048-08 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	03-33-048-08 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	04-07-048-02 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	04-11-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	04-14-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	04-17-048-02 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	04-27-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	05-07-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	05-27-054-18 W4M		√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	05-35-053-10 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	06-06-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	06-08-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	06-11-047-03 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	06-36-047-02 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	07-11-048-10 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	08-03-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	08-07-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	08-10-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	08-23-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	10-03-047-04 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	10-14-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	10-15-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	11-03-050-06 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	11-04-049-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	11-13-054-26 W4M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	11-21-047-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	11-25-053-26 W4M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	12-06-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	12-30-047-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	13-23-047-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	13-27-054-18 W4M		√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	14-01-048-04 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	14-02-048-04 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	14-28-047-02 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	14-28-047-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	14-33-050-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	15-01-048-10 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	16-12-048-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	16-25-047-02 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	16-27-047-02 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	Satellite	16-33-047-02 W5M	√	√
SINO-WESTERN PETROLEUM, INC.	Battery	11-20-049-25 W4M	√	√
SOLARA EXPLORATION LTD.	Battery	02-09-045-05 W5M		√
SOLARA EXPLORATION LTD.	Battery	04-09-045-05 W5M		√
SONDE RESOURCES CORP.	Battery	07-19-055-25 W4M	√	√
SPECTRA ENERGY MIDSTREAM CORPORATION	Battery	15-09-047-14 W5M	√	
STAMPEDE OILS INC.	Battery	12-07-048-24 W4M	√	
STANFORD OIL & GAS LTD.	Battery	06-06-058-22 W5M	√	
STELLARTON RESOURCES LIMITED	Battery	04-17-054-18 W5M	√	√
SUNCOR ENERGY INC.	Battery	01-07-044-18 W5M		√
SUNCOR ENERGY INC.	Battery	02-01-042-15 W5M		√
SUNCOR ENERGY INC.	Battery	02-21-041-14 W5M		√
SUNCOR ENERGY INC.	Battery	02-28-044-19 W5M	√	√
SUNCOR ENERGY INC.	Battery	02-30-044-17 W5M		√
SUNCOR ENERGY INC.	Battery	02-33-041-14 W5M		√
SUNCOR ENERGY INC.	Battery	03-08-043-16 W5M		√
SUNCOR ENERGY INC.	Battery	03-09-042-15 W5M		√
SUNCOR ENERGY INC.	Battery	03-16-049-21 W5M	√	√
SUNCOR ENERGY INC.	Battery	04-08-045-18 W5M	√	√
SUNCOR ENERGY INC.	Battery	05-01-045-18 W5M	√	√
SUNCOR ENERGY INC.	Battery	05-35-045-19 W5M	√	√
SUNCOR ENERGY INC.	Battery	06-05-044-06 W5M		√
SUNCOR ENERGY INC.	Battery	06-13-045-19 W5M	√	√
SUNCOR ENERGY INC.	Battery	06-23-042-15 W5M		√
SUNCOR ENERGY INC.	Battery	07-17-044-17 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
SUNCOR ENERGY INC.	Battery	07-33-041-14 W5M		√
SUNCOR ENERGY INC.	Battery	08-19-042-15 W5M		√
SUNCOR ENERGY INC.	Battery	09-07-044-18 W5M		√
SUNCOR ENERGY INC.	Battery	09-14-042-16 W5M		√
SUNCOR ENERGY INC.	Battery	09-16-044-17 W5M		√
SUNCOR ENERGY INC.	Battery	09-21-041-14 W5M		√
SUNCOR ENERGY INC.	Battery	09-35-047-20 W5M	√	√
SUNCOR ENERGY INC.	Battery	10-03-041-14 W5M		√
SUNCOR ENERGY INC.	Battery	10-21-045-19 W5M	√	√
SUNCOR ENERGY INC.	Battery	11-29-043-06 W5M		√
SUNCOR ENERGY INC.	Battery	11-29-046-20 W5M	√	√
SUNCOR ENERGY INC.	Battery	12-23-043-17 W5M		√
SUNCOR ENERGY INC.	Battery	13-16-044-17 W5M		√
SUNCOR ENERGY INC.	Battery	13-17-042-17 W5M		√
SUNCOR ENERGY INC.	Battery	13-22-044-19 W5M	√	√
SUNCOR ENERGY INC.	Battery	13-23-048-21 W5M	√	√
SUNCOR ENERGY INC.	Battery	14-23-041-15 W5M		√
SUNCOR ENERGY INC.	Battery	15-15-049-22 W5M	√	√
SUNCOR ENERGY INC.	Battery	16-18-043-16 W5M		√
SUNCOR ENERGY INC.	Satellite	02-13-045-06 W5M		√
SUNCOR ENERGY INC.	Satellite	05-01-045-06 W5M		√
SUNCOR ENERGY INC.	Satellite	08-11-045-06 W5M		√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Battery	06-02-043-07 W5M		√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Battery	06-29-044-17 W5M		√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Battery	10-18-048-22 W5M	√	√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Battery	12-13-047-12 W5M	√	
SUNCOR ENERGY RESOURCES PARTNERSHIP	Battery	14-06-049-18 W5M	√	√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Battery	UNAVAILABLE	√	√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Satellite	06-22-048-08 W5M	√	√
SUNCOR ENERGY RESOURCES PARTNERSHIP	Satellite	16-12-042-07 W5M		√
SUNTEX ENERGY LTD.	Satellite	08-04-048-07 W5M	√	√
SUPERMAN RESOURCES INC.	Satellite	07-21-042-06 W5M		√
SURE ENERGY INC.	Battery	01-09-056-20 W4M		√
SURE ENERGY INC.	Battery	02-04-056-20 W4M		√
SURE ENERGY INC.	Battery	03-09-056-20 W4M		√
TALISMAN ENERGY INC.	Battery	01-05-057-24 W5M	√	
TALISMAN ENERGY INC.	Battery	01-07-056-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	01-08-057-18 W5M	√	
TALISMAN ENERGY INC.	Battery	01-13-056-24 W5M	√	
TALISMAN ENERGY INC.	Battery	01-28-057-22 W5M	√	
TALISMAN ENERGY INC.	Battery	02-02-057-24 W5M	√	
TALISMAN ENERGY INC.	Battery	02-27-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	02-32-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	03-08-044-17 W5M		√
TALISMAN ENERGY INC.	Battery	03-19-053-21 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
TALISMAN ENERGY INC.	Battery	03-23-056-24 W5M	√	
TALISMAN ENERGY INC.	Battery	03-33-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	04-02-053-22 W5M	√	√
TALISMAN ENERGY INC.	Battery	04-25-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	04-26-053-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	04-28-053-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	04-34-051-20 W5M	√	√
TALISMAN ENERGY INC.	Battery	05-07-057-19 W5M	√	
TALISMAN ENERGY INC.	Battery	05-13-056-24 W5M	√	
TALISMAN ENERGY INC.	Battery	05-28-052-15 W5M	√	√
TALISMAN ENERGY INC.	Battery	06-03-056-23 W5M	√	
TALISMAN ENERGY INC.	Battery	06-04-051-15 W5M	√	√
TALISMAN ENERGY INC.	Battery	06-15-057-20 W5M	√	√
TALISMAN ENERGY INC.	Battery	06-20-054-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	07-09-056-23 W5M	√	
TALISMAN ENERGY INC.	Battery	07-15-057-23 W5M	√	
TALISMAN ENERGY INC.	Battery	07-35-052-22 W5M	√	√
TALISMAN ENERGY INC.	Battery	09-07-056-23 W5M	√	
TALISMAN ENERGY INC.	Battery	09-09-056-23 W5M	√	
TALISMAN ENERGY INC.	Battery	09-14-054-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	09-16-056-23 W5M	√	
TALISMAN ENERGY INC.	Battery	10-05-046-19 W5M	√	√
TALISMAN ENERGY INC.	Battery	10-11-053-18 W5M	√	√
TALISMAN ENERGY INC.	Battery	10-22-056-24 W5M	√	
TALISMAN ENERGY INC.	Battery	10-25-057-24 W5M	√	
TALISMAN ENERGY INC.	Battery	10-27-057-16 W5M	√	
TALISMAN ENERGY INC.	Battery	11-10-058-24 W5M	√	
TALISMAN ENERGY INC.	Battery	11-14-054-20 W5M	√	√
TALISMAN ENERGY INC.	Battery	11-22-057-24 W5M	√	
TALISMAN ENERGY INC.	Battery	11-23-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	11-26-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	11-32-056-24 W5M	√	√
TALISMAN ENERGY INC.	Battery	11-34-052-21 W5M	√	√
TALISMAN ENERGY INC.	Battery	12-22-056-24 W5M	√	√
TALISMAN ENERGY INC.	Battery	12-27-055-23 W5M	√	
TALISMAN ENERGY INC.	Battery	13-24-053-18 W4M		√
TALISMAN ENERGY INC.	Battery	13-29-053-20 W5M	√	√
TALISMAN ENERGY INC.	Battery	13-32-052-17 W5M	√	√
TALISMAN ENERGY INC.	Battery	14-05-056-23 W5M	√	
TALISMAN ENERGY INC.	Battery	14-35-052-22 W5M	√	√
TALISMAN ENERGY INC.	Battery	15-18-058-24 W5M	√	
TALISMAN ENERGY INC.	Battery	16-03-057-24 W5M	√	
TALISMAN ENERGY INC.	Battery	16-14-065-13 W6M		√
TALISMAN ENERGY INC.	Gas Gathering System	06-16-057-19 W5M	√	
TALISMAN ENERGY INC.	Satellite	05-13-053-18 W4M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
TALISMAN ENERGY INC.	Satellite	06-04-048-02 W5M	√	√
TALISMAN ENERGY INC.	Satellite	06-05-048-02 W5M	√	√
TALISMAN ENERGY INC.	Satellite	10-35-047-02 W5M	√	√
TALISMAN ENERGY INC.	Satellite	16-35-047-02 W5M	√	√
TAMARACK ACQUISITION CORP.	Battery	09-33-055-20 W4M		√
TAMARACK VALLEY ENERGY LTD.	Battery	01-04-047-06 W5M		√
TANDEM ENERGY CORPORATION	Battery	03-22-042-06 W5M		√
TAQA NORTH LTD.	Battery	01-09-049-06 W5M	√	√
TAQA NORTH LTD.	Battery	01-20-046-09 W5M	√	√
TAQA NORTH LTD.	Battery	01-30-058-09 W5M	√	√
TAQA NORTH LTD.	Battery	02-12-048-09 W5M	√	
TAQA NORTH LTD.	Battery	03-07-048-08 W5M	√	
TAQA NORTH LTD.	Battery	03-16-047-09 W5M	√	√
TAQA NORTH LTD.	Battery	03-35-047-09 W5M	√	√
TAQA NORTH LTD.	Battery	04-01-047-10 W5M	√	√
TAQA NORTH LTD.	Battery	04-05-053-05 W5M	√	√
TAQA NORTH LTD.	Battery	04-18-062-07 W6M		√
TAQA NORTH LTD.	Battery	04-28-046-09 W5M	√	√
TAQA NORTH LTD.	Battery	04-31-047-05 W5M	√	√
TAQA NORTH LTD.	Battery	05-02-049-06 W5M	√	√
TAQA NORTH LTD.	Battery	05-12-048-09 W5M	√	
TAQA NORTH LTD.	Battery	05-31-047-08 W5M	√	√
TAQA NORTH LTD.	Battery	05-36-048-06 W5M	√	√
TAQA NORTH LTD.	Battery	06-07-055-15 W5M	√	√
TAQA NORTH LTD.	Battery	06-10-049-06 W5M	√	√
TAQA NORTH LTD.	Battery	06-15-046-09 W5M	√	√
TAQA NORTH LTD.	Battery	06-24-054-12 W5M	√	√
TAQA NORTH LTD.	Battery	06-33-047-09 W5M	√	
TAQA NORTH LTD.	Battery	07-01-048-09 W5M	√	
TAQA NORTH LTD.	Battery	07-12-049-06 W5M	√	√
TAQA NORTH LTD.	Battery	07-18-049-05 W5M	√	√
TAQA NORTH LTD.	Battery	07-19-044-06 W5M		√
TAQA NORTH LTD.	Battery	07-26-045-11 W5M	√	
TAQA NORTH LTD.	Battery	08-29-046-09 W5M	√	√
TAQA NORTH LTD.	Battery	09-04-048-09 W5M	√	
TAQA NORTH LTD.	Battery	10-12-045-11 W5M	√	
TAQA NORTH LTD.	Battery	11-05-063-07 W6M		√
TAQA NORTH LTD.	Battery	11-07-049-05 W5M	√	√
TAQA NORTH LTD.	Battery	11-28-047-09 W5M	√	
TAQA NORTH LTD.	Battery	12-07-045-09 W5M	√	
TAQA NORTH LTD.	Battery	12-16-046-09 W5M	√	√
TAQA NORTH LTD.	Battery	12-19-046-08 W5M		√
TAQA NORTH LTD.	Battery	12-32-047-08 W5M	√	√
TAQA NORTH LTD.	Battery	12-32-048-06 W5M	√	√
TAQA NORTH LTD.	Battery	13-04-047-09 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
TAQA NORTH LTD.	Battery	13-14-048-01 W5M	√	√
TAQA NORTH LTD.	Battery	13-29-046-09 W5M	√	√
TAQA NORTH LTD.	Battery	14-01-048-02 W5M	√	√
TAQA NORTH LTD.	Battery	14-02-048-09 W5M	√	
TAQA NORTH LTD.	Battery	14-15-046-10 W5M	√	√
TAQA NORTH LTD.	Battery	14-28-043-06 W5M		√
TAQA NORTH LTD.	Battery	14-31-047-08 W5M	√	√
TAQA NORTH LTD.	Battery	14-33-047-09 W5M	√	
TAQA NORTH LTD.	Battery	14-36-047-09 W5M	√	
TAQA NORTH LTD.	Battery	15-26-061-07 W6M		√
TAQA NORTH LTD.	Battery	16-09-048-09 W5M	√	
TAQA NORTH LTD.	Battery	16-13-045-11 W5M	√	
TAQA NORTH LTD.	Battery	16-17-058-09 W5M	√	√
TAQA NORTH LTD.	Battery	16-19-057-14 W5M	√	√
TAQA NORTH LTD.	Battery	16-26-048-09 W5M	√	
TAQA NORTH LTD.	Satellite	01-32-057-14 W5M	√	√
TAQA NORTH LTD.	Satellite	03-01-048-09 W5M	√	
TAQA NORTH LTD.	Satellite	03-06-048-06 W5M	√	√
TAQA NORTH LTD.	Satellite	05-13-063-08 W6M		√
TAQA NORTH LTD.	Satellite	05-16-046-09 W5M	√	√
TAQA NORTH LTD.	Satellite	05-19-047-08 W5M	√	√
TAQA NORTH LTD.	Satellite	06-23-063-08 W6M		√
TAQA NORTH LTD.	Satellite	07-12-049-06 W5M	√	√
TAQA NORTH LTD.	Satellite	07-16-055-05 W5M	√	√
TAQA NORTH LTD.	Satellite	07-22-063-08 W6M		√
TAQA NORTH LTD.	Satellite	08-12-063-08 W6M		√
TAQA NORTH LTD.	Satellite	08-13-063-08 W6M		√
TAQA NORTH LTD.	Satellite	09-15-063-08 W6M		√
TAQA NORTH LTD.	Satellite	11-05-051-25 W4M	√	√
TAQA NORTH LTD.	Satellite	11-12-063-08 W6M		√
TAQA NORTH LTD.	Satellite	12-32-048-06 W5M	√	√
TAQA NORTH LTD.	Satellite	13-02-048-07 W5M	√	√
TAQA NORTH LTD.	Satellite	14-05-062-07 W6M		√
TAQA NORTH LTD.	Satellite	14-07-062-07 W6M		√
TAQA NORTH LTD.	Satellite	14-13-048-09 W5M	√	
TAQA NORTH LTD.	Satellite	15-02-048-09 W5M	√	
TAQA NORTH LTD.	Satellite	16-21-063-08 W6M		√
TIMBERROCK ENERGY CORP.	Battery	06-22-056-17 W5M	√	√
TKE ENERGY INC	Satellite	10-20-048-05 W5M	√	√
TORC OIL & GAS LTD.	Battery	16-09-053-14 W5M	√	√
TORC OIL & GAS LTD.	Satellite	03-08-051-12 W5M	√	
TOURMALINE OIL CORP.	Battery	01-12-058-02 W6M		√
TOURMALINE OIL CORP.	Battery	01-18-056-24 W5M	√	√
TOURMALINE OIL CORP.	Battery	01-28-061-06 W6M		√
TOURMALINE OIL CORP.	Battery	03-03-056-24 W5M	√	

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
TOURMALINE OIL CORP.	Battery	03-17-055-24 W5M	√	√
TOURMALINE OIL CORP.	Battery	04-02-050-20 W5M	√	√
TOURMALINE OIL CORP.	Battery	04-11-062-06 W6M		√
TOURMALINE OIL CORP.	Battery	04-36-055-23 W5M	√	√
TOURMALINE OIL CORP.	Battery	06-17-051-18 W5M	√	√
TOURMALINE OIL CORP.	Battery	07-04-053-24 W5M	√	√
TOURMALINE OIL CORP.	Battery	07-21-049-20 W5M	√	√
TOURMALINE OIL CORP.	Battery	07-34-051-26 W5M	√	√
TOURMALINE OIL CORP.	Battery	07-36-051-26 W5M	√	√
TOURMALINE OIL CORP.	Battery	08-10-056-24 W5M	√	
TOURMALINE OIL CORP.	Battery	08-10-057-27 W5M	√	√
TOURMALINE OIL CORP.	Battery	08-13-062-06 W6M		√
TOURMALINE OIL CORP.	Battery	08-35-055-24 W5M	√	
TOURMALINE OIL CORP.	Battery	09-15-049-20 W5M	√	√
TOURMALINE OIL CORP.	Battery	09-31-050-20 W5M	√	√
TOURMALINE OIL CORP.	Battery	10-15-050-21 W5M	√	√
TOURMALINE OIL CORP.	Battery	11-04-056-24 W5M	√	
TOURMALINE OIL CORP.	Battery	11-16-055-24 W5M	√	
TOURMALINE OIL CORP.	Battery	12-02-058-27 W5M		√
TOURMALINE OIL CORP.	Battery	12-28-061-06 W6M		√
TOURMALINE OIL CORP.	Battery	12-36-055-23 W5M	√	√
TOURMALINE OIL CORP.	Battery	13-09-055-24 W5M	√	√
TOURMALINE OIL CORP.	Battery	13-13-053-01 W6M	√	√
TOURMALINE OIL CORP.	Battery	13-15-062-06 W6M		√
TOURMALINE OIL CORP.	Battery	13-16-055-22 W5M	√	√
TOURMALINE OIL CORP.	Battery	13-20-056-23 W5M	√	
TOURMALINE OIL CORP.	Battery	14-02-056-23 W5M	√	
TOURMALINE OIL CORP.	Battery	14-10-058-27 W5M		√
TOURMALINE OIL CORP.	Battery	14-22-050-21 W5M	√	√
TOURMALINE OIL CORP.	Battery	15-10-056-24 W5M	√	
TOURMALINE OIL CORP.	Battery	15-10-062-06 W6M		√
TOURMALINE OIL CORP.	Battery	15-20-053-27 W5M	√	√
TOURMALINE OIL CORP.	Battery	15-26-051-26 W5M	√	√
TOURMALINE OIL CORP.	Battery	16-02-056-24 W5M	√	
TOURMALINE OIL CORP.	Battery	16-12-056-24 W5M	√	
TOURMALINE OIL CORP.	Battery	16-15-051-26 W5M	√	√
TOURNAMENT EXPLORATION LTD.	Battery	14-34-049-08 W5M	√	
TOWN OF REDWATER	Satellite	12-17-057-21 W4M	√	
TRANSCANADA PIPELINES LIMITED	Battery	UNAVAILABLE	√	√
TRANSCANADA PIPELINES LIMITED	Gas Processing Plant	07-19-054-19 W5M	√	√
TRIAXON ENERGY INC.	Battery	03-08-050-27 W4M	√	√
TRIDENT EXPLORATION (ALBERTA) CORP.	Battery	01-19-058-06 W5M	√	√
TRIDENT EXPLORATION (ALBERTA) CORP.	Battery	14-33-060-05 W5M		√
TRIMOX ENERGY INC.	Battery	05-27-056-12 W5M		√
TRIMOX ENERGY INC.	Battery	12-14-056-12 W5M		√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
TRIMOX ENERGY INC.	Battery	14-23-056-12 W5M		√
TRIMOX ENERGY INC.	Battery	16-22-056-12 W5M		√
TWOCO PETROLEUMS LTD.	Battery	13-16-050-18 W4M		√
VELVET ENERGY LTD.	Battery	01-05-053-14 W5M	√	√
VELVET ENERGY LTD.	Battery	01-08-051-14 W5M	√	√
VELVET ENERGY LTD.	Battery	02-16-056-17 W5M	√	√
VELVET ENERGY LTD.	Battery	02-25-053-16 W5M	√	√
VELVET ENERGY LTD.	Battery	02-30-051-13 W5M	√	
VELVET ENERGY LTD.	Battery	03-09-054-15 W5M	√	√
VELVET ENERGY LTD.	Battery	04-14-056-19 W5M	√	√
VELVET ENERGY LTD.	Battery	06-17-054-15 W5M	√	√
VELVET ENERGY LTD.	Battery	10-15-056-19 W5M	√	√
VELVET ENERGY LTD.	Battery	13-05-055-17 W5M	√	√
VELVET ENERGY LTD.	Battery	13-24-054-17 W5M	√	√
VELVET ENERGY LTD.	Battery	13-34-052-14 W5M	√	√
VELVET ENERGY LTD.	Battery	16-23-054-16 W5M	√	√
VERMILION ENERGY INC.	Battery	04-28-052-11 W5M	√	√
VERMILION ENERGY INC.	Battery	05-03-045-11 W5M	√	
VERMILION ENERGY INC.	Battery	06-23-049-12 W5M	√	
VERMILION ENERGY INC.	Battery	06-28-051-11 W5M	√	
VERMILION ENERGY INC.	Battery	07-34-050-13 W5M	√	
VERMILION ENERGY INC.	Battery	10-26-049-13 W5M	√	
VERMILION ENERGY INC.	Battery	11-08-047-08 W5M		√
VERMILION ENERGY INC.	Battery	14-16-047-08 W5M	√	√
VERMILION ENERGY INC.	Satellite	01-23-051-12 W5M	√	
VERMILION ENERGY INC.	Satellite	01-26-050-12 W5M	√	
VERMILION ENERGY INC.	Satellite	02-21-050-11 W5M	√	
VERMILION ENERGY INC.	Satellite	02-29-051-11 W5M	√	
VERMILION ENERGY INC.	Satellite	03-04-050-13 W5M	√	
VERMILION ENERGY INC.	Satellite	03-08-051-11 W5M	√	
VERMILION ENERGY INC.	Satellite	03-32-050-11 W5M	√	
VERMILION ENERGY INC.	Satellite	05-01-050-12 W5M	√	
VERMILION ENERGY INC.	Satellite	05-01-051-12 W5M	√	
VERMILION ENERGY INC.	Satellite	05-14-049-13 W5M	√	
VERMILION ENERGY INC.	Satellite	08-12-051-13 W5M	√	
VERMILION ENERGY INC.	Satellite	08-14-051-11 W5M	√	
VERMILION ENERGY INC.	Satellite	09-09-050-13 W5M	√	
VERMILION ENERGY INC.	Satellite	09-29-050-11 W5M	√	
VERMILION ENERGY INC.	Satellite	12-05-051-11 W5M	√	
VERMILION ENERGY INC.	Satellite	13-20-050-11 W5M	√	
VERMILION ENERGY INC.	Satellite	13-25-050-12 W5M	√	
VERMILION ENERGY INC.	Satellite	13-25-050-13 W5M	√	
VERMILION ENERGY INC.	Satellite	14-01-051-12 W5M	√	
VERMILION RESOURCES LTD.	Battery	10-21-049-15 W5M	√	√
VERMILION RESOURCES LTD.	Battery	12-02-050-14 W5M	√	√

TABLE 8A.1-3 Cont'd

Primary Applicant	Development Type	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
VERMILION RESOURCES LTD.	Satellite	03-18-051-10 W5M	√	
VESTA ENERGY LTD.	Battery	11-34-048-27 W4M	√	√
WALDRON ENERGY CORPORATION	Battery	02-21-058-03 W5M		√
WALDRON ENERGY CORPORATION	Battery	05-28-058-03 W5M		√
WALDRON ENERGY CORPORATION	Battery	15-36-058-04 W5M		√
WHITECAP RESOURCES INC.	Battery	05-16-048-05 W5M	√	√
WHITECAP RESOURCES INC.	Battery	05-21-048-05 W5M	√	√
WHITECAP RESOURCES INC.	Battery	08-14-048-05 W5M	√	√
WHITECAP RESOURCES INC.	Battery	09-04-049-06 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	01-09-048-03 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	01-22-047-02 W5M	√	
WHITECAP RESOURCES INC.	Satellite	04-22-047-05 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	04-26-047-02 W5M	√	
WHITECAP RESOURCES INC.	Satellite	04-27-047-02 W5M	√	
WHITECAP RESOURCES INC.	Satellite	05-34-047-03 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	10-21-048-05 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	12-03-048-03 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	12-35-047-03 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	13-19-049-04 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	13-21-047-05 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	13-34-047-03 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	14-20-049-04 W5M	√	√
WHITECAP RESOURCES INC.	Satellite	16-19-049-04 W5M	√	√
WILD ROSE ENERGY LTD.	Battery	02-26-048-13 W5M	√	
WILD ROSE ENERGY LTD.	Battery	16-25-048-13 W5M	√	
WRANGLER WEST ENERGY CORP.	Battery	11-02-055-27 W4M	√	√
WRANGLER WEST ENERGY CORP.	Satellite	08-03-055-27 W4M	√	√
WRANGLER WEST ENERGY CORP.	Satellite	12-02-055-27 W4M	√	√
WRANGLER WEST ENERGY CORP.	Satellite	14-02-055-27 W4M	√	√
ZARGON OIL & GAS LTD.	Battery	15-32-047-10 W5M	√	
ZARGON OIL & GAS LTD.	Satellite	06-09-052-11 W5M	√	√
ZARGON OIL & GAS LTD.	Satellite	06-28-051-04 W5M	√	√
ZARGON OIL & GAS LTD.	Satellite	15-32-047-10 W5M	√	
TOTAL			2,093	1,768

Sources: ERCB 2013, IHS Inc. 2013

TABLE 8A.1-4

REASONABLY FORESEEABLE OIL AND GAS WELL DEVELOPMENTS WITHIN THE TRANS MOUNTAIN EXPANSION PROJECT RSA OF VARIOUS ELEMENTS

Primary Applicant	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
APACHE CANADA LTD.	01-29-057-20 W5M	√	√
APACHE CANADA LTD.	04-32-064-09 W6M		√
APACHE CANADA LTD.	05-25-048-26 W4M	√	√
APACHE CANADA LTD.	10-10-047-14 W5M	√	
ARC RESOURCES LTD.	02-35-047-07 W5M	√	√
ARC RESOURCES LTD.	03-25-049-07 W5M	√	√
ARC RESOURCES LTD.	04-20-048-06 W5M	√	√
ARC RESOURCES LTD.	08-07-047-08 W5M		√
ARC RESOURCES LTD.	08-17-047-08 W5M		√
ARC RESOURCES LTD.	08-18-047-08 W5M		√
ARC RESOURCES LTD.	11-23-056-21 W4M	√	√
ARC RESOURCES LTD.	12-04-048-08 W5M	√	√
ARC RESOURCES LTD.	12-32-048-08 W5M	√	
ARC RESOURCES LTD.	13-05-049-05 W5M	√	√
ARC RESOURCES LTD.	16-35-048-05 W5M	√	√
ARC RESOURCES LTD.	16-35-049-07 W5M	√	√
ARSENAL ENERGY INC.	01-26-045-16 W5M	√	
AVATAR ENERGY LTD.	07-06-052-20 W4M	√	√
BACCALIEU ENERGY INC.	02-17-047-11 W5M	√	
BACCALIEU ENERGY INC.	03-13-050-12 W5M	√	
BACCALIEU ENERGY INC.	04-28-049-11 W5M	√	
BACCALIEU ENERGY INC.	13-03-047-11 W5M	√	
BACCALIEU ENERGY INC.	14-36-045-07 W5M		√
BACCALIEU ENERGY INC.	15-10-047-05 W5M		√
BACCALIEU ENERGY INC.	15-36-045-07 W5M		√
BAYTEX ENERGY LTD.	02-19-057-22 W4M	√	√
BAYTEX ENERGY LTD.	02-25-057-23 W4M	√	
BAYTEX ENERGY LTD.	10-08-057-22 W4M	√	√
BAYTEX ENERGY LTD.	10-17-057-22 W4M	√	√
BAYTEX ENERGY LTD.	16-04-057-22 W4M	√	√
BELLATRIX EXPLORATION LTD.	01-23-045-09 W5M	√	
BELLATRIX EXPLORATION LTD.	01-26-049-07 W5M	√	√
BELLATRIX EXPLORATION LTD.	02-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	02-11-045-11 W5M	√	
BELLATRIX EXPLORATION LTD.	03-18-044-07 W5M		√
BELLATRIX EXPLORATION LTD.	03-26-047-07 W5M	√	√
BELLATRIX EXPLORATION LTD.	04-05-045-10 W5M	√	
BELLATRIX EXPLORATION LTD.	04-11-045-11 W5M	√	

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
BELLATRIX EXPLORATION LTD.	05-18-049-08 W5M	√	
BELLATRIX EXPLORATION LTD.	06-28-048-08 W5M	√	√
BELLATRIX EXPLORATION LTD.	10-05-049-09 W5M	√	
BELLATRIX EXPLORATION LTD.	13-22-050-11 W5M	√	
BELLATRIX EXPLORATION LTD.	13-23-047-07 W5M	√	√
BELLATRIX EXPLORATION LTD.	16-02-050-10 W5M	√	
BONAVISTA ENERGY CORPORATION	02-19-057-18 W5M	√	
BONAVISTA ENERGY CORPORATION	04-32-055-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	13-30-057-18 W5M	√	
BONAVISTA ENERGY CORPORATION	13-35-052-15 W5M	√	√
BONAVISTA ENERGY CORPORATION	14-18-056-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	16-07-056-19 W5M	√	√
BONAVISTA ENERGY CORPORATION	16-24-055-20 W5M	√	√
BONTERRA ENERGY CORP.	01-32-048-04 W5M	√	√
BONTERRA ENERGY CORP.	03-22-050-07 W5M	√	√
APACHE CANADA LTD.	01-29-057-20 W5M	√	√
BONTERRA ENERGY CORP.	04-22-050-07 W5M	√	√
BONTERRA ENERGY CORP.	04-23-047-10 W5M	√	
BONTERRA ENERGY CORP.	10-03-050-09 W5M	√	
BONTERRA ENERGY CORP.	13-13-047-07 W5M		√
BONTERRA ENERGY CORP.	15-13-047-07 W5M		√
BONTERRA ENERGY CORP.	16-12-048-06 W5M	√	√
BONTERRA ENERGY CORP.	16-12-048-06 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	04-14-051-12 W5M	√	
CANADIAN NATURAL RESOURCES LIMITED	08-05-053-21 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	10-05-053-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	10-08-052-23 W5M	√	√
CANADIAN NATURAL RESOURCES LIMITED	13-01-052-23 W5M	√	√
CANADIAN SPOONER RESOURCES INC.	04-09-049-25 W4M	√	√
CANYON OIL & GAS CORPORATION	08-05-050-05 W5M	√	√
CELTIC EXPLORATION ULC	04-14-057-27 W5M	√	√
CELTIC EXPLORATION ULC	06-19-057-26 W5M	√	√
CEQUENCE ENERGY LTD.	14-10-057-11 W5M		√
CHEVRON CANADA LIMITED	12-12-057-22 W5M	√	√
COALSPUR MINES (OPERATIONS) LTD.	04-30-051-23 W5M	√	√
COALSPUR MINES (OPERATIONS) LTD.	09-30-051-23 W5M	√	√
COALSPUR MINES (OPERATIONS) LTD.	10-20-051-23 W5M	√	√
COALSPUR MINES (OPERATIONS) LTD.	12-19-051-23 W5M	√	√
COMPTON PETROLEUM CORPORATION	04-27-053-14 W5M	√	√
COMPTON PETROLEUM CORPORATION	13-11-054-13 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	03-13-057-27 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	03-25-059-01 W6M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	05-12-059-02 W6M		√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	07-08-057-20 W5M	√	√
CONOCOPHILLIPS CANADA OPERATIONS LTD.	16-16-045-09 W5M	√	

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
CONOCOPHILLIPS CANADA OPERATIONS LTD.	16-28-049-15 W5M	√	√
CONOCOPHILLIPS CANADA RESOURCES CORP.	10-27-058-05 W5M		√
CREW ENERGY INC.	06-32-051-16 W5M	√	√
CROCOTTA ENERGY INC.	01-11-055-18 W5M	√	√
CROCOTTA ENERGY INC.	01-19-054-17 W5M	√	√
CROCOTTA ENERGY INC.	05-15-054-18 W5M	√	√
CROCOTTA ENERGY INC.	05-17-054-18 W5M	√	√
CROCOTTA ENERGY INC.	06-31-046-17 W5M	√	
CROCOTTA ENERGY INC.	13-18-054-17 W5M	√	√
DEETHREE EXPLORATION LTD.	02-23-047-15 W5M	√	
DEETHREE EXPLORATION LTD.	08-28-047-14 W5M	√	
DESMARAIS ENERGY CORPORATION	05-14-058-04 W5M		√
DEVON CANADA CORPORATION	01-23-059-27 W5M		√
DEVON NEC CORPORATION	01-25-064-10 W6M		√
DEVON NEC CORPORATION	04-16-056-04 W6M		√
DEVON NEC CORPORATION	12-22-047-17 W5M	√	
DIRECT ENERGY MARKETING LIMITED	14-18-051-14 W5M	√	√
ECHOEX LTD.	03-27-055-20 W4M		√
ECLIPSE RESOURCES LTD.	10-22-050-09 W5M	√	
ECLIPSE RESOURCES LTD.	16-28-049-05 W5M	√	√
ENCANA CORPORATION	01-14-047-03 W5M		√
ENCANA CORPORATION	01-24-061-06 W6M		√
ENCANA CORPORATION	05-19-061-05 W6M		√
ENCANA CORPORATION	05-26-059-02 W6M		√
ENCANA CORPORATION	06-21-063-08 W6M		√
ENCANA CORPORATION	08-10-059-02 W6M		√
ENCANA CORPORATION	09-03-060-02 W6M		√
ENCANA CORPORATION	10-12-044-07 W5M		√
ENCANA CORPORATION	12-01-060-02 W6M		√
ENCANA CORPORATION	12-09-062-06 W6M		√
ENCANA CORPORATION	14-31-061-06 W6M		√
ENCANA CORPORATION	16-21-056-21 W5M	√	√
ENCANA CORPORATION	5-29-53-18 W5M	√	√
ENERPLUS CORPORATION	01-18-050-19 W5M	√	√
ENERPLUS CORPORATION	13-26-045-09 W5M		√
ENQUEST ENVIRONMENTAL SERVICES CORP.	07-28-058-10 W5M		√
EOG RESOURCES CANADA INC.	05-09-051-04 W5M	√	√
EPSILON ENERGY LTD.	07-28-047-03 W5M	√	√
EXXONMOBIL CANADA LTD. & EXXONMOBIL RESOURCES COMP.	05-10-046-13 W5M	√	
FAWN MEADOWS DEVELOPMENT INC.	15-04-053-02 W5M	√	√
FORT HILLS ENERGY CORPORATION	07-14-056-22 W4M	√	√
FORT HILLS ENERGY CORPORATION	09-11-056-22 W4M	√	√
FORT HILLS ENERGY CORPORATION	14-12-056-22 W4M	√	√
GRIZZLY RESOURCES LTD.	07-05-050-06 W5M	√	√
HARVEST OPERATIONS CORP.	01-27-062-06 W6M		√

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
HARVEST OPERATIONS CORP.	10-12-055-09 W5M	√	√
HARVEST OPERATIONS CORP.	12-09-057-17 W5M	√	√
HARVEST OPERATIONS CORP.	12-26-061-06 W6M		√
HITIC ENERGY LTD.	04-04-049-03 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	01-10-056-07 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	01-13-056-07 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	01-24-051-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	02-20-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	03-02-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-07-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-17-049-17 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	03-26-048-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	04-25-056-24 W4M	√	√
HUSKY OIL OPERATIONS LIMITED	05-14-050-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	06-29-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	07-28-053-21 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	08-03-055-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	08-04-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	08-20-056-20 W4M		√
HUSKY OIL OPERATIONS LIMITED	11-13-054-08 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	11-29-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	12-03-056-07 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	12-04-051-19 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	12-10-056-07 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	13-04-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	13-08-050-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	13-15-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	16-03-049-18 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	16-14-050-20 W5M	√	√
HUSKY OIL OPERATIONS LIMITED	16-19-055-19 W4M		√
HYPERION EXPLORATION CORP.	04-06-054-12 W5M	√	√
HYPERION EXPLORATION CORP.	05-25-050-10 W5M	√	
HYPERION EXPLORATION CORP.	05-31-046-04 W5M		√
IBERDROLA CANADA ENERGY SERVICES LTD.	10-18-055-14 W5M	√	√
IMPERIAL OIL LIMITED	04-20-050-26 W4M	√	√
IMPERIAL OIL RESOURCES LIMITED	01-19-060-26 W5M		√
IMPERIAL OIL RESOURCES LIMITED	02-12-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	12-11-049-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	13-03-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	16-10-050-11 W5M	√	
IMPERIAL OIL RESOURCES LIMITED	16-21-051-26 W4M	√	√
JAYCOR RESOURCES INC.	12-18-049-25 W4M	√	√
JAYCOR RESOURCES INC.	13-18-049-25 W4M	√	√
JOURNEY ENERGY INC.	06-36-048-05 W5M	√	√
JOURNEY ENERGY INC.	13-31-048-04 W5M	√	√

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
JOURNEY ENERGY INC.	13-06-049-04 W5M	√	√
JOURNEY ENERGY INC.	15-29-057-19 W5M	√	
LONE PINE RESOURCES CANADA LTD.	10-04-064-13 W6M		√
LONG RUN EXPLORATION LTD.	01-26-057-23 W4M	√	
LONG RUN EXPLORATION LTD.	02-24-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	03-08-056-20 W4M		√
LONG RUN EXPLORATION LTD.	03-18-057-21 W4M	√	
LONG RUN EXPLORATION LTD.	05-08-056-20 W4M		√
LONG RUN EXPLORATION LTD.	08-30-055-07 W5M	√	√
LONG RUN EXPLORATION LTD.	08-32-055-20 W4M		√
LONG RUN EXPLORATION LTD.	10-23-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	10-34-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	12-08-056-20 W4M		√
LONG RUN EXPLORATION LTD.	13-13-055-21 W4M	√	√
LONG RUN EXPLORATION LTD.	14-08-056-20 W4M		√
LONG RUN EXPLORATION LTD.	14-22-056-21 W4M	√	√
LONG RUN EXPLORATION LTD.	15-23-055-21 W4M	√	√
LONGVIEW OIL CORP.	01-14-053-10 W5M	√	√
LONGVIEW OIL CORP.	02-26-053-10 W5M	√	√
LONGVIEW OIL CORP.	16-32-046-03 W5M		√
LONGVIEW OIL CORP.	16-33-046-03 W5M		√
MADALENA VENTURES	08-05-056-07 W5M	√	√
MADALENA VENTURES	15-16-058-09 W5M	√	√
MANCAL ENERGY INC.	08-28-057-22 W4M	√	
MANCAL ENERGY INC.	09-18-056-20 W4M	√	√
MANCAL ENERGY INC.	15-15-049-12 W5M	√	
MANITOK ENERGY INC.	02-29-042-15 W5M		√
MANITOK ENERGY INC.	03-29-042-15 W5M		√
MANITOK ENERGY INC.	04-34-052-26 W5M	√	√
MANITOK ENERGY INC.	06-21-042-15 W5M		√
MANITOK ENERGY INC.	14-25-042-16 W5M		√
MANITOK ENERGY INC.	15-01-042-15 W5M		√
MISTAHIYA RESOURCES LTD.	13-30-056-20 W4M	√	√
MKE CANADA LTD.	16-05-047-10 W5M	√	√
MKE CANADA LTD.	16-14-047-11 W5M	√	
MOSAIC ENERGY LTD.	05-19-057-22 W4M	√	√
MOSAIC ENERGY LTD.	06-31-052-11 W5M	√	√
NAL RESOURCES LIMITED	14-28-054-17 W5M	√	√
NEP CANADA ULC	01-17-050-26 W4M	√	√
NEP CANADA ULC	01-22-050-26 W4M	√	√
NEP CANADA ULC	05-15-050-26 W4M	√	√
NEP CANADA ULC	06-22-050-26 W4M	√	√
NEP CANADA ULC	06-36-050-26 W4M	√	√
NEP CANADA ULC	07-02-050-26 W4M	√	√
NEP CANADA ULC	07-05-051-26 W4M	√	√

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
NEP CANADA ULC	07-15-050-26 W4M	√	√
NEP CANADA ULC	09-21-051-26 W4M	√	√
NEP CANADA ULC	12-04-051-26 W4M	√	√
NEP CANADA ULC	12-09-050-26 W4M	√	√
NEP CANADA ULC	12-16-050-26 W4M	√	√
NEP CANADA ULC	13-09-050-26 W4M	√	√
NEP CANADA ULC	14-15-050-26 W4M	√	√
NEP CANADA ULC	14-25-050-26 W4M	√	√
NEP CANADA ULC	15-16-051-26 W4M	√	√
NEP CANADA ULC	16-22-050-26 W4M	√	√
NEW STAR ENERGY LTD.	08-16-051-04 W5M	√	√
NEWALTA CORPORATION	06-31-058-09 W5M	√	√
NUVISTA ENERGY LTD.	14-29-048-15 W5M	√	
OMERS ENERGY INC.	09-31-053-01 W6M	√	√
OMERS ENERGY INC.	16-17-053-01 W6M	√	√
PANTERRA RESOURCE CORP.	04-07-053-12 W5M	√	√
PANTERRA RESOURCE CORP.	16-36-052-06 W5M	√	√
PEMBINA NGL CORPORATION	02-12-056-22 W4M	√	√
PEMBINA NGL CORPORATION	13-01-056-22 W4M	√	√
PENGROWTH ENERGY CORPORATION	01-07-056-19 W5M	√	√
PENGROWTH ENERGY CORPORATION	04-29-057-18 W5M	√	
PENGROWTH ENERGY CORPORATION	11-06-056-19 W5M	√	√
PENN WEST PETROLEUM LTD.	01-28-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	02-07-045-06 W5M		√
PENN WEST PETROLEUM LTD.	04-15-047-03 W5M		√
PENN WEST PETROLEUM LTD.	04-17-045-06 W5M		√
PENN WEST PETROLEUM LTD.	04-20-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	08-21-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	12-04-050-09 W5M	√	
PENN WEST PETROLEUM LTD.	13-07-045-05 W5M		√
PENN WEST PETROLEUM LTD.	13-20-047-10 W5M	√	
PENN WEST PETROLEUM LTD.	16-12-048-06 W5M	√	√
PENN WEST PETROLEUM LTD.	16-16-047-10 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	04-20-051-18 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	13-10-052-15 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	13-11-052-16 W5M	√	√
PERPETUAL ENERGY OPERATING CORP.	16-16-051-18 W5M	√	√
PERSTA RESOURCES INC.	04-01-048-20 W5M	√	√
PERSTA RESOURCES INC.	04-23-048-20 W5M	√	√
PETROBAKKEN ENERGY LTD.	01-26-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	04-02-049-11 W5M	√	
PETROBAKKEN ENERGY LTD.	11-29-046-12 W5M	√	
PETROBAKKEN ENERGY LTD.	12-02-048-11 W5M	√	
PETROBAKKEN ENERGY LTD.	16-12-050-13 W5M	√	
PETROGLOBE INC.	12-20-053-15 W5M	√	√

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
PETRUS RESOURCES LTD.	11-12-045-18 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-05-053-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	01-29-055-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	02-17-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	02-18-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-03-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-05-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-18-056-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-27-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-29-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	04-32-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	05-04-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	05-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	07-20-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	09-27-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	09-30-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	11-23-057-03 W6M		√
PEYTO EXPLORATION & DEVELOPMENT CORP.	12-12-054-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-03-055-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-04-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-13-052-19 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-17-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-23-052-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-24-052-20 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-27-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	13-29-054-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-07-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-29-054-22 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-32-053-21 W5M	√	√
PEYTO EXPLORATION & DEVELOPMENT CORP.	16-34-053-20 W5M	√	√
PINE CLIFF ENERGY LTD.	03-21-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	08-08-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	08-09-051-14 W5M	√	√
PINE CLIFF ENERGY LTD.	15-16-051-14 W5M	√	√
PLAINS MIDSTREAM CANADA ULC	07-15-054-21 W5M	√	√
PLAINS MIDSTREAM CANADA ULC	11-12-050-21 W5M	√	√
POTTS PETROLEUM INC.	03-12-045-17 W5M	√	√
POTTS PETROLEUM INC.	16-26-046-14 W5M	√	
PREDATOR OIL LTD.	14-34-054-05 W5M	√	√
PRIMROSE DRILLING VENTURES LTD.	06-26-053-09 W5M	√	√
PRIMROSE DRILLING VENTURES LTD.	14-23-053-09 W5M	√	√
QUESTERRE ENERGY CORPORATION	04-18-062-05 W6M		√
RAVENWOOD ENERGY CORP.	02-03-049-01 W5M	√	√

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
RAVENWOOD ENERGY CORP.	15-34-048-01 W5M	√	√
SANTONIA ENERGY INC.	13-20-046-16 W5M	√	
SANTONIA ENERGY INC.	15-04-047-12 W5M	√	
SANTONIA ENERGY INC.	16-16-044-15 W5M		√
SANTONIA ENERGY INC.	16-30-043-15 W5M		√
SHELL CANADA ENERGY	03-22-054-25 W5M	√	√
SHELL CANADA LIMITED	01-25-058-23 W5M	√	
SHELL CANADA LIMITED	01-31-065-13 W6M		√
SHELL CANADA LIMITED	01-33-053-22 W5M	√	√
SHELL CANADA LIMITED	03-12-054-22 W5M	√	√
SHELL CANADA LIMITED	10-09-054-21 W5M	√	√
SHELL CANADA LIMITED	11-07-054-21 W5M	√	√
SHELL CANADA LIMITED	13-30-054-22 W5M	√	√
SHELL CANADA LIMITED	14-19-056-20 W5M	√	√
SHELL CANADA LIMITED	16-11-054-23 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	01-29-048-05 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	01-30-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	04-26-054-23 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	06-11-048-10 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	07-17-048-09 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	08-01-057-17 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	08-09-048-13 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	08-20-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	10-30-047-11 W5M	√	
SINOPEC DAYLIGHT ENERGY LTD.	12-14-047-04 W5M		√
SINOPEC DAYLIGHT ENERGY LTD.	12-31-047-03 W5M	√	√
SINOPEC DAYLIGHT ENERGY LTD.	13-31-047-03 W5M	√	√
SPYGLASS RESOURCES CORP.	01-04-049-05 W5M	√	√
SPYGLASS RESOURCES CORP.	16-35-045-08 W5M		√
STANDARD EXPLORATION LTD.	03-24-047-10 W5M	√	
SUNCOR ENERGY INC.	04-13-046-17 W5M	√	
SUNDANCE ENERGY CORPORATION	16-11-056-27 W4M	√	√
SURE ENERGY INC.	02-04-056-20 W4M		√
TALISMAN ENERGY INC.	01-05-057-24 W5M	√	√
TALISMAN ENERGY INC.	01-17-051-17 W5M	√	√
TALISMAN ENERGY INC.	01-21-051-17 W5M	√	√
TALISMAN ENERGY INC.	02-09-057-23 W5M	√	
TALISMAN ENERGY INC.	03-02-057-24 W5M	√	
TALISMAN ENERGY INC.	03-23-056-24 W5M	√	
TALISMAN ENERGY INC.	04-03-056-23 W5M	√	
TALISMAN ENERGY INC.	04-04-052-22 W5M	√	√
TALISMAN ENERGY INC.	04-24-057-24 W5M	√	
TALISMAN ENERGY INC.	04-25-055-24 W5M	√	
TALISMAN ENERGY INC.	06-04-057-24 W5M	√	
TALISMAN ENERGY INC.	06-14-056-24 W5M	√	

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic	HORU/TLRU
		RSA	RSA
TALISMAN ENERGY INC.	07-13-057-24 W5M	√	
TALISMAN ENERGY INC.	07-22-056-24 W5M	√	
TALISMAN ENERGY INC.	07-25-056-24 W5M	√	
TALISMAN ENERGY INC.	08-17-052-22 W5M	√	√
TALISMAN ENERGY INC.	08-19-057-23 W5M	√	
TALISMAN ENERGY INC.	09-32-056-24 W5M	√	√
TALISMAN ENERGY INC.	11-24-056-24 W5M	√	
TALISMAN ENERGY INC.	12-06-052-20 W5M	√	√
TALISMAN ENERGY INC.	12-22-056-24 W5M	√	√
TALISMAN ENERGY INC.	12-33-055-23 W5M	√	
TALISMAN ENERGY INC.	13-06-052-20 W5M	√	√
TALISMAN ENERGY INC.	13-08-057-23 W5M	√	
TALISMAN ENERGY INC.	13-21-052-20 W5M	√	√
TALISMAN ENERGY INC.	14-35-053-21 W5M	√	√
TALISMAN ENERGY INC.	16-07-057-23 W5M	√	
TALISMAN ENERGY INC.	16-22-051-18 W5M	√	√
TALLGRASS ENERGY CORP.	13-15-054-13 W5M	√	√
TAMARACK ACQUISITION CORP.	03-27-055-20 W4M		√
TAMARACK ACQUISITION CORP.	05-19-055-19 W4M		√
TAMARACK ACQUISITION CORP.	06-26-055-20 W4M		√
TAMARACK ACQUISITION CORP.	07-23-055-20 W4M		√
TAMARACK VALLEY ENERGY LTD.	06-22-046-06 W5M		√
TAMARACK VALLEY ENERGY LTD.	10-07-047-17 W5M	√	
TAMARACK VALLEY ENERGY LTD.	11-13-045-16 W5M	√	√
TAQA NORTH LTD.	05-22-052-10 W5M	√	√
TORC OIL & GAS LTD.	01-06-054-15 W5M	√	√
TORC OIL & GAS LTD.	03-26-054-16 W5M	√	√
TORC OIL & GAS LTD.	04-33-052-14 W5M	√	√
TORC OIL & GAS LTD.	06-04-056-17 W5M	√	√
TORC OIL & GAS LTD.	08-34-057-14 W5M	√	√
TORC OIL & GAS LTD.	14-27-049-12 W5M	√	
TOURMALINE OIL CORP.	01-11-056-24 W5M	√	
TOURMALINE OIL CORP.	01-17-059-01 W6M		√
TOURMALINE OIL CORP.	01-29-061-06 W6M		√
TOURMALINE OIL CORP.	03-15-062-06 W6M		√
TOURMALINE OIL CORP.	04-08-051-21 W5M	√	√
TOURMALINE OIL CORP.	04-11-062-06 W6M		√
TOURMALINE OIL CORP.	04-12-058-04 W6M		√
TOURMALINE OIL CORP.	07-27-049-19 W5M	√	√
TOURMALINE OIL CORP.	09-15-049-20 W5M	√	√
TOURMALINE OIL CORP.	13-05-059-01 W6M		√
TOURMALINE OIL CORP.	13-20-047-19 W5M	√	√
TOURMALINE OIL CORP.	13-31-050-21 W5M	√	√
TOURMALINE OIL CORP.	13-35-046-18 W5M	√	
TOURMALINE OIL CORP.	16-16-047-19 W5M	√	√

TABLE 8A.1-4 Cont'd

Primary Applicant	Legal Location	Socio-Economic RSA	HORU/TLRU RSA
TOURNAMENT EXPLORATION LTD.	09-12-049-08 W5M	√	√
TOURNAMENT EXPLORATION LTD.	13-09-050-10 W5M	√	
TRILOGY RESOURCES LTD	12-35-045-13 W5M	√	
TWIN BUTTE ENERGY LTD.	04-07-056-07 W5M	√	√
VELVET ENERGY LTD.	03-10-054-15 W5M	√	√
VELVET ENERGY LTD.	03-31-054-17 W5M	√	√
VELVET ENERGY LTD.	08-30-055-16 W5M	√	√
VERMILION ENERGY INC.	04-15-050-12 W5M	√	
VERMILION ENERGY INC.	05-16-051-12 W5M	√	
VERMILION ENERGY INC.	05-32-047-06 W5M	√	√
VERMILION ENERGY INC.	11-12-051-13 W5M	√	
VERMILION ENERGY INC.	12-01-051-13 W5M	√	
VERMILION ENERGY INC.	13-21-046-09 W5M	√	√
VERMILION ENERGY INC.	14-03-052-09 W5M	√	√
VERMILION ENERGY INC.	16-05-050-12 W5M	√	
VERMILION ENERGY INC.	16-18-051-11 W5M	√	
VERMILION RESOURCES LTD.	04-12-050-12 W5M	√	
WESTBRICK ENERGY LTD.	13-16-049-10 W5M	√	
WHITECAP RESOURCES INC.	03-30-050-10 W5M	√	
WHITECAP RESOURCES INC.	04-27-047-02 W5M	√	
WHITECAP RESOURCES INC.	05-26-047-02 W5M	√	
WHITECAP RESOURCES INC.	14-21-049-04 W5M	√	√
TOTAL		342	322

Sources: ERCB 2013, IHS Inc. 2013

TABLE 8A.1-5

REASONABLY FORESEEABLE DEVELOPMENTS IN ALBERTA (UNMAPPED)

Project	Location/Proponent	Description	Status and/or Schedule	Sources
PUBLIC, TOURISM, ARTS AND OUTDOOR RECREATION DEVELOPMENTS				
Calder, Capilano and Stanley Milner Libraries ($38.5 million)	Edmonton/City of Edmonton	Proposed development consists of construction of the new Calder Library and Capilano Library and the rehabilitation of the Milner Library.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Clareview Multi-Purpose Facility ($93 million)	Edmonton/City of Edmonton	Development of outdoor natural grass and artificial turf sports fields, park spaces and a multi-purpose recreation centre, as well as a high school completion centre and the Clareview Library.	Under construction/completion in 2014.	City of Edmonton Website: http://www.edmonton.ca/city_government/projects_redevelopment/clareview-district-park-development.aspx
Downtown Performing Arts Centre ($850 million)	Edmonton/Edmonton Academic and Cultural Foundation	Proposed development includes a performing arts centre including open air arts galleria, 1,600-seat theatre and three smaller spaces, underground parking garage and office tower.	Proposed/construction from 2014 to 2017.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Edmonton Area and Entertainment District Development Project ($604.5 million)	Edmonton/City of Edmonton and Edmonton Arena Corp.	The proposed project includes a new arena to house the Edmonton Oilers, Winter Garden, community rink, LRT connection and pedestrian corridor.	Proposed/construction start in early 2014, in-service by September 2016.	City of Edmonton Website: http://www.edmonton.ca/city_government/projects_redevelopment/downtown-arena.aspx
Edmonton Police Service Northwest Campus ($65 million)	Edmonton/City of Edmonton and Edmonton Police Service	Proposed Northwest Campus would include a police station, arrest processing unit and training facility.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Edmonton Valley Zoo Developments ($50 million)	Edmonton/City of Edmonton	Proposed development consists of several phases of development including a main public pathway to the new exhibit areas as they develop and an interactive play and education area.	Under construction/unknown.	City of Edmonton Website: http://www.edmonton.ca/city_government/projects_redevelopment/downtown-arena.aspx
Edson Health Care Centre ($186.4 million)	Edson/Alberta Health Services and Alberta Infrastructure	The proposed new Edson Health Care Centre will include: an emergency department; acute care; outpatient services; renal dialysis unit; surgical services; primary health care services; diagnostic imaging and laboratory services; physician clinic space; and continuing care.	Under construction/completion in 2015.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx Alberta Health Services Website: http://www.albertahealthservices.ca/2342.asp
Emerald Hills Aquatic and Wellness Centre ($25.8 million)	Sherwood Park/Strathcona County	Proposed new aquatic and wellness centre.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Federal Building Parkade and Centennial Plaza ($110 million)	Edmonton/Alberta Infrastructure	Renewal of the Federal Building and construction of a new public plaza and parkade to increase public space at the Legislature grounds and provide year round recreational opportunities for visitors.	Under construction/completion in late 2013.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx Alberta Infrastructure Website: http://www.infrastructure.alberta.ca/5.htm

TABLE 8A.1-5 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Fort Edmonton Park Expansion ($110 million)	Edmonton/Fort Edmonton Park Management Co.	Proposed expansion of Fort Edmonton Park.	Proposed/construction anticipated to take between 7 and 10 years.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Glenrose Long Term Care Facility ($51.4 million)	Edmonton/Alberta Infrastructure and Alberta Health and Wellness	Proposed development of a long-term care and transition and continuing care facility.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Hinton Training Centre Additions/Alterations ($39.1 million)	Hinton/Alberta Infrastructure and Alberta Environment and Sustainable Resource Development	Proposed additions and alterations to the Hinton Training Centre.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Meadows Recreation Centre and Library ($88.8 million)	Edmonton/City of Edmonton	New recreation centre and library.	Under construction/completion in 2014.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
NAIT Centre for Applied Technologies ($200 million)	Edmonton/NAIT	New centre for applied technologies.	Proposed/construction start in 2013/2014 with several years to complete.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx NAIT Website: http://www.nait.ca/44779_90969.htm
NorQuest College North Learning Centre (Downtown Campus) Development ($170 million)	Edmonton/NorQuest College	The learning centre is planned as a 27,500 m2, five-storey building facing Capital Boulevard, flanked by 103 Avenue and 107 Street.	Proposed/unknown.	NorQuest College Website: http://www.norquest.ca/media-centre/news/2011/norquest-s-downtown-campus-development-project-and.aspx Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Royal Alberta Museum ($340 million)	Edmonton/Government of Alberta	A new provincial museum anticipated to be an iconic institution respected around the world.	Under construction/completion in 2016.	Alberta Infrastructure: http://www.infrastructure.alberta.ca/5.htm
Stollery Children's Hospital Renovations ($33.7 million)	Edmonton/Alberta Infrastructure	Development consists of a surgical suite redevelopment and IMRI renovations.	Under construction/completion in 2015.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Strathcona Hospital Phase 1 ($130 million)	Sherwood Park/Alberta Infrastructure	Construction of Strathcona Hospital Phase 1. Phase 2 cancelled in 2013 provincial budget.	Under construction/completion in 2014.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
The Quarters Hotel ($45 million)	Edmonton/Shivam Developments	Proposed new hotel.	Proposed/completion in 2014.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Trestle Creek Golf Resort ($30 million)	East of Entwistle/Trestle Creek Golf Resort	Development consists of an RV resort, recreation centre, equine centre, sports park and 27 hole golf course.	Under construction/first 9 holes completed in 2012, second nine to be completed in 2014.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
University of Alberta Dentistry/Pharmacy Building Repurposing ($170 million)	Edmonton/University of Alberta	Proposed dentistry/pharmacy building repurposing and refurbishment.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx

TABLE 8A.1-5 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
University of Alberta Student Physical Activity and Wellness Centre ($57 million)	Edmonton/University of Alberta	Development of a new student physical activities and wellness centre.	Under construction/construction from 2012 to 2014.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
University of Alberta Student Residence Buildings A and B in East Campus ($27 million)	Edmonton/University of Alberta	Proposed development of student residence buildings in the East Campus Village.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
University of Alberta St. Joseph's College Women's Residence ($28 million)	Edmonton/University of Alberta	Proposed development of a new women's residential building.	Proposed/construction from 2013 to 2015.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Visual Performing Arts Centre ($90 million)	Edmonton/Grant MacEwan University	Proposed new visual performing arts centre at the MacEwan University Downtown Campus.	Proposed/construction from 2013 to 2015.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
TRANSPORTATION AND INFRASTRUCTURE				
Bethel Transit Terminal and Park and Ride ($23 million)	Sherwood Park/Strathcona County	The new development will be located at the current site of Strathcona Station and Park and Ride on Bethel Drive. The new transit terminal will be an integrated terminal and park and ride lot that will eventually anchor intermunicipal transit service between Strathcona County and Edmonton.	Under construction/completion in late 2013.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx Strathcona County Website: http://www.strathcona.ca/departments/Transit/Bethel-Terminal-Background.aspx
Campbell Road Transit Centre/Park and Ride ($30 million)	St. Albert/City of St. Albert	Proposed Campbell Road transit centre and park and ride.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Central Station LRT Rehabilitation and Jasper Avenue Streetscaping ($44 million)	Edmonton/City of Edmonton	Development includes repairs to the Central LRT Station and the development of a new streetscape along a section of Jasper Avenue between 100 and 102 Street.	Under construction/completion in December 2013.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx City of Edmonton Website: http://www.edmonton.ca/transportation/road_projects/central-lrt-station-jasper-avenue-streetscape.aspx
Highway 22 Bridge Construction and Highway Realignment ($51 million)	Drayton Valley/Alberta Transportation	Development entails bridge replacement over the North Saskatchewan River, highway realignment and grade revisions, access management and intersection relocation/improvements.	Under construction/completion in 2014.	Alberta Transportation Website: http://www.transportation.alberta.ca/projects/index.html
LRT Bridge Replacement of Cloverdale Pedestrian Bridge ($45 to $65 million)	Edmonton/City of Edmonton	A proposed LRT bridge to replace Cloverdale pedestrian bridge on Downtown – Millwoods Line.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx

TABLE 8A.1-5 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
North LRT to NAIT (Metro Line) ($755 million)	Edmonton/City of Edmonton	The North LRT to NAIT (Metro Line) is a 3.3 km extension from Churchill LRT Station in downtown Edmonton northwest to NAIT. It is the first segment of a planned LRT expansion to Edmonton city limits near St. Albert and is part of the Transportation Master Plan's vision to expand LRT service to all sectors of the City by 2040.	Under construction/completion in December 2013.	City of Edmonton Website: http://www.edmonton.ca/transportation/ets/lrt_projects/downtown-to-nait-lrt-study.aspx
Northeast Anthony Henday Project ($1.81 billion)	Edmonton/City of Edmonton	The Northeast Anthony Henday Project will include 18 km of reconstructed six and eight-lane divided freeway, 9 km of new six and eight-lane divided freeway, nine service interchanges, seven grade separations and twin river bridge structures. The 27 km northeast leg of the ring road will be free-flow (there will be no traffic lights on the freeway).	Under construction/construction from 2012 to 2016.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx Northeast Anthony Henday Project Website: http://www.northeastanthonyhenday.com/index.php
Northeast Transit Garage ($ 130 million)	Edmonton/City of Edmonton	Replacement of the Westwood Transit Garage with the Northeast Transit Garage.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx
Southeast to West LRT (Valley Line) Project ($3.2 billion)	Edmonton/City of Edmonton	A proposed 27 km low-floor urban line that will run from Mill Woods to Lewis Farms, crossing through downtown Edmonton. The project is currently in the preliminary design phase.	City Council approval/construction could start in 2015 and take several years.	City of Edmonton Website: http://www.edmonton.ca/transportation/ets/lrt_projects/southeast-to-west-lrt-mill-woods-to-lewis-farms.aspx
Queen Elizabeth II (QE II) Highway and 41 Avenue SW Interchange ($205 million)	Edmonton/City of Edmonton	Proposed activities include construction on a grade-separated interchange in south Edmonton, at the junction of QE II Highway and 41 Avenue SW. This partial cloverleaf interchange will convert 41 Avenue SW into a continuous corridor with full access to and from QE II Highway. Further, a new bridge will be constructed over Blackmud Creek on the realigned section of 41 Avenue SW. The project will also include a road/rail grade separation of the Canadian Pacific Railway tracks east of QE II Highway.	Approved/construction from summer 2013 to 2015.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx City of Edmonton Website: http://www.edmonton.ca/transportation/road_projects/qe-2-hwy-41-avenue-interchange.aspx
UTILITY AND PUBLIC WORKS ACTIVITIES				
Urban Pipelines Replacements Project ($600 to $700 million)	Edmonton/ATCO Gas and Pipelines Ltd.	Proposed construction of new high-pressure natural gas pipeline network in the Transportation Utility Corridors of Edmonton and Calgary over a period of five years.	Proposed/unknown.	Alberta Inventory of Major Projects: https://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx ATCO Gas and Pipelines Ltd. Website: http://www.atcopipelines.com/upr/ AUC Website: http://www.auc.ab.ca/items-of-interest/urban-pipeline-replacement/Pages/default.aspx

TABLE 8A.1-5 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
OIL AND GAS EXPLORATION AND DEVELOPMENT				
Edmonton Terminal (South) Expansion Project	Edmonton/Enbridge Pipelines Inc.	Proposed construction and operation of several new tanks and associated facilities at the existing Enbridge Edmonton Terminal at NW 32-52-23 W4M, with transfer pipe via NE 32-52-23 W4M that integrates the new tanks into the existing terminal in SE 5-53-23 W4M.	NEB approval granted on July 25, 2013 (Order XO-E101-017-2013) and pre-clearing activities commenced in fall 2013 with operations to begin in the first half of 2015.	NEB Website: https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=919196&objAction=browse&sort=-name
Edmonton Terminal Expansion Project	Edmonton/Trans Mountain Pipeline ULC.	Trans Mountain is currently in the process of constructing the Edmonton Terminal Expansion Project, which involves constructing 10 new tanks and associated facilities at the Edmonton Terminal. This project was approved by the NEB in March 2008 and is now being constructed under Amending Order AO-005-XO-T246-04-2008. In February 2013, Trans Mountain applied to the NEB to vary Amending Order AO-005-XO-T246-04-2008 to permit construction of four additional tanks at the Edmonton Terminal for a total of 14 tanks. The NEB issued an Amending Order AO-006-XO-T246-04-2008 on June 20, 2013 and the four additional tanks are expected to come into service by late 2014.	Under construction/all tanks in-service by late 2014.	NEB Website: https://www.neb-one.gc.ca/ll-eng/livelink.exe?func=ll&objId=474966&objAction=browse&sort=-name
Natural Gas to Liquid Fuel Plant ($8 billion)	Edmonton/Sasol Canada Holdings Ltd.	Proposed gas-to-liquid conversion facility. The development would create more than 500 new, permanent skilled jobs once in operation and employ over 5,000 other individuals during peak construction periods.	In planning stages/in-service by late 2015.	Alberta Inventory of Major Projects: http://www.albertacanada.com/business/statistics/inventory-of-major-projects.aspx Sasol Canada Holdings Ltd. Website: http://www.sasolcanada.com/our-canadian-business/canada-gtl-project/

TABLE 8A.1-6

REASONABLY FORESEEABLE DEVELOPMENTS IN BRITISH COLUMBIA (UNMAPPED)

Project	Location/Proponent	Description	Status and/or Schedule	Sources
PUBLIC, TOURISM, ARTS AND RECREATION DEVELOPMENT AND ACTIVITIES				
Acadia Road Primary and Intermediate School ($29 million)	Vancouver/School District 39	Replacement of existing University Hill Secondary school with new a 1,030 student capacity K-8 school.	Under construction/February 2012 to January 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
BC Children's and Women's Hospital Expansion ($682 million)	Vancouver/Provincial Health Services Authority	Redevelopment of the BC Children's and Women's Hospital to create a state of the art facility for pediatric care and research.	Under construction/spring 2011 to fall 2018.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Bike Lane Master Plan ($25 million)	Vancouver/City of Vancouver	Proposed investment in 55 km of new bike lanes for Vancouver's Cycling Master Plan.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Burke Mountain Secondary School ($64 million)	Coquitlam/School District 43	Proposed new school with a capacity for 1,200 students.	Proposed/November 2013 to August 2016.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Casino, Hotel and Convention Centre ($100 million)	Surrey/unknown	A proposed 200-room hotel and 800-seat convention centre with casino is planned for a 10 ha site at 8th Avenue and 168th Street.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Centennial Secondary School ($62 million)	Coquitlam	Proposed replacement of the 1,250 student school.	Proposed/February 2013 to April 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Chilliwack Senior Secondary Replacement ($58 million)	Chilliwack	Replacement of the secondary school on the existing site for 1,200 student capacity and a Neighbourhood Learning Centre.	Construction started/January2011 to fall 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Chip and Shannon Wilson School of Design - Kwantlen University College ($36 million)	Richmond/Kwantlen University College	Proposed 4,900m^2 facility for a technical apparel design program.	Proposed/fall 2013 to March 2016.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Dalai Lama Educational Centre ($60 million)	Vancouver/Unknown	Proposed development for a 2,790 m^2 educational centre.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
False Creek Elementary School ($20 million)	Vancouver/School District 93	A new Conseil Scolaire Francophone elementary school to be located in the False Creek neighbourhood.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Great Northern Way Campus Expansion ($134 million)	Burnaby	Expansion of the Great Northern Way Campus, including construction of a state-of-the-art Emily Carr visual, media and design art facility that would accommodate up to 1,800 students.	Construction started/June 2011 to July 2016.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Guildford Recreation Centre Complex Expansion ($41 million)	Surrey/City of Surrey	A new 52.5 m long swimming pool building will be added in a planned expansion of the Guildford Recreation Centre complex.	Proposed/2013 to 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Hemlock Valley Mountain Ski Resort Expansion ($ unknown)	Agassiz	Proposed expansion to include additional lifts and ski runs as well as a new village centre, several 35 to 65 room hotels and up to 5,000 housing units.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Company Website: www.hemlockvalleyresort.com

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Heritage Mountain Middle School ($28 million)	Coquitlam	New 500 student capacity junior middle school.	Under construction/August 2012 to April 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
International Village Elementary School ($23 million)	Vancouver/School District 39	Proposed new elementary school located in the International Village neighbourhood.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
John Oliver Secondary ($45 million)	Vancouver School District 39	Renovation and seismic upgrade of the school.	Proposed/June 2013 to September 2016.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
John Robson Elementary School ($23 million)	New Westminster/School District 40	Replacement of elementary school with 380-student capacity on a new site.	Proposed/spring 2013 to September 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Kitsilano Secondary School Replacement ($58 million)	Vancouver/School District 39	Proposed replacement of the school at 2550 W. 10th Ave with an 18,000 m^2, 3-storey facility.	Proposed/March 2013 to August 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Lord Strathcona Community Elementary School ($30 million)	Vancouver/School District 39	Seismic upgrade to elementary school is in planning stages.	Proposed/August 2013 to December 2016	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Lions Gate Hospital Acute Mental Health Facility - Hope Centre ($62 million)	North Vancouver/Vancouver Coastal Health Authority and Lions Gate Hospital Foundation	Development of a 4 storey, 26-bed psychiatric services building.	Under construction/fall 2012 to summer 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Mission Community Health Centre ($31 million)	Mission	Proposed 2,510 m^2 health complex located near Mission General Hospital will include primary care, public health, clinics and a senior`s campus of care.	Under construction/July 2012 to late 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Moody Middle School Replacement ($23 million)	Coquitlam	Replacement of Moody Middle School with a capacity for 450 students.	Proposed/April 2013 to December 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
New Westminster Secondary School (82 million)	New Westminster/School District 40	Proposed new secondary school to replace the existing 1,800-student capacity school.	Proposed/July 2013 to September 2016.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Pacific National Exhibition (PNE) Expansion ($208 million)	Vancouver/City of Vancouver	Proposed redevelopment plan of the Hastings Park that would see Playland expanded ($36.5M) and pulled back from Hastings St. Improvements to auditoriums ($40.6M) and parking expansion ($32M).	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Pitt River Middle School Replacement ($20 million)	Coquitlam	Replacement of the 450 capacity middle school.	Under construction/February 2012 to July 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Royal Inland Hospital - Clinical Services Building, Parking and Site Infrastructure Upgrading ($80 million)	Kamloops/Interior Health Authority	Proposal to upgrade hospital site infrastructure and construct a multi-storey parkade and clinical building.	Proposed/late 2013 to unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Simon Fraser University Student Union Building and Stadium (SFU) ($65 million)	Burnaby	Proposed 9,290 m^2 student union building and 2,500 seat outdoor stadium.	Proposed/spring 2013 to September 2017.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf SFU Website: http://buildsfu.sfss.ca/
South Surrey Recreational Amenities ($51 million)	Surrey/City of Surrey	Construction of a new 50 m swimming pool, a new fitness facility and an addition for community arts.	Proposed/2012 to 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Surrey City Hall and Civic Facility ($97 million)	Surrey/City of Surrey	New city hall to be located in the Whalley area. A performing arts centre, office building, additional space for SFU and mixed use building will be included in the planned facility on 102 Avenue.	Under construction/summer 2012 to 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Surrey Memorial Hospital Emergency Department and Critical Care Tower ($512 million)	Surrey/Surrey Memorial Hospital	Construction is underway on a new emergency department and critical care tower at the Surrey Memorial Hospital as well as renovation and expansion of existing space.	Under construction/March 2011 to summer 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Thompson River University - Faculty of Law Building ($20 million)	Kamloops/Thompson Rivers University	Expansion to the Faculty of Law at Thompson Rivers University.	Under construction/fall 2012 to September 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
UBC Student Union Building ($120 million)	Vancouver/UBC	Proposed Student Union Building.	Proposed/complete by August 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Quintet Mixed Use Development ($ 1 billion)	Richmond/Canada Sunrise Development Corp.	A 5 tower development including a community centre and a campus for Trinity Western University, located on Minoru Boulevard.	Under construction/summer 2011 to 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Vancouver Art Gallery ($350 million)	Vancouver/Vancouver Art Gallery	Proposed relocation of the Vancouver Art Gallery.	Proposed/2013 to 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Vancouver Aquarium Revitalization and Expansion Project ($100 million)	Vancouver/Vancouver Aquarium	The revitalization and expansion will include 8 projects approved in August 2010.	Under construction/fall 2011 to 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Vancouver General Hospital - Joseph and Rosalie Segal Family Centre ($85 million)	Vancouver/Vancouver General Hospital	Planned replacement of the aging psychiatric facility at Vancouver General Hospital.	Proposed/2014 to 2017.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Whitecaps Stadium - Thunderbird Park ($33 million)	Vancouver/Vancouver Whitecaps FC	Proposed National Soccer Development Centre will be built at UBC Thunderbird Park.	Proposed/spring 2013 to 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Willoughby Elementary School ($20 million)	Langley	Proposed new elementary school for the Willoughby neighbourhood.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Willoughby Middle School ($20 million)	Langley	Proposed new middle school for the Willoughby neighbourhood.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Yorkson Area Middle School ($23 million)	Langley	Middle School will accommodate 750 students from grades 6 to 8 and include a Neighbourhood Learning Centre.	Proposed/early 2013 to September 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
TRANSPORTATION AND INFRASTRUCTURE DEVELOPMENT				
Abbotsford Airport Expansion ($100 million)	Abbotsford/City of Abbotsford	Expansion for the Abbotsford airport that will include a 1,300 m^2 passenger terminal, runway upgrades. A hotel and tourist-related services are also part of the plan. The $30 million runway expansion portion of the project was completed in September 2011. Approximately 81 ha will be designated for future aerospace related developments.	Under construction/2010 to 2020.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Abbotsford International Airport Backgrounder Report: http://www.abbotsford.ca/Assets/Abbotsford/News+Releases/2011-09-16+Abbotsford+Airport+Expansion+Backgrounder.pdf
Brooksbank Avenue Underpass/ Lynn Creek Rail Bridge ($46 million)	North Vancouver/Port Metro Vancouver	Modifications to Brooksbank Avenue underpass ($25M) for future port and terminal expansion have completed construction. The Lynn Creek Rail Bridge addition ($21M) is expected to complete in spring 2014.	Under construction/July 2010 to spring 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Burrard Street Bridge Improvements ($63 million)	Vancouver/City of Vancouver	Proposed renovation of the Burrard Street Bridge.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Deltaport Terminal Road and Rail Improvement Project ($280 million)	Delta/PMV, Province of BC and TSI Terminal Systems Inc.	The project has four key elements: an overpass on the existing Roberts Bank causeway that will separate road and rail traffic; reconfiguration of rail track and additional container handling equipment within the existing Deltaport Terminal; additional rail track within the existing railway corridor and a portion of the Option Lands; and road improvements on Deltaport Way.	Under construction/late 2012 to late 2014.	PMV Website: http://portmetrovancouver.com/en/projects/ongoingprojects/DTRRIP/Environment.aspx
Gateway Program – North Fraser Perimeter Road ($72 million)	Coquitlam to Pitt Meadows/BC MTI	Route to improve trucking and vehicle route along an extended United Boulevard through Coquitlam along Highway 7 to the north end of the Golden Ears Bridge.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Gateway Program – North Fraser Perimeter Road, New Westminster Section ($60 million)	New Westminster/BC MTI	Route to provide improved trucking and vehicle route along the north end of the Queensborough Bridge along Front, Columbia and Brunette in New Westminster.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Gateway Program - Port Mann Bridge/Highway 1 Improvements ($3.3 billion)	Langley To Vancouver/BC MTI	Construction is underway on a new 10-lane bridge across the Fraser River between Coquitlam and Surrey, 37 km of highway widening from Vancouver to Langley, including 30 km of new high occupancy vehicle lanes, and the replacement of nine highway interchanges.	Under construction/February 2009 to late 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Port Mann Bridge/Hwy 1 Improvements website: http://www.pmh1project.com/Pages/default.aspx

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Gateway Program - South Fraser Perimeter Road ($1,264 million)	Surrey to Delta/BC MTI and Fraser Transportation Group Partnership	A 40 km long four-lane, 80 km/hr route along the south side of the Fraser River from Deltaport Way in southwest Delta to 176th Street (Highway 15) in Surrey, with connections to Highways 1, 15, 17, 91, 99, and TransLink.	Under construction/fall 2008 to December 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Fraser Transportation Group Partnership website: http://www.sfprconstruction.ca/index.php
Highway 1 Truck Lane - 232 Street to 264 Street ($24 million)	Langley	An eastbound truck climbing lane will be added to Highway 1 between 232 Street and 264 Street and the 248th Street overpass will be replaced.	Proposed/2013 to spring 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Highway 99 Interchange - 16th Avenue ($24 million)	Surrey/BC MTI	A new interchange on Highway 99 will replace the 16th Avenue overpass.	Proposed/2013 to 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Hope to Kawkawa Lake Road Bridge Replacement ($6.6 million)	Hope/Jakes Construction Ltd.	Replacement of the Kawkawa Lake Road Bridge from a timber bridge to a two vehicular-lane concrete bridge with one dedicated pedestrian path and two 1.5 m shoulders. The project will also include an upgrade of approximately 200 m of Kawkawa Lake Road.	Under construction/complete by summer 2013.	Jakes Construction Website: http://www.jakesconstruction.ca/2013/02/15/suckers-creek-bridge-replacement-kawkawa-lake-road-improvements/ CEA Agency Website: http://www.acee-ceaa.gc.ca/052/details-eng.cfm?pid=51930 BC MTI News Release: http://www2.news.gov.bc.ca/news_releases_2005-2009/2009TRAN0016-000252.htm
Low Level Road Realignment ($100 million)	North Vancouver/TransLink	Realignment of Lower Level Road over 1.5 km to accommodate 2 new tracks and the North Shore Spirit Trail.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Mission Bridge Seismic Upgrade ($21 million)	Mission/BC MTI	Phased upgrade of the Mission Bridge.	Under construction/October 2010 to late 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Neptune/Cargill Grade Separation ($48 million)	North Vancouver/PMV	Project to improve rail movements near Lower Level Road and 3rd Street East.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Old Port Mann Bridge Demolition ($50 million)	Coquitlam and Surrey/Transportation Investment Corporation	Demolition and removal of the superstructure, substructure, piers, and footings of the old Port Mann Bridge down to the Fraser River mudline.	Demolition started/completion by late 2014.	Port Metro Vancouver Website: http://portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led_Projects/PortMannDemo.aspx
Pemberton Ave Grade Separation ($43 million)	North Vancouver/District of North Vancouver	Proposed overpass over the CN Rail line replacing the Pemberton Avenue and Philip Avenue crossings.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Port of Vancouver - South Shore Corridor Project ($75 million)	Vancouver/Vancouver Fraser Port Authority	The project includes road improvements on port lands between Heatley Avenue and McGill Street in Vancouver.	Under construction/complete by 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Powell Street Grade Separation ($48 million)	Vancouver/Port Metro Vancouver	Proposed grade separation located between the Clark Drive and Heatley Avenue entrances to the PMV terminals.	Proposed/complete by March 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Roberts Bank Rail Corridor – Grade Separation and Improvements ($307 million)	Delta, Surrey and Langley/TransLink	Grade separation and rail improvements at nine sites in the Lower Mainland.	Under construction/spring 2011 to 2018.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Shortsea Shipping Route ($26 million)	Vancouver/Transport Canada	Proposed development of specialized multimodal facilities for a Shortsea shipping route will consist of seven projects.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Skytrain - Evergreen Line Rapid Transit Project ($1.4 billion)	Vancouver to Coquitlam/BC MTI and TransLink	A new rapid transit line that will connect Coquitlam to Vancouver via Port Moody and Burnaby.	Under construction/complete by summer 2016.	Major Project Inventory http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_348.html Evergreen Line Website: http://www.evergreenline.gov.bc.ca/index.htm
Skytrain - Expo Line Upgrade Strategy ($3.1 billion)	Surrey and Vancouver Area/BC MTI and TransLink	Double the capacity of the existing Expo Line and add a proposed 6 km SkyTrain extension in Surrey to Fleetwood Area.	Under construction/2008 to 2020.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/September_2012.pdf TransLink Website: http://www.translink.ca/en/Plans-and-Projects/Rapid-Transit-Projects/Expo-Line-Upgrade-Strategy.aspx
Stewart Street Elevated Structure ($80 million)	Vancouver/Port Metro Vancouver	Proposed elevated structure to accommodate through traffic will be located east of Clark Drive near Vanterm.	Proposed/complete by March 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Trans Canada Hwy Improvements - Hoffman's Bluff ($42 million)	Kamloops/BC MTI	Proposed improvements to re-align and widen 3.1 km of the Trans Canada Highway through Hoffman's Bluff to four lanes.	Proposed/2013 to fall 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Trans Canada Hwy Improvements – Monte Creek to Pritchard ($49 million)	Kamloops/BC MTI	Widening to four lanes of Highway 1 between Monte Creek and Pritchard.	Proposed/October 2011 to fall 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Trans Canada Hwy Improvements - Pritchard to Hoffman's Bluff ($20 million)	Kamloops/BC MTI	Proposed improvements to widen 3 km of the Trans Canada Hwy from Pritchard to Hoffman's Bluff to four lanes.	Proposed/spring 2013 to fall 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Vancouver International Airport Upgrades ($1.74 billion)	Richmond/Vancouver Airport Authority	Upgrades include: 700 m of corridors, moving walkways and a high-speed baggage system for the international terminal ($408M); and upgrades to the domestic terminal ($488.7M). Airfield improvements ($286.4M) will include runway safety enhancements and upgrades to roads, bridges and dykes ($559.8M).	Proposed/completed by 2022.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Vancouver International Airport Expansion ($1.76 billion)	Richmond/Vancouver Airport Authority	Expansion Plan 2010 includes several phases, many of which are completed. New proposal for continued airport development in Expansion Plan 2027 includes an additional terminal (by 2015) and runway (by 2023) and 14 additional gates and options are being reviewed for an additional runway at the estimated capital cost of $1 billion (not included in capital cost shown).	Under construction/April 2000 to 2027.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Western Lower Level Route Extension to Marine Drive ($87 million)	North Vancouver/BC MTI	Project to extend Lower Level Route from Garden Avenue to Marine Drive to include a bridge over the Capilano River.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
UTILITY, PUBLIC WORKS AND ALTERNATIVE ENERGY DEVELOPMENT				
Berkey Creek Hydroelectric Project ($ unknown)	Hope/Princeton Energy Inc.	Proposed 1.5 MW hydroelectric project on Berkey Creek, approximately 10 km southeast of Hope.	Proposed/unknown.	BC MFLNRO Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=3883
Big Bend Substation ($32 million)	South Burnaby/BC Hydro	The South Burnaby, Big Bend area requires a new greenfield, 100 MVA, 69/12 kV substation to meet local residential and commercial load growth.	Proposed/spring 2013 to spring 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC Hydro Website: http://www.bchydro.com/energy-in-bc/projects/substation/bigbend.html
Biomass Heating Project ($27 million)	Vancouver/UBC	Proposed biomass project located at the University of British Columbia.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Burnaby - New Westminster Area Reinforcement ($31 million)	New Westminster/BC Hydro	A new 60 kV underground transmission circuit and upgrading the New Westminster Substation.	Under construction/spring 2012 to fall 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Cache Creek Landfill Extension ($100 million)	Cache Creek/Belkorp Environmental Services	Proposed extension of the existing Cache Creek landfill to provide an additional 15 million tonnes of capacity.	Proposed/spring 2013 to 2017.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Capilano Substation Upgrade ($45 million)	North Vancouver/BC Hydro	Project will add a new building, 25 kV and 60 kV indoor switchgear and two 75 MVA 60/25 kV transformers to raise the capacity to 100 MVA at Capilano Substation.	Proposed/complete by fall 2016.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Capilano (Cleveland) Dam Powerplant ($90 million)	North Vancouver/Greater Vancouver Regional District	Proposed 14 MW plant built in the Capilano watershed would include turbines and generators to produce power for approximately 6,000 homes.	Proposed/complete by 2020.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Clemina Creek Hydroelectric Project ($27 million)	Valemount/TransAlta Corp.	11 MW hydroelectric run-of-river project located on the Clemina Creek south of Valemount.	Under Review (not confirmed)/start date unknown, in-service by July 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC Hydro Generator Interconnection Queue shows as under review. Website: http://transmission.bchydro.com/NR/rdonlyres/20779185-8EEC-4622-9B6A-0AF4DD50E642/0/TGIQueue2013Apr22.pdf BC Ministry of JTST Regional Economic Investment Pilot website indicates still undeveloped. http://www.jtst.gov.bc.ca/economic_pilots/barriere_mcbride_info.htm#projects
Coquitlam Area Reinforcement ($21 million)	Coquitlam/BC Hydro	Add a 150 MVA 230 25 kV transformer and a 100 MVA feeder section at Como Lake substation which serves the community of Coquitlam.	Under construction/spring 2012 to spring 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Esme Creek Hydroelectric Project ($ unknown)	Hope/Innergex Renewable Energy Inc.	Proposed 9.3 MW hydroelectric project on Esme Creek, approximately 45 km northwest of Hope.	Proposed/unknown.	BC MFLNRO Investigative Use Application and Reasons for Decision: http://www.arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=9080
Eureka Creek Hydroelectric Project ($ unknown)	Hope/Princeton Energy Inc.	Proposed 1.35 MW hydroelectric project on Eureka Creek, approximately 3 km south of Hope.	Proposed/unknown.	BC MFLNRO Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4169
Iona Island Wastewater Treatment Plant Upgrades ($1 billion)	Richmond/Greater Vancouver Regional District	Proposed upgrades to Iona Island wastewater treatment plant.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Kamloops Sewage Treatment Centre Upgrade ($43 million)	Kamloops/City of Kamloops	The upgrade will result in the improvement of effluent quality for discharge into the Thompson River. In addition, the upgrade will replace the aging infrastructure, improve energy efficiency and recover resources.	Under construction/April 2012 to February 2014.	Canada Economic Action Plan Projects Map: http://actionplan.gc.ca/en/page/projects-map City of Kamloops News Release: http://www.kamloops.ca/news/2012/04-20-SewageTreatmentCentre.shtml Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Kidd 2 Substation Upgrade Project ($34 million)	Richmond/BC Hydro	Replace aging equipment and increase the capacity of the Kidd 2 Substation to meet the growing demand for electricity in the Richmond area.	Under construction/fall 2011 to fall 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC Hydro Website: http://www.bchydro.com/energy-in-bc/projects/substation/kidd2.html

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Lions Gate Sewage Treatment Plant ($400 million)	North Vancouver/City of North Vancouver	Proposed construction of a new secondary sewage treatment plant near Burrard Inlet on the former BC Rail passenger station at McKeen Avenue and West First Street to replace the existing Lions Gate Primary Treatment plant at the north end of the Lions Gate Bridge.	Proposed/complete by 2020.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Lynn Valley Substation Upgrade - Phase 1 ($21 million)	North Vancouver/BC Hydro	The project involves adding an indoor 25 kV feeder section and a 150 MVA 230/25 kV transformer to increase station capacity.	Proposed/early 2011 to fall 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
McBride Biomass Project ($140 million)	McBride/EcoTECH Energy Group	Project to include a combined heat and electricity generating station. Phase 1 will produce a total of 7 MW of power and will be followed by phase 2 planned for 24 MW. Phase 3 is in the planning stages. Rezoning and permitting are in place and establishment of temporary housing for workers is underway.	Proposed/spring 2013 to 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf Northern Development Initiative Trust Website: http://investnorthcentralbc.ca/major-projects-investment-opportunities/map-view/mcbride-2/green-technology-industrial-park
Merritt Green Energy Project ($120 million)	Merritt/Western Bioenergy Inc.	Proposed 40 MW biomass energy project requiring provincial and BC Hydro approvals.	Proposed/complete by early 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC Hydro Interconnection Queue: http://transmission.bchydro.com/NR/rdonlyres/20779185-8EEC-4622-9B6A-0AF4DD50E642/0/TGIQueue2013Apr22.pdf
Metro Vancouver Waste-to-Energy Incineration Facility ($500 million)	Vancouver/Metro Vancouver	Approval issued; however, proposed waste-to-energy incinerator is dependent on solid waste management plan.	Proposed/unknown.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Nicola 500 kV Station Reconfiguration ($15 million)	Merritt/BC Hydro	The project scope includes a 500 kV transmission line position rearrangement within the substation, bus conductor upgrade and transformer high-side breaker installation.	Under construction/spring 2012 to fall 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Northwest Stave River Hydroelectric Project ($41 million)	Mission/Innergex Renewable Energy Inc.	Proposed 18 MW run-of-river hydroelectric project located 45 km northwest of Mission.	Under construction/fall 2011 to late 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Organic Biofuel Facility ($68 million)	Surrey/City of Surrey	Organic biofuel facility located near the Port Kells Transfer Station. 80,000 metric tonnes/year of organic waste will be converted into compressed natural gas.	Proposed/start date unknown, completion in 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Ruskin Dam Safety and Powerhouse Upgrade ($718 million)	Mission/BC Hydro	Seismic and other upgrades required to Ruskin Dam	Construction from 2012 to 2018.	BC Hydro Website: http://www.bchydro.com/energy-in-bc/projects/ruskin_dam_powerhouse_upgrade.html BCUC Decision: http://www.bcuc.com/Documents/Decisions/2012/DOC_30241_03-30-2012_C-5-12_BCH_Ruskin-Dam-Decision-WEB.pdf

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
Serpentine Creek Hydroelectric Project ($22 million)	Blue River/TransAlta Corp.	9.6 MW run-of-river hydro project on Serpentine Creek located near Blue River.	Under Review (not confirmed)/start date unknown, in-service by July 2014.	BC Hydro Generator Interconnection Queue shows as under review. Website: http://transmission.bchydro.com/NR/rdonlyres/20779185-8EEC-4622-9B6A-0AF4DD50E642/0/TGIQueue2013Apr22.pdf BC Ministry of JTST Regional Economic Investment Pilot website indicates still undeveloped. http://www.jtst.gov.bc.ca/economic_pilots/barriere_mcbride_info.htm#projects
Seymour Arm Series (Capacitor Station 5L71/5L72 Project) ($55 million)	Chase/BC Hydro	Construct a 500 kV series capacitor station adjacent to the existing transmission lines 5L71 and 5L72, which run between Mica Generating Station and the Nicola Substation near Merritt.	Under construction/fall 2011 to fall 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Seymour-Capilano Filtration Project ($600 million)	North Vancouver/Metro Vancouver	Water filtration plant. Construction of pumping station completed in late 2008 and filtration plant in spring 2010. Commissioning of twin 7.1 km long tunnels is expected in 2014.	Construction from 2003 to 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Silverdale Substation Project ($37 million)	Mission/BC Hydro	A new substation to serve the growing demand for electricity in the Mission area.	Under construction/early 2012 to fall 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC Hydro Website: http://www.bchydro.com/energy-in-bc/projects/substation/silverdale.html
Surrey Area Substation Project ($67 million)	Lower Mainland/BC Hydro	Construction of facilities necessary to reinforce the transmission system in the Fraser Valley West Area.	Proposed/Complete fall 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Surrey Waste-to-Energy Incineration Facility ($ unknown)	Surrey/City of Surrey	Proposed waste-to-energy plant to be located near Surrey town centre.	Proposed/complete by 2015.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Telus Data Centre ($100 million)	Kamloops/Telus Communications Corp.	Flagship data centre to accommodate 200 workers.	Under construction/fall 2012 to summer 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Tributary to Wardle Creek Hydroelectric Project ($ unknown)	Hope/Princeton Energy Inc.	Proposed 0.61 MW hydroelectric project on a tributary to Wardle Creek, approximately 5 km southeast of Hope.	Proposed/unknown.	BC MFLNRO Investigative Use Application and Reasons for Decision: http://arfd.gov.bc.ca/ApplicationPosting/viewpost.jsp?PostID=4159
Vancouver City Central Transmission Project ($180 million)	Vancouver/BC Hydro	Build an enclosed 230/12 kV substation in the Mount Pleasant area of Vancouver and two new underground 230 kV transmission lines connecting the new substation to the existing transmission network to serve growing loads in the Mount Pleasant/False Creek area and maintain a reliable supply of electricity to other areas of Vancouver.	Under construction/November 2010 to early 2014.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC Hydro Website: http://www.bchydro.com/energy-in-bc/projects/vcct.html

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
MARINE AND INDUSTRIAL DEVELOPMENT				
Coal Handling Infrastructure Upgrade and Expansion ($120 million)	North Vancouver/Neptune Bulk Terminals Ltd.	Upgrade and expansion of metallurgical coal handling systems at a terminal to increase throughput and improve coal handling operations. The increased vessel traffic from the project is expected to be approximately one additional train per day and one additional vessel per week.	Under construction/January 2013 to November 2014.	Permit Application: http://portmetrovancouver.com/Libraries/PROJECTS_Project_Review/2012-06-01_Application_fr_Neptune_-_Neptune_-_Coal_Handling_Infrastructure_Improvements__Project_Allison__PP_2012-066.sflb.ashx Permit Approval: http://portmetrovancouver.com/Libraries/PROJECTS_Project_Review/2013-01-23_Project_Permit_-_Signed_with_Plans_and_Schedule_-_Neptune_Coal_Capacity_PP_2012-066.sflb.ashx
Fraser Surrey Docks Direct Transfer Coal Facility (unknown)	Surrey/Fraser Surrey Docks	Proposed development of a Direct Transfer Coal Facility at the southwest end of the existing terminal to handle up to four million metric tonnes of coal per year. The coal will be transferred by rail to the terminal and will be loaded onto barges at existing Berth 2. When loaded, tugs will take single barges down to the mouth of the Fraser River. Once barges pass Sand Heads, they will be towed in tandem to Texada Island. From there the coal will be stored before transfer to a deep sea vessel for overseas export.	Under review/construction from Q1 to Q4 2014.	Port Metro Vancouver Website: http://portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led_Projects/FraserSurreyDocks.aspx
Maple Ridge Industrial Park ($250 million)	Maple Ridge/Steve Pelton	Proposal for 81 ha of land on 203rd Street in Maple Ridge would include an industrial park, 2 ha of community garden, park space, trails and community amenities.	Under construction/construction started in fall 2012.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
Richardson International Grain Storage Capacity ($105 million)	North Vancouver/Richardson International Ltd.	The proposal includes installation of approximately 494 open-ended steel wall piles and 315 timber piles, and construction of two 40,000 metric tonne concrete storage annexes.	Under construction/in-service by early 2015.	Port Metro Vancouver Website: http://www.portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led_Projects/RichardsonInternational.aspx
Roberts Bank Terminal 2 Expansion Project ($2 billion)	Delta/PMV	The Roberts Bank Terminal 2 Project is a proposed new multi-berth container terminal at Roberts Bank in Delta, B.C. that would provide 2.4 million TEUs (twenty-foot equivalent unit containers) of container capacity. The project is part of Port Metro Vancouver's Container Capacity Improvement Program, a long-term strategy to deliver projects to meet anticipated growth in demand for container capacity to 2030.	Pre-application/ construction from 2017/2018 to 2024.	Roberts Bank project Website: http://www.robertsbankterminal2.com/
Seaspan Shipyard Modernization ($62 million)	North Vancouver (Burrard Inlet)/Seaspan ULC	Proposed works under PMV's permit review process include Construction of a 53.56 m long x 31.8 m wide concrete load-out pier and installation of approximately 102 steel piles.	Under construction/in-service by early 2015.	Port Metro Vancouver Website: http://portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led_Projects/Seaspan.aspx

TABLE 8A.1-6 Cont'd

Project	Location/Proponent	Description	Status and/or Schedule	Sources
South Richmond Terminal Project ($ unknown)	Richmond/Lehigh Hanson Materials Ltd.	Proposed development of an aggregate (sand and gravel) processing and distribution facility on leased property owned by Port Metro Vancouver in southeast Richmond. Components include a wash plant, aggregate material stockpiles, reclaimer, rail and truck loading facilities and two marine berths for loading and unloading barges. Several years of site preparation will be required to achieve the necessary ground settlement across the site prior to construction of the facility, which is expected to begin in 2018.	Under review/construction from 2014 to 2022.	Port Metro Vancouver Website: http://www.portmetrovancouver.com/en/projects/OngoingProjects/Tenant-Led_Projects/LehighHansonSouthRichmondTerminalProject.aspx
Vancouver Shipyard Improvements ($200 million)	North Vancouver (Burrard Inlet)/Seaspan ULC	Improvements to the Vancouver shipyard include a fabrication shop, assembly hall, workshops, offices and equipment required to build large vessels.	Under construction/November 2012 to October 2014.	Seaspan Marine Corp. Website: http://www.seaspan.com/shipyards/modernization.php
MINERAL RESOURCES				
Highland Valley Copper Modernization ($475 million)	Logan Lake/Teck Resources Ltd.	Modernization to extend the life of the mill and increase the mill capacity.	Under construction/summer 2012 to late 2013.	Major Project Inventory: http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf
PROPOSED PIPELINE DEVELOPMENTS				
Vancouver Airport Fuel Delivery Project ($100 million)	Richmond to Vancouver/Vancouver Airport Fuel Facilities Corp.	Proposed marine terminal expansion in Richmond along the South Arm of the Fraser, a fuel receiving and storage facility near the marine terminal and a new jet fuel delivery pipeline to YVR. Application currently under review by the BC EAO.	BC EAO application approval is pending/estimated 24 month construction period following approval.	Major Project Inventory http://www.jtst.gov.bc.ca/ministry/major_projects_inventory/pdfs/December_2012.pdf BC EAO Website: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_project_home_346.html Fuel Delivery Project Website: http://www.vancouverairportfuel.ca/home

9.0 SUPPLEMENTAL STUDIES

9.1 Introduction

A comprehensive socio-economic field program was conducted in 2012 and 2013 in support of the ESA to address the following objectives:

- characterize the human use (including heritage resources, TLU, socio-economic and community health) setting of the Project;
- identify sensitive or unique features;
- support the selection and refinement of a proposed pipeline corridor;
- develop environmental mitigation measures to avoid or reduce potential effects; and
- assess the potential residual socio-economic effects (including the Project's contribution to residual cumulative effects) that might be caused by or otherwise affect the Project.

The socio-economic field program was designed to support the highest standards of socio-economic assessment in recognition of the large scale of the Project and the many environments it crosses.

Co-operation was received from many Aboriginal communities, landowners and regulatory authorities, resulting in access to most lands and facilities along the proposed pipeline corridor for the socio-economic field crews. This allowed for the collection of field data which complemented desktop studies, literature reviews, information available from 60 years of operational experience, adjacent lands, and professional judgment.

Access was not available at some land parcels at the time of field study; however, potential effects and mitigation measures were developed based on existing literature and desktop studies and knowledge of adjacent lands as well as the professional judgment of the assessment team. Additional field studies will be completed in 2014 lands where access was not available in order to confirm literature results and mitigation measures, including those found in the EPPs. Additional field studies may also be warranted if route refinement results in new lands being crossed.

All applicable permits that may be necessary will be identified prior to commencing supplemental field investigations. The EPPs (Volumes 6B, 6C and 6D), Environmental Alignment Sheets (Volume 6E) and Environmental Facility Drawings (Volumes 6C and 6D) will be updated and re-issued, if warranted, prior to construction with pertinent information on site-specific issues and mitigation measures arising from the supplemental studies. Current mitigation, management and contingency plans have been developed to address potential findings from the supplemental studies and have been based on existing literature as well as professional judgment based on continuity of adjoining land parcels for which comprehensive field studies have been completed. The proposed mitigation measures are anticipated to be sufficient to address potential adverse effects from the Project.

No supplemental studies relating to the following elements are anticipated:

- socio-economic (social and cultural well-being, HORU, infrastructure and services, navigation and navigation safety, employment and economy);
- community health;
- human health; and
- marine commercial, recreational and tourism use.

The objectives of the supplemental filings are to confirm predictions and gather site-specific information for the implementation of mitigation measures and EPPs.

The additional data for heritage resources will be collected in spring/summer 2014 to confirm predictions and proposed mitigation measures. Results of the supplemental studies, along with an update to the socio-economic assessment will be submitted to the NEB in Q3 2014.

9.2 Heritage Resources

Archaeological surveys are planned in 2014. The specific information that will be collected during the 2014 Historical Resources Impact Assessment (HRIA) and Archaeological Impact Assessment (AIA) surveys will be the same as the information collected during the 2013 HRIAs and AIAs and will serve to support and confirm predicted effects and proposed mitigation measures. The 2014 HRIA field survey will consist of an assessment to determine the effects of the Project on heritage resources in the areas where construction will be carried out, as per the *Guidelines for Archaeological Permit Holders in Alberta* (Archaeological Survey of Alberta 1989). The 2014 AIA field survey will consist of an assessment to determine the effects of construction on heritage resources in the area where construction will be carried out, as per the *Archaeological Impact Assessment Guidelines* (BC MFLNRO 2013).

This assessment is based on observation and recording of factors influencing heritage resource site potential (*e.g.*, proximity to known heritage resources, proximity to notable waterbodies and watercourses, slope, terrain features and drainage characteristics) for each survey location, as well as any observed evidence of heritage resources (cultural features [including historic structures], Precontact and Historic Period artifacts, and/or palaeontological resources).

9.2.1 Location of Survey

HRIA and AIA studies will be completed for portions of the Project with high potential for heritage resource sites. Exact locations of additional studies will be determined in Q1 2014 in consultation with Alberta Culture and BC Archaeology Branch and after field results from Q3 and Q4 2013 are processed.

9.2.2 Timing of Survey

The additional HRIA and AIA surveys are planned in early 2014 (March to May) as soon as snow-free and frost-free conditions, which improve the efficiency of HRIA and AIA surveys, occur in the Project area. Timing of HRIA and AIA surveys is dependent not only on weather, but also on regulatory permitting, acquisition of proximity agreements for deep testing as well as landowner consent. For these reasons, it is possible that the 2014 HRIA and AIA surveys will continue throughout the summer as the required conditions are met.

9.2.3 Survey Methodology

All HRIA field studies in 2014 will be consistent with those accepted by Alberta Culture for Archaeological Permit 13-018, under which the 2013 HRIA was conducted for the Project. All AIA field studies in 2014 will be consistent with those accepted by BC MFLNRO Archaeological Permit 2013-165, under which the 2013 AIA was conducted for the Project.

The standardized methods for the 2014 HRIA and AIA were designed collectively by the current and past members of TERA's archaeology team. These methods are in keeping with those outlined in the *Guidelines for Archaeological Permit Holders in Alberta* (Archaeological Survey of Alberta 1989) and *Archaeological Impact Assessment Guidelines* (BC MFNLRO 2013).

9.2.3.1 Qualifications of Personnel Designing Survey

The protocol for selection of target areas for the HRIA field studies was designed by the Archaeology Permit Holder. The Permit Holder has a Doctorate in Archaeology (Ph.D.), 10 years experience in Western Canadian archaeology, and has held Archaeological Permit Holder status in the Province of Alberta for 7 years. The archaeology Permit Holder is recognized by the regulatory authority (Alberta Culture) as qualified to design survey methods for HRIA.

The protocol for selection of target areas for the AIA field studies was designed by the Archaeology Permit Holder. The Permit Holder has a Master's Degree in Archaeology (M.A.), 22 years experience in Western Canadian archaeology, and has held Archaeological Permit Holder status in the Province of BC

for 20 years. The archaeology Permit Holder is recognized by the regulatory authority (BC Archaeology Branch) as qualified to design survey methods for AIA.

9.2.3.2 Qualifications of Personnel Conducting Survey

The archaeological personnel that will be conducting the 2014 HRIA survey will include the Permit Holder that conducted the 2013 HRIA for the proposed Project. Crew members will be assigned to support the Permit Holder from TERA's Archaeology team.

The archaeological personnel that will be conducting the 2014 AIA survey will include the Permit Holder that conducted the 2013 AIA for the proposed Project. Crew members will be assigned to support the Permit Holder from TERA's Archaeology team. Where feasible, the preferred contractor of some Aboriginal communities will join TERA's field crews.

In the event the Permit Holders are not available to conduct the survey, they will be replaced with a suitable alternate with similar qualifications.

9.2.3.3 Consultation with Appropriate Regulatory Authorities

The 2014 HRIA survey will be conducted under an Archaeological Research Permit, which will be issued by the Historic Resources Management Branch of Alberta Culture. The final report for the HRIA will be submitted to Alberta Culture for review and approval prior to the onset of construction activities for those portions of the Project that still require *Historical Resources Act* (*HRA*) clearance.

Should any conditions be placed on the *HRA* clearance issued for the Project by Alberta Culture (*i.e.*, a Schedule "B" *HRA* requirements letter or any subsequent schedules issued by Alberta Culture), the mitigation requirements may warrant discussion with Alberta Culture.

The 2014 AIA survey will be conducted under a Heritage Inspection Permit, which will be issued by the Archaeology Branch of BC MFLNRO. The final report for the AIA will be submitted to the Archaeology Branch for review prior to the onset of construction activities.

9.3 Traditional Land and Resource Use

TLU studies for the Project were initiated in May 2012 and continue to be ongoing. The initiation of TLU studies, either as TERA-facilitated or community directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies. The TERA-facilitated TLU studies are conducted in a phased approach consisting of map reviews and interviews, field reconnaissance and follow-up reporting. Interpreters are made available at the request of the community.

Ongoing TLU studies will describe the current use of lands for traditional purposes by Aboriginal communities, and the spatial and temporal extent of that use (*i.e.*, frequency, duration and seasonal aspects) potentially affected by the Project, in addition to identification of issues and concerns relating to traditional land and resource use and review of proposed mitigation measures to address concerns raised. The methodology for ongoing TLU studies, as well as the qualifications of the personnel designing and conducting the studies, are described in the Traditional Land and Resource Use Technical Report of Volume 5D. Further details regarding completed TLU studies are also provided in the Traditional Land and Resource Use Technical Report of Volume 5D.

Additional field work is scheduled to occur with participating Aboriginal communities for the Project in snow-free ground conditions prior to construction. The information gathered during ongoing TLU studies will serve to confirm current predicted effects and proposed mitigation measures and will be incorporated into Project planning, including the EPPs (Volumes 6B, 6C and 6D), Environmental Alignment Sheets (Volume 6E) and Environmental Facility Drawings (Volumes 6C and 6D), as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

9.3.1 Traditional Marine Resource Use

TMRU studies for the Westridge Marine Terminal component of the Project were initiated in 2012 and continue to be ongoing. The initiation of TMRU studies, either as TERA-facilitated or community-directed using a third-party consultant, was discussed with Aboriginal communities based on an indicated interest in participating in these studies.

Ongoing TMRU studies are intended to describe the current use of land and water for traditional purposes by Aboriginal communities and the spatial and temporal extent of that use (*i.e.*, frequency, duration and seasonal aspects) potentially affected by the Project, in addition to identification of issues and concerns relating to TMRU. The methodology for ongoing TMRU studies, as well as the qualifications of the personnel designing and conducting the studies, are described in the Traditional Land and Resource Use Technical Report of Volume 5D. Further details regarding completed TMRU studies are also provided in the Traditional Land and Resource Use Technical Report of Volume 5D.

Additional studies are scheduled to occur with participating Aboriginal communities for the Project prior to construction. The information gathered during ongoing TMRU studies will serve to confirm current predicted effects and proposed mitigation measures and will be incorporated into Project planning, including the Environmental Facility Drawing of the Westridge Marine Terminal (Volume 6D), as appropriate. The results of these ongoing engagement efforts will be provided to the NEB.

9.4 Update to the Socio-Economic Assessment

An update to Volume 5B ESA – Socio-Economic will be provided to the NEB. The update will contain the following information:

- an update to the socio-economic settings (Sections 5.0 and 6.0), confirmation of effects assessment (Section 7.0) and cumulative effects assessment (Section 8.0) based on the collection of additional field information as well as the results of ongoing consultation and engagement that will confirm predictions; and

- an update to the socio-economic setting (Sections 5.0 and 6.0), effects assessment (Section 7.0) and cumulative effects assessment (Section 8.0) based on confirmation of selected route, including any proposed reroutes that are located outside of the studied proposed pipeline corridor.

Development of the HHRA for marine transportation proceeded step-wise, beginning with the screening level HHRA that was completed for the filing of the application. The second step of the process will be the completion and submission of the comprehensive HHRA to the NEB in early 2014 to expand on the findings and conclusions made at the screening level.

The screening level HHRA and the comprehensive HHRA represent either end of the scale of complexity in human health risk assessment. The screening level HHRA due, in part, to its more simplistic nature is associated with a higher level of uncertainty than its comprehensive counterpart. However, this uncertainty is accommodated through the use of assumptions based on existing literature and scientific data as well as the professional judgment and experience of the assessment team. Using this approach, any health risks identified by the screening level HHRA are unlikely to be understated, but may be considerably overstated. The increased detail and complexity of the comprehensive HHRA will serve to reduce the uncertainty associated with the screening level HHRA.

9.5 References

Archaeological Survey of Alberta. 1989. Guidelines for Archaeological Permit Holder in Alberta. Archaeological Survey of Alberta, Historical Resources Division, Albera Culture and Multiculturalism. Edmonton, AB.

British Columbia Ministry of Forests, Lands and Natural Resource Operations. 2013. Archaeological Impact Assessment Guidelines. Archaeology Branch, Victoria, BC. Website: http://www.for.gov.bc.ca/archaeology/docs/impact_assessment_guidelines/index.htm. Accessed: June 2013.

10.0 FOLLOW-UP

Under the *CEA Act, 2012* and as described in the NEB *Filing Manual*, a follow-up program is defined as a program to verify the accuracy of the environmental assessment of a designated project, and to determine the effectiveness of any mitigation measures. Based on Project knowledge and comprehensive field studies to date, the need for follow up programs under the *CEA Act, 2012* have been identified for various indicators within the Socio-economic Management Plan. Trans Mountain plans to collect additional information in 2014 to inform and refine the mitigation strategies recommended in the Environmental Protection Plans.

11.0 CONCLUSION

This socio-economic component of the Environmental and Socio-Economic Assessment (ESA) was completed in support of the proposed Trans Mountain Expansion Project (referred to as "TMEP" or "the Project"). The biophysical component of the ESA is found in the companion Volume 5A.

Application is being made by Trans Mountain Pipeline ULC (Trans Mountain), a Canadian corporation with its head office located in Calgary, Alberta, pursuant to Section 52 of the *National Energy Board Act* (*NEB Act*) for the TMEP.

The proposed expansion will, in essence, comprise the following:

- Pipeline segments that complete a twinning (or "looping") of the pipeline in Alberta and BC with about 987 km of new buried pipeline.
- New and modified facilities, including pump stations and tanks.
- Three new berths at the Westridge Marine Terminal in Burnaby, BC, each capable of handling Aframax class vessels.

The Project will require a NEB CPCN pursuant to Section 52 of the *NEB Act*. In addition, according to the *Regulations Designating Physical Activities,* the Project is a designated project under the *Canadian Environmental Assessment Act, 2012* (*CEA Act, 2012*). The ESA considers the mandatory factors listed in Section 19(1) of the *CEA Act, 2012*, the factors listed in the NEB *Filing Manual* (NEB 2013a), and pertinent issues and concerns identified through consultation and engagement with Aboriginal communities, landowners, regulatory authorities, stakeholders and the general public.

In addition, the ESA addresses the NEB's *List of Issues* (July 29, 2013) for the Project (NEB 2013b) provided below. Issues 4 and 5 of this list specifically informed the ESA.

1. *The need for the proposed project.*
2. *The economic feasibility of the proposed project.*
3. *The potential commercial impacts of the proposed project.*
4. *The potential environmental and socio-economic effects of the proposed project, including any cumulative environmental effects that are likely to result from the project, including those required to be considered by the NEB's Filing Manual.*
5. *The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed project, including the potential effects of accidents or malfunctions that may occur (addressed in Volume 8A).*
6. *The appropriateness of the general route and land requirements for the proposed project.*
7. *The suitability of the design of the proposed project.*
8. *The terms and conditions to be included in any approval the Board may issue.*
9. *Potential impacts of the project on Aboriginal interests.*
10. *Potential impacts of the project on landowners and land use.*
11. *Contingency planning for spills, accidents or malfunctions, during construction and operation of the project.*
12. *Safety and security during construction of the proposed project and operation of the project, including emergency response planning and third-party damage prevention.*

> *The Board does not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands, or the downstream use of the oil transported by the pipeline.*

The scope and methodology of the ESA is more fully described in Section 1.2 of this volume. In summary the ESA includes a description of the following:

- the environmental and socio-economic setting;
- the predicted beneficial and adverse effects of the proposed Project on the socio-economic and biophysical environment over the life of the Project;
- the methods used for effects analysis, and the rationale for selecting the methods chosen;
- the proposed inspection, monitoring and mitigation measures; and
- the predicted significance of residual Project effects and residual cumulative effects.

The ESA was prepared by a team of highly qualified environmental professionals with element-specific expertise led by TERA Environmental Consultants (TERA). Team members included representatives from:

- B.A. Blackwell & Associates Ltd. for forestry expertise;
- Steppe Consulting Inc. and L.V. Hills for palaeontological expertise;
- Vista Strategy Corp., TERA and Conference Board of Canada for socio-economic expertise;
- McTavish Resource & Management Consultants for agricultural expertise;
- Decision Economics Consulting Group for worker expenditure expertise;
- Habitat Health Impact Consulting Corp. for community health expertise;
- Intrinsik Environmental Sciences Inc. for human health risk assessment expertise; and
- TERA for heritage resources, traditional land and resource use, traditional marine resource use and viewshed modelling expertise.

Socio-economic elements potentially interacting with the Project include heritage resources, TLRU, social and cultural well-being, HORU, infrastructure and services, navigation and navigation safety, employment and economy, community health, HHRA, traditional marine resource use and marine commercial, recreational and tourism use. The description of the socio-economic setting (current state of the socio-economic environment) within the Project area was compared against the Project description to assess potential socio-economic effects that might be caused by the Project. For this assessment, one or more indicators (often referred to as Valued Socio-economic Components) were selected to describe the present and predicted future condition of an element. One or more measurement endpoints (measurable parameters) were identified for each indicator to allow quantitative or qualitative measurement of potential Project effects.

The socio-economic issues identified through engagement with Aboriginal communities and consultation with landowners, regulatory authorities, stakeholders and the general public, as well as through literature reviews, field studies and the professional experience of the assessment team are consistent with other projects of this nature. Most of the associated potential effects on socio-economic indicators arising from construction of the Project can be readily mitigated by standard socio-economic mitigation measures common to pipeline projects in similar settings.

Most of the potential socio-economic residual effects that are of high probability of occurring during construction and operation of the Project are considered to be reversible in the short to long-term.

The socio-economic assessment concludes that some potential residual socio-economic effects are positive, particularly where related to increased business, employment opportunities and economic

benefits. Two significant positive effects associated with the Project were identified, namely provincial and national benefits and increased municipal taxes in Footprint communities. The proposed pipeline and associated facilities (*e.g.*, pump stations, terminals, Westridge Marine Terminal) do not result in a significant adverse residual socio-economic effect as defined in Section 7.1. Consequently, the identified residual effects of construction and operation of the Project on socio-economic indicators will be not significant for the pipeline and facilities component of the Project.

The Project may act cumulatively with existing activities and reasonably foreseeable developments in the vicinity of the Project, including agriculture (*e.g.*, crop production and livestock grazing), forestry, recreational activities, transportation activities (*e.g.*, vehicle and rail traffic, road infrastructure and highway maintenance), utilities activities (*e.g.*, transmission lines and gas distribution lines), rural and urban residential and commercial development, and industrial, oil and gas, and mineral resources developments. Cumulative effects associated with the Project were evaluated conservatively using assumptions relevant to the element under consideration. Most of the Project's contribution to cumulative effects within the element-specific LSAs and RSAs that are likely to occur are anticipated to be reversible in the short to long-term and are generally of low to medium magnitude. There are no situations that would result in a significant adverse cumulative socio-economic effect, as defined in Section 7.1 for the pipeline and facilities component of the Project.

Project design, and industry and regulatory standards anticipate and address most of the Project's potential effects on the socio-economic environment. Routing of the proposed pipeline corridor to parallel existing linear disturbances for most of its length (89%) has reduced the potential effects associated with construction and operation of the Project. Mitigation measures have been developed to further reduce potential adverse residual socio-economic effects. Enhancement measures have been developed to promote the likelihood of potential socio-economic residual effects where a positive impact balance was identified. Implementation of the proposed mitigation measures will further reduce the adverse residual socio-economic effects associated with the construction and operation of the Project. Applicable proposed construction mitigation measures will form the basis of operation and maintenance procedures during the life of the Project.

11.1 References

11.1.1 Literature Cited

National Energy Board. 2013a. Filing Manual. Inclusive of Release 2013-03 (August 2013). Calgary, AB.

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