

**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***

**NPS 42 PIPELINE FROM HARGREAVES TO BLUE RIVER**

**December 1, 2014**

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

## TABLE OF CONTENTS

	<u>Page</u>
1.0 EXECUTIVE SUMMARY .....	6
2.0 PROJECT DESCRIPTION .....	7
2.1 Overview .....	7
2.1.1 Previously Proposed Pipeline Design .....	7
2.1.2 Proposed Revised Pipeline Design .....	8
2.1.3 Construction Implications .....	10
2.1.4 Ongoing Studies .....	10
2.2 Project Execution and Schedule .....	10
2.3 Costs .....	11
3.0 LAND AND CONSULTATION OVERVIEW .....	12
3.1 Stakeholder Engagement .....	12
3.1.1 Notice of Potential Pipeline Design Reconfiguration .....	12
3.1.2 Project Update Notification Letter .....	14
3.1.3 Follow-up to Project Update Notification Letter .....	14
3.1.4 Project Update Letter of Study Results and NEB Filing .....	16
3.2 Aboriginal Engagement .....	16
3.2.1 Identification of Aboriginal Communities, Groups, Associations, Councils and Tribes .....	16
3.2.2 Engagement Activity .....	16
3.2.3 Future Aboriginal Engagement Activity .....	17
3.3 Land Interests and Landowner Consultation .....	17
4.0 PROJECT DESIGN AND EXECUTION UPDATE .....	18
4.1 Engineering Design .....	18
4.1.1 General .....	18
4.1.2 Hydraulic Design .....	18
4.1.3 Pipeline System Design .....	18
4.1.4 Facilities Design .....	20
4.2 Construction .....	20
4.2.1 Pipeline Construction .....	20
4.2.2 Facilities Construction .....	20
4.3 Operations and Maintenance .....	21
5.0 ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT .....	22
5.1 Introduction .....	22
5.2 Environmental and Socio-economic Setting .....	25
5.3 Environmental and Socio-economic Effects Assessment .....	33
5.3.1 Hargreaves to Blue River Proposed Pipeline Segment .....	33
5.3.2 Pump Station Activities .....	33
5.4 Cumulative Effects Assessment .....	40
5.5 Conclusion .....	40
6.0 RISK ASSESSMENT AND MANAGEMENT OF PIPELINE SPILLS UPDATE .....	42
6.1 Risk Assessment .....	42
6.2 Emergency Preparedness and Response .....	42
7.0 CONCLUSIONS .....	44

8.0	REFERENCES.....	45
8.1	Literature Cited.....	45
9.0	APPENDICES .....	48

#### **LIST OF APPENDICES**

Appendix A	Simulations of Hypothetical Oil Spills, Hargreaves to Blue River, Trans Mountain Expansion Project
Appendix B	Updated Overland Spill Mapping for NPS 42 Pipeline from Hargreaves to Blue River
Appendix C	Updated Semi-Quantitative Risk Assessment for NPS 42 from Hargreaves to Blue River
Appendix D	Terrestrial Noise Technical Report for the Trans Mountain Expansion Project: McMurphy Pump Station
Appendix E	Project Update Notification Letter, October 23, 2014
Appendix F	Project Update Letter, November 28, 2014
Appendix G	Letter to Aboriginal Groups, October 16, 2014
Appendix H	Letter to Aboriginal Groups, November 28, 2014
Appendix I	Letters to Landowners
Appendix J	Updated Hydraulic Gradient NPS 42
Appendix K	Characterization of Residual Effects for Evaluation of Significance

### LIST OF FIGURES

Figure 2.1.1	Trans Mountain Expansion Project: Revised Configuration Map .....	9
Figure 5.1.1	Hargreaves to Blue River 42 Inch Pipeline Overview .....	24
Figure 5.2.1	Location of Proposed Work at McMurphy Pump Station .....	32

### LIST OF TABLES

table 3.1.1	Preliminary Consultation on Potential Project Changes .....	12
Table 3.1.2	Follow-Up Consultation on Potential Project Changes .....	15
Table 4.1.1	Preliminary Pipe Wall Thicknesses .....	18
Table 4.1.2	Proposed Locations of the RMBLVs and Check Valves for the Proposed Revised Pipeline Design Between Hargreaves and Blue River .....	19
Table 5.1.1	Revisions to Activities to be Conducted at Pump Station Facilities to Accommodate Larger Diameter Pipe from Hargreaves to Blue River .....	22
Table 5.2.1	Summary of Environmental and Socio-Economic Elements and Considerations for the McMurphy Pump Station .....	26
Table 5.3.1	Potential Effects, Mitigation Measures and Residual Effects of Project Activities at McMurphy Pump Station on Acoustic Environment .....	35
Table 5.3.2	Significance Evaluation of Potential Residual Effects of Project Activities at the McMurphy Pump Station on the Acoustic Environment .....	36
Table 5.3.3	Summary of Sound Level Magnitude for McMurphy Pump Station Construction .....	37
Table 5.3.4	Summary of Sound Level Magnitude for McMurphy Pump Station Operations .....	38

## ABBREVIATIONS AND ACRONYMS

This table lists the abbreviations and acronyms used in this volume of the application.

Term	Meaning
AER	Alberta Energy Regulator
ASL	ambient sound level
bb/d	Barrels per day
BC	British Columbia
BC CDC	British Columbia Conservation Data Centre
BC OGC	British Columbia Oil & Gas Commission
BGC	biogeoclimatic
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DUC	Ducks Unlimited Canada
EMP	Emergency Management Program
EPP	Environmental Protection Plan
ESA	Environmental and Socio-economic Assessment
GHG	greenhouse gas
%HA	percent highly annoyed
HP	Horsepower
HSDA	Health Service Delivery Area
IBA	Important Bird Area
ICH	Interior Cedar-Hemlock
IR	Information Request
LSA	local study area
m <sup>3</sup> /d	cubic metres per day
mm	millimeters
NEB	National Energy Board
NPS	Nominal Pipe Size
NRCan	Natural Resources Canada
PSL	permissible sound level
RCMP	Royal Canadian Mounted Police
RDFFG	Regional District of Fraser-Fort George
RK	reference kilometre
RMBVLs	remote mainline block valves
RSA	regional study area
SARA	<i>Species at Risk Act</i>
the Project	the proposed Trans Mountain Expansion Project
Trans Mountain	Trans Mountain Pipeline ULC
TMEP	Trans Mountain Expansion Project
TMPL	Trans Mountain Pipeline
TNRD	Thompson Nicola Regional District
VFD	variable frequency drive

## 1.0 EXECUTIVE SUMMARY

Trans Mountain Pipeline ULC (Trans Mountain) filed its Application for a Certificate of Public Convenience and Necessity for the Trans Mountain Expansion Project (TMEP or the Project) with the National Energy Board (NEB) on December 16, 2013. As stated in Sections 2.1 and 2.2 in Volume 2 of its Application, Trans Mountain specified that the pipeline component of the Project for Line 2 would be a nominal pipe size (NPS) 36 (914 mm) outside diameter pipeline as well as the expansion or construction of new pumping facilities at select locations along the pipeline corridor (Filing IDs A3S0Q8 and A3S0Q9). The initial specifications of the Project were based on preliminary engineering design and hydraulic modelling.

Since the Application was filed with the NEB, Trans Mountain has continued to optimize the pipeline design through ongoing engineering analysis, hydraulic modelling, and consultation with the Aboriginal communities, government agencies, the general public, and industry representatives. Trans Mountain is proposing several modifications to the design of the Project that would serve to reduce environmental impacts and reduce the scope of upgrades to the utility power infrastructure in the lower North Thompson River valley, which would be required to meet the incremental power demand of the Project.

Specifically, Trans Mountain proposes to increase the outside diameter of the pipeline from NPS 36 to NPS 42 (1,067 mm) for a distance of 121 km between Hargreaves, British Columbia (BC) and the Blue River Pump Station. The proposed increase in diameter in this segment eliminates the need for the proposed Rearguard Pump Station and the associated need for BC Hydro deep system upgrades to supply utility power. Associated changes to the configuration of the pipeline design are discussed in detail in Section 2.1.2. One of the most significant results of this change is the elimination of two pipeline crossings of the Fraser River near the previously proposed Rearguard Pump Station. As well, the proposed reconfiguration will result in a slight reduction in overall risk when compared to the same segment using an NPS 36 diameter pipeline.

Trans Mountain reviewed this proposed revised pipeline design in the context of the requirements of the NEB's Filing Manual and the *Canadian Environmental Assessment Act, 2012*, and has addressed these requirements in this supplemental filing, which forms part of Project and Technical Update No. 4 to the NEB.

## **2.0 PROJECT DESCRIPTION**

### **2.1 Overview**

Trans Mountain filed its Application for a Certificate of Public Convenience and Necessity for the Project NEB on December 16, 2013. As stated in Sections 2.1 and 2.2 in Volume 2 of its Facility Application, Trans Mountain specified that the pipeline component of the Project for Line 2 would be a NPS 36 (914 mm) outside diameter pipeline as well as the expansion or construction of new pumping facilities at select locations along the pipeline corridor (Filing IDs A3S0Q8 and A3S0Q9). The initial specifications of the Project were based on preliminary engineering design and hydraulic modelling.

Trans Mountain has continued to optimize the pipeline design since the Application was filed through ongoing engineering analysis, hydraulic modelling, and consultation with the Aboriginal communities, government agencies, the general public, and industry representatives. Trans Mountain is proposing several modifications to the design of the Project that would serve to reduce environmental impacts and reduce the scope of upgrades to the utility power infrastructure in the lower North Thompson River valley, which would be required to meet the incremental power demand of the Project.

#### **2.1.1 *Previously Proposed Pipeline Design***

The previously proposed scope of the Project in the upper Fraser River valley and upper North Thompson River valley included:

- approximately 125 km of NPS 36 pipeline between Hargreaves, BC and Blue River, BC;
- dismantling of existing sending and receiving trap facilities for the NPS 24 pipeline located at Hargreaves, BC;
- additional infrastructure at the existing Rearguard Pump Station site, including a new pump station complete with three 5,000 horsepower (HP) pumping units and three variable frequency drives (VFDs), 24-inch and 36-inch receiving and sending traps, and one additional VFD at the existing pump station;
- approximately 4 km of NPS 36 pipeline including two crossings of the Fraser River needed to access the Rearguard Pump Station; and
- new pump stations each consisting of three 5,000 HP pumping units and three VFDs to be constructed at both the Blue River and Blackpool Pump stations.

The addition of the previously proposed facilities to the current demand for electricity in the upper Fraser River and upper North Thompson River valleys would exceed the capacity of the electrical transmission system servicing this region. The previously proposed Project design would require upgrades to the electrical transmission system to meet the projected power demand and effectively operate the new and expanded pipeline facilities. The specific details regarding this electrical transmission system upgrade are preliminary. However, it is anticipated that the construction of a new high-voltage electrical transmission line would be required, likely originating in Kamloops, BC and extending north to Barriere, BC.

### **2.1.2 Proposed Revised Pipeline Design**

The proposed revised pipeline design has fewer environmental impacts (e.g., the avoidance of two crossings of the Fraser River associated with the previously proposed Rearguard pump station), while being more efficient (i.e., consumes less electricity). This proposed revised pipeline design, as illustrated on Figure 2.1.1, includes the following changes:

- Pipeline - increase the outside diameter of the pipeline from NPS 36 to NPS 42 (1,067 mm) for a distance of 121 km between Hargreaves, BC and the Blue River Pump Station;
- Hinton Pump Station - install one additional 5,000 HP pumping unit and three additional VFDs at the new pump station that is planned to be constructed adjacent to the existing Hinton Pump Station in Alberta;
- Hargreaves Trap Site - install a 36-inch receiving trap and a 42-inch sending trap, at the existing Hargreaves Trap Site in BC;
- Rearguard Pump Station - eliminate the new pump station and the 36-inch receiving and sending trap facility for Line 2 that was originally planned to be constructed adjacent to the existing Rearguard Pump Station. The elimination of the Rearguard Pump Station for Line 2 also results in the elimination of the 4 km of NPS 36 pipeline, including the elimination of two crossings of the Fraser River, that would have been needed to tie-in the new pump station;
- Blue River Pump Station - eliminate one of the three 5,000 HP pumping units that was planned for installation at the new pump station to be constructed at the Blue River Pump Station site. Install one VFD at the proposed pump station for Line 2 as well as a 42-inch receiving trap and a 36-inch sending trap as well as 24-inch sending and receiving traps on the existing Trans Mountain Pipeline Line (TMPL);
- McMurphy Pump Station - construct a new pump station consisting of two 5,000 HP pumping units and two VFDs, and replace the existing electrical transformer at the existing McMurphy Pump Station site; and
- Blackpool Pump Station - eliminate one of the three 5,000 HP pumping units that was originally planned to be constructed as part of the new pump station to be constructed adjacent to the existing Blackpool Pump Station. Add one VFD to the proposed pump station for Line 2 and make upgrades to the existing electrical transformer at this station.

The increased diameter of the pipeline would result in reduced fluid friction losses in the pipeline and an associated reduction in electrical demand. The design basis for the NPS 42 pipeline remains the same as for the NPS 36 pipe, that being a sustainable capacity of 85,850 m<sup>3</sup>/d (540,000 bbl/d). Additional information regarding the engineering design associated with the change in pipeline diameter between Hargreaves and Blue River, BC are provided in Section 4.1.



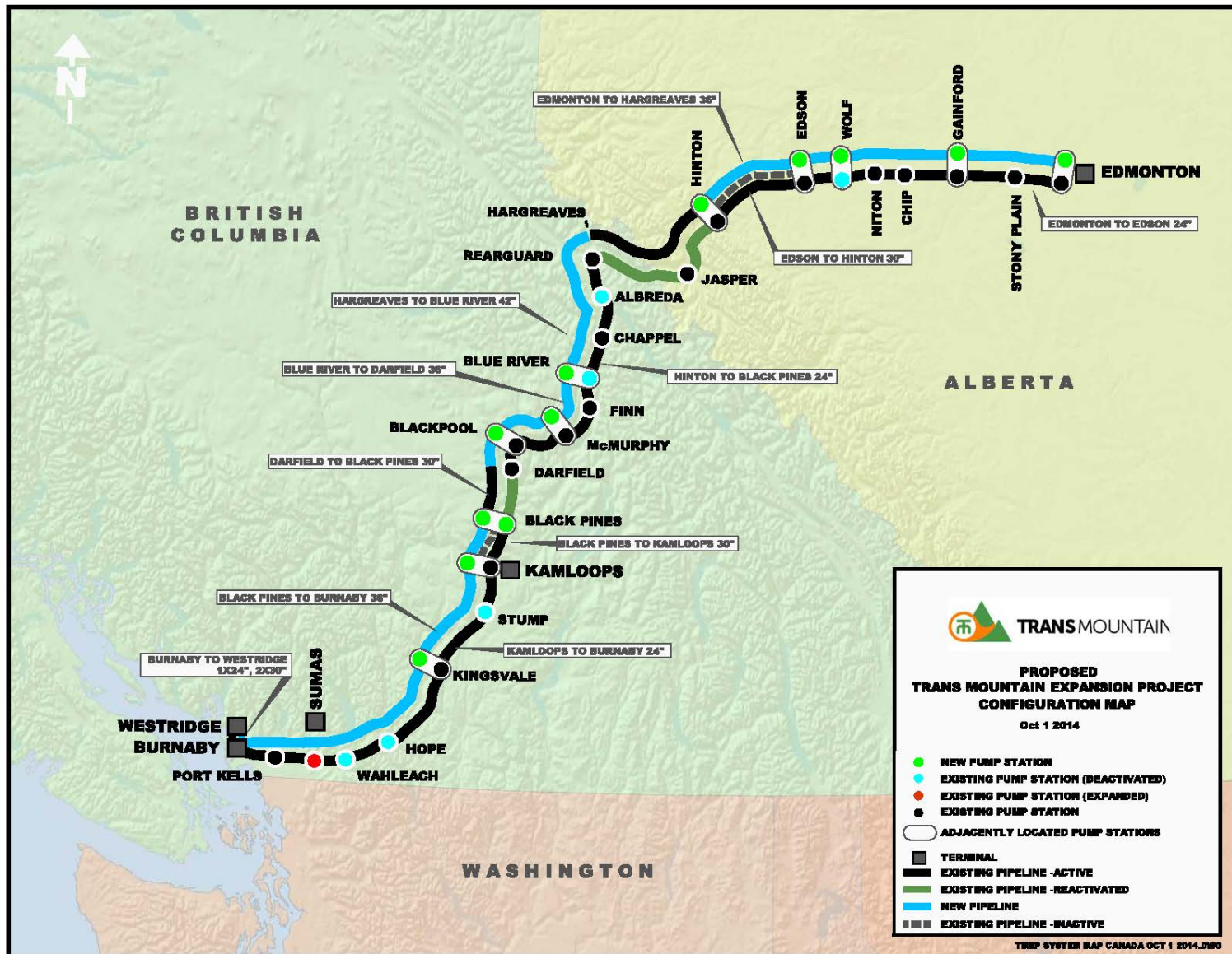


Figure 2.1.1 Trans Mountain Expansion Project: Revised Configuration Map

### **2.1.3 Construction Implications**

The implications to the construction phase of the Project that result from this change in pipeline design would be negligible. The larger diameter pipe would require a slightly deeper trench to maintain the minimum depth of cover after the pipeline is backfilled. A larger construction right-of-way (*i.e.*, permanent easement and temporary workspace) would not be required to allow for the deeper trench and storage of extra spoil material during construction. The duration of the welding component of the pipeline construction for the NPS 42 pipeline would be slightly longer when compared to the NPS 36 pipeline. However, the construction of this 121 km section could still occur within the planned 2-year construction phase of the Project. The equipment that would be used to install the NPS 42 pipeline would be the same size as the equipment used to install the NPS 36 pipeline. Additional details regarding the cost analysis for the change in diameter in the pipeline between Hargreaves and Blue River, BC are provided in Section 2.3.

### **2.1.4 Ongoing Studies**

Trans Mountain has completed additional studies to assess the merits and impacts of this optimized pipeline design; these studies include:

- simulations of hypothetical oil spills within this segment (Appendix A);
- overland spill modelling (Appendix B);
- a revised semi-quantitative risk assessment including a quantitative Geohazard assessment and updated outflow modelling (Appendix C); and
- a baseline noise assessment for the added pump station at the McMurphy Pump Station (Appendix D).

The results from these assessments, along with feedback received through consultation, have been considered by Trans Mountain in the determination of optimized pipeline configuration. Additional information regarding ongoing noise studies, risk assessment and emergency preparedness and response are provided in Sections 5.0, 6.1 and 6.2, respectively.

## **2.2 Project Execution and Schedule**

There will be no material changes to the overall construction execution plans described in Volume 4B of the Facilities Application (Filing ID A3S1K5, A3S1K6 and A3S1K7) as a result of the increase in the diameter of the pipeline between Hargreaves and Blue River and the associated scope modifications described in the Section 2.1.

Experience has shown that the average daily productivity for pipeline construction is approximately the same whether the pipeline is NPS 42 or NPS 36. Avoidance of a double pipeline crossing installation in the Fraser River and a reduction in overall pipeline length of 4 km will decrease overall pipeline construction within the segment.

The elimination of the proposed new pump station at Rearguard and the proposed addition of a new pump station at McMurphy will require a minor reshuffling of the pump station construction groups, with Blue River moving from Group 3 to Group 2 and McMurphy being added to Group 3. All of the other proposed pump station changes, such as the reduction or increase in pump units or variable frequency drives (VFDs), will be seamlessly incorporated to the construction plans described in Volume 4B.

The Master Schedule, Pipeline Construction Schedules, and Facility Construction Schedules in Volume 4B have been updated to reflect the changes in the timing of the NEB Facilities Application review process (unrelated to the proposed Hargreaves to Blue River diameter change) and have been filed concurrently to this Application Supplemental. The pump station group changes described above are reflected in the updated Pump Station Construction Schedule.

## **2.3 Costs**

All else being equal, the increase in the diameter of the Hargreaves to Blue River segment of the proposed Line 2 pipeline and the other associated scope changes are expected to result in a net capital cost reduction of approximately \$25 million. The increases in cost, for pipeline materials (primarily mainline pipe), pipeline construction, additional mainline valves, additional mainline pump units (outside the segment), and additional VFDs (at various locations), will be more than offset by the reductions in cost resulting from the decrease in the overall length of the segment (4 km), the removal of two Fraser River pipeline crossings, fewer mainline pump units (within the segment), and the avoidance of anticipated BC Hydro transmission system infrastructure upgrades (north of Kamloops). The elimination of the proposed new pump station at Rearguard will approximately offset the cost of the proposed added pump station at McMurphy.

### 3.0 LAND AND CONSULTATION OVERVIEW

#### 3.1 Stakeholder Engagement

This section provides information on the stakeholder engagement and communication activities that have supported Trans Mountain work specific to the potential pipeline design reconfiguration in the Upper Fraser River Valley and Upper North Thompson River Valley. The feedback reported in this section covers the period from October 1 to November 27, 2014.

Trans Mountain's engagement is ongoing. Trans Mountain will continue to file Consultation Updates with the NEB reporting on the outcomes of engagement activities with Aboriginal groups, landowners, and stakeholders. Consultation Update No. 3 will be filed in Q2 2015.

##### 3.1.1 Notice of Potential Pipeline Design Reconfiguration

Early in October 2014, Trans Mountain contacted by phone the stakeholders identified in Table 3.1.1 and provided them with an overview of potential modifications to the Project scope, which would serve to reduce environmental impacts and reduce the scope of upgrades to the utility power infrastructure in the Lower North Thompson Valley currently required for the proposed expansion Project scope.

**TABLE 3.1.1**

#### **PRELIMINARY CONSULTATION ON POTENTIAL PROJECT CHANGES**

<b>Stakeholder / Group Name</b>	<b>Date of Contact</b>	<b>Comments / Concerns Expressed</b>	<b>Trans Mountain Response</b>
Regional District of Fraser-Fort George (RDFFG)	October 1, 2014	No concern expressed about potential change in scope. Endorsed the elimination of Fraser River crossings associated with Rearguard pump station.	No response required
		RDFFG is comfortable potential changes being addressed in the December 1, 2014 filing will provide them enough time for review and participation in the information request (IR) process. Aware of opportunities to continue conversations outside of NEB regulatory process.	No response required
		Interest in outcome of reconfiguration of valve placement to limit spill volume with larger pipe.	Addressed in letter of November 28 <sup>th</sup> and NEB submission.
City of Kamloops	October 2, 2014	No concern expressed about potential change in scope. Changes are outside of municipality and so the City of Kamloops would not comment or submit an IR.	No response required

**TABLE 3.1.1**

**PRELIMINARY CONSULTATION ON POTENTIAL PROJECT CHANGES (continued)**

<b>Stakeholder / Group Name</b>	<b>Date of Contact</b>	<b>Comments / Concerns Expressed</b>	<b>Trans Mountain Response</b>
District of Clearwater	October 2, 2014	No concern expressed about potential change in scope as all modifications are outside municipality.	No response required
		Endorsed the elimination of possible Fraser River crossings.	No response required
		District of Clearwater is comfortable the December 1, 2014 filing would provide enough time for review and participation in the IR process. Aware of opportunities to continue conversations outside of NEB regulatory process.	No response required
Village of Valemount	October 2, 2014	No concern expressed about potential change in scope. Endorsed the elimination of Fraser River crossings associated with Rearguard pump station.	No response required
		Village of Valemount is comfortable the December 1, 2014 filing would provide enough time for review and participation in the IR process. Acknowledged that the Valemount's interests are represented by Regional District in the NEB process.	No response required
Thompson-Nicola Regional District (TNRD)	October 3, 2014	TNRD is comfortable that potential changes being addressed in the December 1, 2014 filing would provide them enough time for review and participation in the IR process. Aware of opportunities to continue conversations outside of NEB regulatory process.	No response required
		TNRD requested a general TMEP briefing for TNRD Board in October 2014, to provide preliminary information to politicians before municipal election.	In consultation with TNRD representatives it was determined Trans Mountain will brief TNRD Board following submission of pipeline design reconfiguration. Trans Mountain will include outcomes of briefing in Consultation Update No. 3 to be filed in Q2 2015.

**TABLE 3.1.1**

**PRELIMINARY CONSULTATION ON POTENTIAL PROJECT CHANGES (continued)**

<b>Stakeholder / Group Name</b>	<b>Date of Contact</b>	<b>Comments / Concerns Expressed</b>	<b>Trans Mountain Response</b>
Thompson-Nicola Regional District (TNRD)	October 3, 2014	Requested a more complete briefing should scope change proceed. Wanted to ensure RDFFG was also informed.	Trans Mountain will brief the Village of Valemount following its determination to proceed with potential pipeline design reconfiguration. Trans Mountain will include outcomes of briefing in Consultation Update No. 3 to be filed in Q2 2015.
		Interest in reconfiguration of valve placement to limit spill volume with larger pipe.	Follow-up discussion following submission to the NEB.

**3.1.2 Project Update Notification Letter**

On October 23, 2014, Trans Mountain provided a Project Update letter to the City of Kamloops, District of Clearwater, RDFFG, TNRD and Village of Valemount. A sample of the letter is located in Appendix E.

The Project Update letter described how Trans Mountain had continued its work to optimize the pipeline design since the Application was filed in December 2013. Trans Mountain described how it recently identified potential modifications to the current project scope, which would serve to reduce environmental impacts and significantly reduce the scope of upgrades to the utility power infrastructure in the Lower North Thompson Valley that would be required to meet the incremental power demand. The letter described pipeline design changes being considered, construction implications, cost analysis, and ongoing studies.

The objectives of the Project Update letter were twofold:

- to inform the stakeholders about the potential project modifications and preliminary assessment of impact; and
- to seek comments and input from the stakeholders regarding potential scope modifications.

**3.1.3 Follow-up to Project Update Notification Letter**

Trans Mountain followed-up with City of Kamloops, District of Clearwater, RDFFG, TNRD and Village of Valemount to review the Notification letter. Table 3.1.2 provides a summary of those discussions.

**TABLE 3.1.2**

**FOLLOW-UP CONSULTATION ON POTENTIAL PROJECT CHANGES**

<b>Stakeholder / Group Name</b>	<b>Date of Contact</b>	<b>Comments / Concerns Expressed</b>	<b>Trans Mountain Response</b>
City of Kamloops	October 29, 2014	Reiterated there were no concerns with the proposed change in scope.	No response required
		Felt there was enough time within the existing NEB schedule to ask any questions and noted the ability to work with Trans Mountain directly, outside of NEB process, to have any concerns addressed.	No response required
		The City of Kamloops would not publically comment on the scope change or participate in the NEB process with regard to the scope change as it does not impact the municipality.	No response required
		No technical briefing for Mayor and Council required.	No response required.
TNRD	November 3, 2014	TNRD representative had not received letter from Chief Administrative Officer. Stakeholder asked for letter to be forwarded and the impacts highlighted.	Trans Mountain forwarded a copy of the October 23, 2014 letter (Appendix E) and followed up by phone on November 4, 2014
	November 4, 2014	No concerns with the proposed change in scope.	No response required
		Felt there was enough time within the existing NEB schedule to ask any questions and noted the ability to work with Trans Mountain directly, outside of NEB process, to have any concerns addressed.	No response required
District of Clearwater	November 4, 2014	No concerns with the proposed change in scope.	No response required
RDFFG	November 5, 2014	No concerns with the proposed change in scope. Felt the decreased environmental and power impacts were good project decisions.	No response required
		Requested a meeting with the RDFFG, the Village of Valemount and their legal representation, should a decision be made to move forward with the scope change. This would ensure all parties understood the implications and were able to ask relevant questions.	To be complete by Q1 2015
Village of Valemount	November 6, 2014	Indicated community did not have any concerns about the potential change in scope and thought it made a lot of sense.	No response required
		Comfortable the December 1, 2014 filing would provide enough time for review and participation in the IR process. Also comfortable with addressing concerns outside of the NEB process.	No response required

### **3.1.4 Project Update Letter of Study Results and NEB Filing**

On November 27, 2014, Trans Mountain provided a Project Update letter to the City of Kamloops, District of Clearwater, RDFFG, TNRD and Village of Valemount. A sample of the letter is located in Appendix F.

The Project Update letter outlines the results of the studies identified in the previous letter dated October 16, 2014 and provides notification of Trans Mountain's intent to file the optimized configuration in the supplementation filing to the NEB on December 1, 2014.

Trans Mountain's engagement is ongoing. Trans Mountain will continue to provide updates and seek feedback from stakeholders regarding its proposed revised pipeline design in the Upper Fraser River Valley and Upper North Thompson River Valley.

## **3.2 Aboriginal Engagement**

Through its Aboriginal Engagement Program, the Project provides ongoing engagement with Aboriginal groups with a traditional territory located in proximity to the proposed pipeline corridor. This supplemental application summarizes the engagement activity, the information provided and feedback received during the period of October 1 to November 27, 2014 as related to the proposed revised pipeline design between Hargreaves and Blue River.

### **3.2.1 Identification of Aboriginal Communities, Groups, Associations, Councils and Tribes**

Trans Mountain has taken an open, extensive and thorough Aboriginal engagement approach for the purposes of engagement specific to the proposed revised pipeline design, the following three Aboriginal groups were identified as having a traditional territory located in proximity to the Reconfiguration or an interest in or potential interest in the proposed revised pipeline design.

- Lheidli T'enneh First Nation;
- Simpcw First Nation; and
- Canim Lake Band (Tsq'escen').

### **3.2.2 Engagement Activity**

On October 16, 2014, Trans Mountain sent a letter to Aboriginal groups to notify of the "potential pipeline design reconfiguration in the Upper Fraser River Valley and Upper North Thompson River Valley". A copy of the letter is included in Appendix G.

On November 7, 2014 Trans Mountain met with Canim Lake Band to discuss the proposed revised pipeline design. Upon conclusion of the meeting, no concerns or questions were outstanding.

On November 7, 2014 Trans Mountain received a letter from Lheidli T'enneh First Nation reiterating concern about a spill at the Rearguard Pump Station. The letter requested more information and a follow up meeting to discuss the proposed revised pipeline design. On November 12, 2014 Trans Mountain responded to Lheidli T'enneh First Nation and proposed two meeting alternatives (November 20, 2014 or November 25, 2014) with the purpose of providing an update on the proposed revised pipeline design and the initial assessments completed such as valve spacing, spill modelling and risk assessment.



On November 27, 2014 Trans Mountain sent a letter to Aboriginal groups to notify of the December 1, 2014 filing with the NEB regarding the confirmed pipeline design reconfiguration in the Upper Fraser River Valley and Upper North Thompson River Valley. A copy of this letter is included in Appendix H.

### **3.2.3      *Future Aboriginal Engagement Activity***

Trans Mountain will continue its engagement with Aboriginal communities, groups, associations, councils and tribes following the submission of this supplemental to ensure meaningful engagement continues to occur in regard to the proposed revised pipeline design. Trans Mountain is committed to the continuation of an effective Aboriginal Engagement Program and will continue engagement through the regulatory process and into Project construction and operation.

### **3.3            Land Interests and Landowner Consultation**

Landowners and Crown occupants with interests in the land parcels located between Hargreaves and Blue River were provided with a notice respecting the proposed optimization in line size from 36" to 42". Letters were sent to 108 landowners and Crown occupants on October 27, 2014. A copy of the letter is included as Appendix I. In the letter, owners and occupants were requested to contact Trans Mountain with any questions or concerns they may have respecting the proposed change. No issues have been raised by these respondents as a result of the letter notifications.

Prior to the letter respecting the proposed revised pipeline design, landowner and occupants along the proposed alternate corridor were provided with the NEB's Application to Participate Notice in January 2014. Trans Mountain has included these landowners in all correspondence with landowners, including mail outs, Project updates, newsletters, etc. that were described in the Application (Filing ID A55987) and Consultation Update No. 1 (Filing ID A59343).

On August 27, 2014, all landowners along the existing TMPL, as well as all landowners with lands intersected by the proposed revised and proposed alternate corridors were sent the NEB's Supplemental Application to Participate Notification.

## **4.0 PROJECT DESIGN AND EXECUTION UPDATE**

### **4.1 Engineering Design**

#### **4.1.1 General**

The design principles identified in Volume 4A of the Facilities Application (Filing IDs A3S0Y8, A3S0Y9, A3S0Z0 and A3S0Z1) will apply for the proposed NPS 42 pipeline segment between Hargreaves and Blue River.

#### **4.1.2 Hydraulic Design**

##### **4.1.2.1 General**

The crude oil properties, availability factors, and design flows identified in Section 3.1, Volume 4A (Filing ID A3S0Y8) were used.

##### **4.1.2.2 Hydraulic Design Results**

An updated hydraulic gradient for Line 2 is provided in Appendix J.

#### **4.1.3 Pipeline System Design**

##### **4.1.3.1 Pipe Wall Thicknesses**

The formula in Clause 4.3.5.1 of CSA Z662 will be used to determine the minimum wall thicknesses of the Line 2 NPS 36 and NPS 42 pipeline segments. The NPS 42 pipe will comply with same specification as identified for NPS 36 pipe and will also be Grade 483 MPa.

The NPS 42 line pipe will have a minimum pipe wall thickness of 13.8 mm. Table 4.1.1 outlines the preliminary pipe wall thicknesses for various applications for the NPS 42 pipe.

**TABLE 4.1.1**

**PRELIMINARY PIPE WALL THICKNESSES**

<b>Pipe</b>	<b>Application</b>	<b>Preliminary Pipe Wall Thickness (mm)</b>
<b>Hargreaves to Blue River (1067 mm OD)</b>		
Line pipe	Mainline Pipeline	13.8
Heavy wall pipe	Road Crossings and Watercourse Crossings	17.2
Extra heavy wall pipe	HDD Crossings and Uncased Railway Crossings	22.1

##### **4.1.3.2 Mainline Valves**

Three remote mainline block valves (RMBLVs) and six check valves have been added to the design of the proposed NPS 42 Hargreaves to Blue River segment so that the maximum potential spill volumes would be limited to approximately the same as for the NPS 36 configuration. Four valves were also relocated to reduce potential spill volumes. Appendix C, attachment B includes the spill volume graphs for the NPS 42 segment. Table 4.1.2, identifies the currently proposed locations of the RMBLVs and check valves for the proposed revised pipeline design between Hargreaves and Blue River.

**TABLE 4.1.2**

**PROPOSED LOCATIONS OF THE RMBLVS AND CHECK VALVES FOR THE PROPOSED  
REVISED PIPELINE DESIGN BETWEEN HARGREAVES AND BLUE RIVER**

Reference Kilometre (RK)/ Alternate Kilometre (AK)	New or Existing	Function and Location	Valve Type
		(Facility or Isolation Valve)	
Hargreaves to Blue River (NPS 42)			
RK 489.6	Existing	Isolation Valve - Hargreaves Trap Site (existing manual valve to be automated)	Automated MLBV
AK 500.8	New	Addition due to NPS 42 scope change	Check Valve
RK 506.5	New	Isolation Valve – Jackman Flats (Relocated due to NPS 42 scope change)	Automated MLBV
RK 509.3	New	Addition due to NPS 42 scope change	Automated MLBV
RK 513.3	New	Addition due to NPS 42 scope change	Check Valve
RK 515.6	New	Addition due to NPS 42 scope change	Check Valve
RK 519.5	New	Addition due to NPS 42 scope change	Automated MLBV
RK 522.3	New	Isolation Valve – Upstream Swift Creek	Automated MLBV
RK 522.8	New	Isolation Valve – Downstream Swift Creek	Check Valve
RK 524.7	New	Addition due to NPS 42 scope change	Check Valve
RK 526.3	New	Addition due to NPS 42 scope change	Check Valve
RK 530.1	New	Isolation Valve – Upstream Canoe River (Relocated due to NPS 42 scope change)	Automated MLBV
AK 531.4	New	Isolation Valve – Downstream of Canoe River (co-located with existing valve site)	Check Valve
RK 535.3	New	Isolation Valve – Downstream Camp Creek	Check Valve
AK 540.2	New	Addition due to NPS 42 scope change	Check Valve
RK 545.3	New	Isolation Valve – Co-Located with Albreda Pump Station (station to be deactivated)	Automated MLBV
RK 558.8	New	Isolation Valve – Upstream Clemina Creek, Dora Creek and Albreda River	Automated MLBV
AK 563.3	New	Isolation Valve – Upstream Albreda River	Automated MLBV
RK 565.9	New	Isolation Valve – Gosnel	Automated MLBV
RK 567.8	New	Isolation Valve – Downstream Dominion Creek	Check Valve
RK 571.8	New	Isolation Valve – Upstream Moonbeam Creek	Automated MLBV
AK 572.1	New	Isolation Valve – Downstream Moonbeam Creek	Check Valve
RK 580.3	New	Isolation Valve – Upstream North Thompson River	Automated MLBV
RK 582.3	New	Isolation Valve – Downstream North Thompson River	Check Valve
AK 591.5	New	Isolation Valve – Upstream Miledge Creek (Relocated due to NPS 42 scope change)	Automated MLBV
RK 593.3	New	Isolation Valve – Downstream Miledge Creek	Check Valve
RK 596.0	New	Addition due to NPS 42 scope change	Automated MLBV
RK 600.1	New	Isolation Valve – Upstream Thunder River	Automated MLBV
RK 600.8	New	Isolation Valve – Downstream Thunder River	Check Valve
RK 608.3	New	Isolation Valve – Upstream Cook Creek	Automated MLBV
RK 611.3	New	Isolation Valve – Upstream Blue River (Relocated due to NPS 42 scope change)	Automated MLBV
RK 614.6	New	Facility Valve – Blue River Pump Station	Automated MLBV
RK 614.6	New	Facility Valve – Blue River Pump Station	Check Valve

#### **4.1.4 Facilities Design**

There are no changes to the engineering principles that will be used for facilities design, described in Sections 3.3 and Section 3.5, Volume 4A of the Facilities Application (Filing IDs A3S0Y8 and A3S0Y9), as a result of the proposed increase in the diameter of the pipeline in the Hargreaves to Blue River segment, the addition of the proposed new pump station at McMurphy, the reductions and increases in the number of pump units and VFDs at various locations, and the relocation of various sending and receiving traps.

### **4.2 Construction**

#### **4.2.1 Pipeline Construction**

The proposed 121 km of NPS 42 pipeline will be constructed on the same construction right-of-way as planned for the 125 km of NPS 36 pipeline in the Facilities Application. The construction typical details shown in Appendix B, Volume 4B (Filing ID A3S1K7) will still apply. The differences in construction methodology for the NPS 42 versus the NPS 36 are as follows:

- **Welding:** The majority of the welds will be completed by automatic/mechanized welding and experience has shown that the average daily pipeline construction production rate will be approximately the same. There will be an extra welding station for the extra welding pass required due to the increased wall thickness.
- **Trenching and Backfill:** There will be approximately 15% more excavated material which will require a corresponding percentage of additional backhoe excavators and dozers to achieve the same daily production rate.
- **Hydrostatic Testing:** There will be approximately 35% more water volume needed for each hydrostatic test, however, the pipeline will be tested in segments of about 20 km and the water will be moved between segments and reused to the extent practical.
- **Valves:** As identified in Section 4.1, three additional block valves and six additional check valves will be required. Similar to the valves proposed for the NPS 36 pipeline, the valve assemblies will be fabricated offsite and installed after hydrostatic testing has been completed. All valves in the segment will require an increase in diameter to NPS 42.

The increase in pipeline diameter between Hargreaves and Blue River eliminates the need for the proposed pump station at Rearguard. This in turn avoids the need for the proposed open-cut dual pipeline crossing of the Fraser River in the vicinity of Rearguard, which would require a minimum of one month during a low water window.

#### **4.2.2 Facilities Construction**

There are no material differences in construction methodology associated with the addition of the proposed new pump station at McMurphy, the reduction or increase in pump units or VFDs at other pump station sites, or the relocation of sending and receiving traps.

### **4.3 Operations and Maintenance**

There would be no differences in the standard operations and maintenance activities associated with the NPS 42 pipeline from those that were described in Volume 4C of the Application (Filing ID A3S1L1).

## 5.0 ENVIRONMENTAL AND SOCIO-ECONOMIC ASSESSMENT

### 5.1 Introduction

Trans Mountain is proposing changes to the Project in order to optimize the pipeline design, reduce environmental impacts and reduce the scope of BC Hydro deep system upgrades in the North Thompson area in BC. To meet this objective, Trans Mountain is proposing to increase the diameter of the proposed pipeline from the Hargreaves Trap Site (reference kilometre [RK] 490) to Blue River Pump Station (RK 614.7) (approximately 121 km) from 914 mm (NPS 36) to 1,067 mm (NPS 42). Scope changes are also proposed at the Hinton, Rearguard, Blue River, McMurphy and Blackpool pump stations and Hargreaves Trap Site (Figure 5.1.1).

The larger diameter pipe between the Hargreaves Trap Site and Blue River Pump Station will be located within the same proposed pipeline corridor as applied for in the Facilities Application in December 2013. The proposed changes to the scope of work at the existing pump stations is described in Table 5.1.1. Sections 2.1, 2.2 and 4.1 of this filing provide additional information on the proposed changes.

**TABLE 5.1.1**

#### **REVISIONS TO ACTIVITIES TO BE CONDUCTED AT PUMP STATION FACILITIES TO ACCOMMODATE LARGER DIAMETER PIPE FROM HARGREAVES TO BLUE RIVER**

Pump Station Facility	Applied-for Scope (December 2013)	Additions (December 2014)	Deletions (December 2014)	Within Previously Disturbed Area Within Existing Fenceline
Hinton, AB	<ul style="list-style-type: none"> <li>TMPL (existing Trans Mountain Pipeline): Replace sending (NPS 36) trap facility with NPS 24 trap facility</li> <li>TMEP: 3-unit 5,000 HP pump station; and 1 × VFD</li> </ul>	<ul style="list-style-type: none"> <li>TMEP: 1 × 5,000 HP pump unit; and 3 × VFDs, in order to have one VFD on each pump unit</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>No. As proposed in the Facilities Application, expansion of the station will require acquisition of approximately 0.32 ha of new Crown land to the west of and adjacent to existing Trans Mountain lands</li> </ul>
Hargreaves, BC (Trap Site)	<ul style="list-style-type: none"> <li>TMPL: Delete NPS 36 to NPS 24 diameter transition facility</li> </ul>	<ul style="list-style-type: none"> <li>TMEP: Permanent receiving (NPS 36) and sending (NPS 42) trap facility</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Yes</li> </ul>
Rearguard, BC	<ul style="list-style-type: none"> <li>TMPL: Receiving (NPS 24) and sending (NPS 24) trap facility; 1 VFD</li> <li>TMEP: 3-unit × 5,000 HP pump station; and receiving (NPS 36) and sending (NPS 36) trap facility</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>TMEP: All scope</li> </ul>	<ul style="list-style-type: none"> <li>Yes</li> </ul>

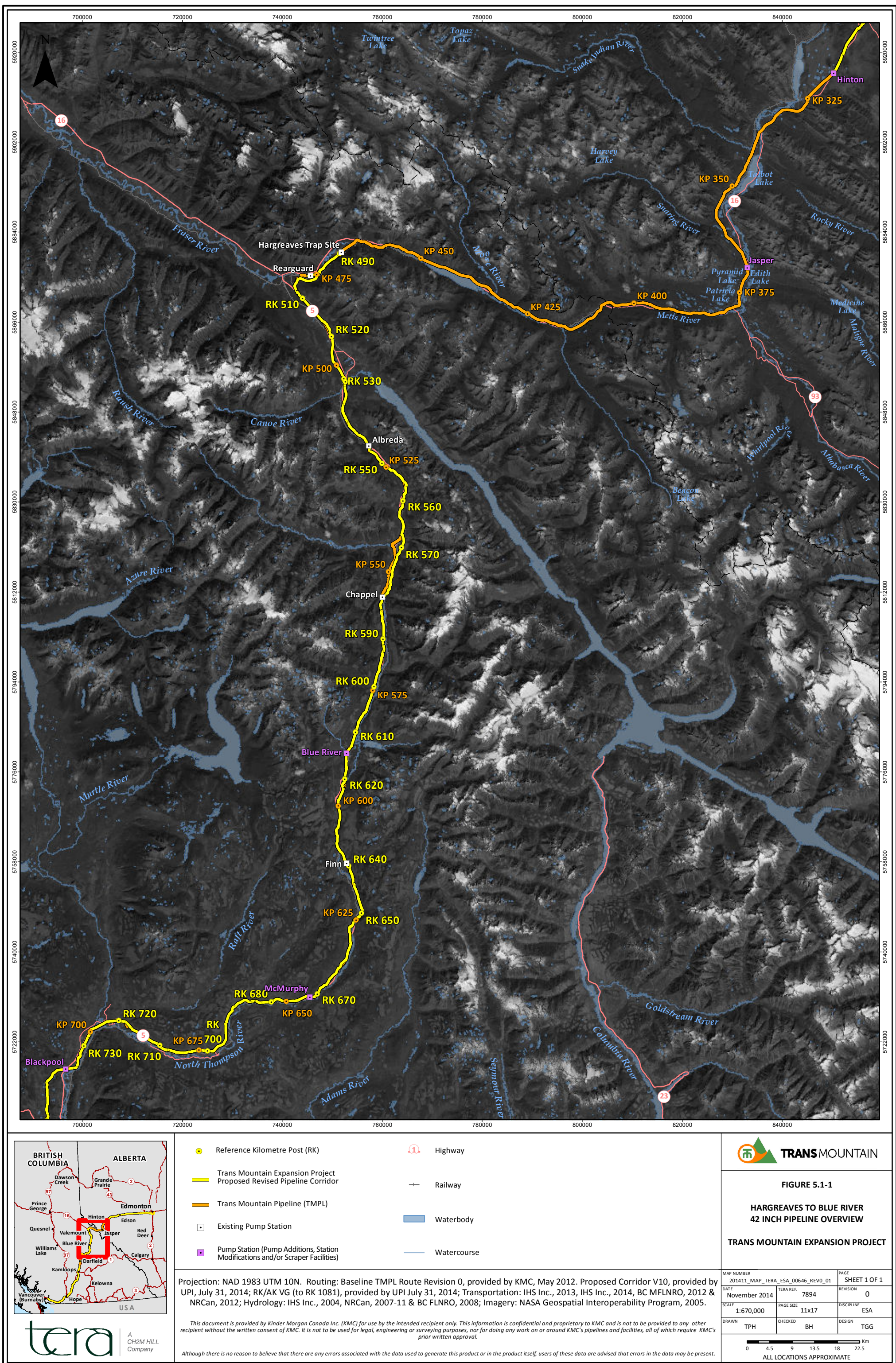
**TABLE 5.1.1**

**REVISIONS TO ACTIVITIES TO BE CONDUCTED AT PUMP STATION FACILITIES TO  
ACCOMMODATE LARGER DIAMETER PIPE FROM HARGREAVES TO BLUE RIVER  
(continued)**

Pump Station Facility	Applied-for Scope (December 2013)	Additions (December 2014)	Deletions (December 2014)	Within Previously Disturbed Area Within Existing Fenceline
Blue River, BC	<ul style="list-style-type: none"> <li>TMEP: 3-unit × 5,000 HP pump station</li> </ul>	<ul style="list-style-type: none"> <li>TMPL: Permanent receiving (NPS 24) and sending (NPS 24) trap facility</li> <li>TMEP: Receiving (NPS 42) and sending (NPS 36) trap facility</li> <li>One VFD</li> </ul>	<ul style="list-style-type: none"> <li>TMEP: 1 × 5,000 HP pump unit (net 2 units)</li> </ul>	<ul style="list-style-type: none"> <li>Yes</li> </ul>
McMurphy, BC	<ul style="list-style-type: none"> <li>TMPL and TMEP: No scope</li> </ul>	<ul style="list-style-type: none"> <li>TMEP: 2-unit × 5,000 HP pump station; and 2 × VFDs</li> <li>Replace electrical transformer</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Yes</li> </ul>
Blackpool, BC	<ul style="list-style-type: none"> <li>TMEP: 3-unit × 5,000 HP pump station; and 3 × VFD</li> </ul>	<ul style="list-style-type: none"> <li>Modifications and upgrades to existing electrical transformer</li> <li>One VFDs (net 2 VFDs)</li> </ul>	<ul style="list-style-type: none"> <li>TMEP: 1 × 5,000 HP pump unit (net 2 units)</li> </ul>	<ul style="list-style-type: none"> <li>Yes</li> </ul>

Consultation on the proposed changes has been conducted and is ongoing with affected stakeholders, Aboriginal groups and landowners. Section 3.0 of this filing provides additional details on consultation and engagement.







## 5.2 Environmental and Socio-economic Setting

The changes to the proposed pipeline between the Hargreaves Trap Site and Blue River Pump Stations are located entirely within the proposed pipeline corridor considered in the Facilities Application. A description of the environmental and socio-economic setting of this segment of the proposed pipeline corridor is provided in Section 5.0 of Volumes 5A and 5B of the Facilities Application, respectively (Filing IDs A3S1L5 to A3S1Q4 and A3S1R7 to A3S2S4). Environmental field studies have been completed for this segment of the proposed pipeline corridor.

The proposed changes to the Hargreaves Trap Site and Blue River and Blackpool pump stations will be located within the existing fenceline of the facilities on previously disturbed land. As proposed in the Facilities Application, 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. A description of the environmental and socio-economic setting of these facilities are provided in Section 6.0 of Volumes 5A and 5B of the Facilities Application, respectively (Filing IDs A3S1Q6 to A3S1Q8 and A3S1S5 to A3S1S6). Expansion work is no longer planned for the Rearguard Pump Station and, therefore, it is not considered further in this assessment.

The McMurphy Pump Station was not in the scope of the Project when the Facilities Application was filed in December 2013. A summary of the environmental and socio-economic elements pertaining to the McMurphy Pump Station is provided in Table 5.2.1. The description of the environmental and socio-economic setting includes the baseline information under subject headings corresponding to those suggested in the NEB *Filing Manual* (NEB 2014). The location of the McMurphy Pump Station is shown on Figure 5.2.1.

Information collected for the setting was obtained from existing literature, internet searches and field studies, all of which are cited in Section 5.6 of this assessment. The level of detail provided within Table 5.2.1 was largely based on the scope of the proposed Project activities at the McMurphy Pump Station. The scope of the activities was also used to determine which of the biophysical and socio-economic elements outlined in Tables A-2 and A-3 of the NEB *Filing Manual* required detailed information. No new indicators were identified as interacting with the activities at McMurphy Pump Station beyond those described in Section 5.0 of Volumes 5A and 5B of the Facilities Application (Filing IDs A3S1L5, A3S1R9, A3S1S0 and A3S1S4). The local study areas (LSAs) and regional study areas (RSAs) mentioned in the setting are element-specific as defined in Section 7.0 of Volumes 5A and 5B of the Facilities Application (Filing IDs A3S1Q9 and A3S1S7).

**TABLE 5.2.1**

**SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC ELEMENTS AND  
CONSIDERATIONS FOR THE MCMURPHY PUMP STATION**

Element	Summary of Considerations
Physical and Meteorological Environment	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is located within the Interior Plateau Physiographic Region, which is characterized by gentle to moderately sloping rolling uplands with rounded ridges and summits, valleys deeply dissecting the plateau, terraces, fluvial plains, fans, and cones (Demarchi 2011, Holland 1976).</li> <li>There are no areas of permafrost within the area of the McMurphy Pump Station (refer to Section 5.1.1 of Volume 5A [Filing ID A3S1R9]).</li> <li>No areas of potential terrain instability are known to occur in the vicinity of the McMurphy Pump Station.</li> <li>No volcanoes have been recorded in the vicinity of the McMurphy Pump Station (Natural Resources Canada [NRCan] 2010a).</li> <li>The site is located in a zone of low seismic activity (NRCan 2010b). Peak ground acceleration with a 1:2,475 annual probability of exceedance is between 0.1 and 0.2 g (NRCan 2013a). Several minor earthquakes (magnitude 3) have been recorded in the area (NRCan 2013b).</li> <li>The topography in the area of the McMurphy Pump Station is generally level.</li> <li>Where activities are planned within the McMurphy Pump Station, soils have been disturbed for industrial use and construction of the new infrastructure will be conducted within the boundaries of the existing station.</li> <li>Wind erosion risk for unprotected soils in the vicinity of the McMurphy Pump Station is considered negligible and unrated by NRCan (NRCan 2010c).</li> <li>A description of the climate for the Interior Cedar-Hemlock (ICH) biogeoclimatic (BGC) Zone is provided in Section 5.1.3 of Volume 5A (Filing ID A3S1R9).</li> <li>Meteorological data from Environment Canada's Blue River Airport Station, located approximately 51 km northeast of the McMurphy Pump Station, are provided in Section 5.1.2 of Volume 5A (Filing ID A3S1R9).</li> <li>No major tornadoes or hailstorms have been recorded in the vicinity of the McMurphy Pump Station (NRCan 2010d, 2010e).</li> </ul>
Soil and Soil Productivity	<ul style="list-style-type: none"> <li>Activities at the McMurphy Pump Station will be conducted within an existing fenced, industrial site lacking topsoil and, therefore, detailed soil information is not warranted as per Table A-2 of the NEB <i>Filing Manual</i>.</li> </ul>
Water Quality and Quantity	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is located in the Upper North Thompson River Watershed of the Fraser River Basin.</li> <li>No work will occur within 30 m of any waterbodies and, therefore, detailed information on surface water quality and quantity is not warranted as per Table A-1 of the NEB <i>Filing Manual</i>.</li> <li>The North Thompson River is located approximately 250 m south of the boundary of the McMurphy Pump Station.</li> <li>The terrain is generally level. Groundwater flow direction likely follows topography south towards the North Thompson River.</li> </ul>

**TABLE 5.2.1**

**SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE MCMURPHY PUMP STATION (continued)**

Element	Summary of Considerations
Air and Greenhouse Gas (GHG) Emissions	<ul style="list-style-type: none"> <li>All existing pumps are electrically driven and are not direct sources of criteria air contaminants..</li> <li>Air quality in the area near the McMurphy Pump Station, based on the nearby emission sources, is expected to be generally very good with some influence from vehicle traffic emissions along Highway 5 and natural emissions from vegetation.</li> <li>Indirect GHG emissions due to electric power consumption by the existing pumps at the McMurphy Pump Station are the main emissions. These include emissions from fossil fuel combustion, unallocated energy from power line losses, metering differences and other losses, and emissions of SF<sub>6</sub> from gas handling and transferring operations, electrical equipment operation, and from equipment mechanical failures.</li> <li>Small amounts of direct GHG emissions will be released due to the space heating of the existing buildings at the McMurphy Pump Station.</li> <li>Small amounts of indirect GHG emissions will be released due to electricity use for equipment other than pumps.</li> <li>Small amounts of GHG emissions will be released from the motor vehicles used by operations/maintenance staff.</li> </ul>
Acoustic Environment	<ul style="list-style-type: none"> <li>Sources of existing sound in the Acoustic Environment LSA are traffic travelling along Highway 5 and surrounding arterial roadways and natural sound (e.g., wind, wildlife, river).</li> <li>No receptors were identified within the Acoustic Environment LSA. The nearest receptor is located approximately 2 km from the boundary of the McMurphy Pump Station.</li> <li>Ambient sound levels (ASL) in the absence of regulated energy facilities ranges between 35 to 40 dBA at night and 45-50 dBA during the day based on British Columbia Oil and Gas Commission (BC OGC) <i>Noise Control Best Practices Guideline</i> (BC OGC 2009).</li> <li>A noise impact assessment was conducted for the proposed activities at the McMurphy Pump Station where noise is expected to increase as a result of the proposed activities (i.e., addition of a 2-unit 5,000 HP pump station). The results of the noise assessment are provided in the Terrestrial Noise Technical Report for the TMEP: McMurphy Pump Station (Appendix E).</li> </ul>
Fish and Fish Habitat	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is located in the Upper Fraser River Watershed of the Fraser River Basin.</li> <li>No work will occur within 30 m of any fish-bearing waterbodies and, therefore, detailed information on fish and fish habitat is not deemed warranted as per Table A-1 of the NEB <i>Filing Manual</i>.</li> </ul>
Wetland Loss or Alteration	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is situated within the boundaries of the Columbia Mountains and Highlands Ecoregion of the Montane Cordillera Ecozone. Wetlands in this ecoregion tend to be restricted to mountain slopes where non-forested bogs, marshes and swamps occur (Ecological Stratification Working Group 1995).</li> <li>The McMurphy Pump Station is also located within the South Interior Mountain Wetland Region. Wetlands characteristic of this region include flat bogs, basin bogs and shallow basin marshes. Within alpine areas, small basin fens and basin bogs can be found (Government of Canada 1986).</li> </ul>

**TABLE 5.2.1**

**SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE MCMURPHY PUMP STATION (continued)**

Element	Summary of Considerations
Wetland Loss or Alteration (cont.)	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is located within the ICH BGC Zone of BC. In this BGC Zone, wetlands are not common due to the mountainous terrain. However, marshes associated with lakes and streams in valley bottoms tend to be more common along with small swamps and transitional bogs and fens (BC Ministry of Forests [MOF] 1996, Meidinger and Pojar 1991).</li> <li>Wetlands provide habitat for native plants and wildlife species, including nesting and foraging habitat for bird species as well as provide storage and natural filtering of water.</li> <li>No wetlands were identified within 30 m of the McMurphy Pump Station during satellite imagery review. As a result, a ground-based wetland survey is not required.</li> <li>There are no Ramsar Wetlands of International Importance (Bureau of the Convention on Wetlands 2014), Important Bird Areas (IBA) (Bird Studies Canada and Nature Canada 2012), Western Hemisphere Shorebird Reserves (WHSRN 2014), Migratory Bird Sanctuaries (Environment Canada 2014a) or Ducks Unlimited Canada (DUC) Priority Areas (DUC 2014) located within the Wetland LSA surrounding the McMurphy Pump Station.</li> </ul>
Vegetation	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is located within the boundaries of the Columbia Mountains and Highlands Ecoregion of the Montane Cordillera Ecozone. This ecoregion is characterized by mature forests of western hemlock and western redcedar in major valleys, with Douglas-fir, western white pine, and western larch occurring less frequently. The subalpine areas are characterized by Engelmann spruce, alpine fir and lodgepole pine stands (Ecological Stratification Working Group 1995).</li> <li>The McMurphy Pump Station is located within the ICH BGC Zone of BC. The ICH BGC Zone is dominated by western redcedar, western hemlock, white spruce, Engelmann spruce, spruce hybrids and subalpine fir. Western larch, Douglas-fir, lodgepole pine, trembling aspen, paper birch, ponderosa pine and western white pine are also common in the central and southern areas of this zone. Black cottonwood are common in wet areas (BC MOF 1996, Meidinger and Pojar 1991).</li> <li>There are no national parks, provincial parks, provincial recreation areas, Environmentally Significant Areas or other protected areas located within the Vegetation LSA near the McMurphy Pump Station.</li> <li>Records of rare plant observations within 5 km of the McMurphy Pump Station were acquired from the BC Conservation Data Centre (BC CDC 2014) database. No provincially-listed (BC CDC) species records were found within the boundaries of the Vegetation LSA.</li> <li>During field surveys in 2013, three provincially-listed (BC CDC) species were recorded within 5 km of the McMurphy Pump Station: silvery sedge (SU); fox sedge (S2S3, Blue-listed) and stalked moonwort (S2, Red-listed).</li> <li>It was determined with satellite imagery interpretation that no native vegetation would be directly disturbed within the site boundaries and, therefore, a ground-based vegetation survey was deemed unnecessary.</li> <li>Consultation with local agricultural authorities was conducted as part of the Facilities Application to determine weed species of concern for the region. Section 4.4 of the Vegetation Technical Report of Volume 5C (Filing ID A3S2I7) provides a summary of these communications.</li> </ul>

**TABLE 5.2.1**

**SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE MCMURPHY PUMP STATION (continued)**

Element	Summary of Considerations
Wildlife and Wildlife Habitat	<ul style="list-style-type: none"> <li>The McMurphy Pump Station lies within the Kamloops Land and Resource Management Plan region (BC Ministry of Forests, Lands and Natural Resource Operations [MFLNRO] 2008a).</li> <li>The McMurphy Pump Station is located on industrial lands.</li> <li>The McMurphy Pump Station is not located within or adjacent to any provincial parks or protected areas (BC MFLNRO 2008b), IBAs (Bird Studies Canada and Nature Canada 2012), Migratory Bird Sanctuaries (Environment Canada 2014a), National Wildlife Areas (Environment Canada 2014a), Western Hemisphere Shorebird Reserves (WHSRN 2014), Ramsar Wetlands of International Importance (Bureau of the Convention on Wetlands 2014), World Biosphere Reserves (United Nations Educational, Scientific and Cultural Organization 2014), designated caribou range (BC Ministry of Environment [MOE] 2008), ungulate winter range (BC MOE 2005a), or Wildlife Habitat Areas (BC MOE 2005b).</li> <li>The McMurphy Pump Station is located in Type 2 Matrix range for southern mountain caribou, as defined by Environment Canada (2014b).</li> <li>The McMurphy Pump Station is not located in a DUC Priority Area (DUC 2014).</li> <li>The McMurphy Pump Station is located in Wildlife Management Unit 3-39 (BC Integrated Land Management Bureau 2006).</li> </ul>
Species at Risk or Species of Special Status and Related Habitat	<ul style="list-style-type: none"> <li>No work will occur within 30 m of any fish-bearing waterbodies and, therefore, detailed information on fish and fish species at risk is not deemed warranted as per Table A-1 of the NEB <i>Filing Manual</i>.</li> <li>Records of rare plant observations within 5 km of the McMurphy Pump Station were acquired from the BC CDC (2014) database. No federally-listed (<i>Species at Risk Act</i> [SARA] or Committee on the Status of Endangered Wildlife in Canada [COSEWIC]) species records were found within these boundaries.</li> <li>Based on known species range and habitat preferences, the following federally-listed (SARA Schedule 1 or COSEWIC) or provincially-listed (Red, Blue, or under BC's <i>Wildlife Act</i>) wildlife species were identified as having the potential to occur in the vicinity of the McMurphy Pump Station (BC MOE 2014, COSEWIC 2014, Environment Canada 2012): <ul style="list-style-type: none"> <li>- barn swallow (SARA: no status, COSEWIC: Threatened, provincial: Blue);</li> <li>- common nighthawk (SARA: Threatened, COSEWIC: Threatened, provincial: Yellow);</li> <li>- olive-sided flycatcher (SARA: Threatened, COSEWIC: Threatened, provincial: Blue);</li> <li>- little brown myotis (SARA: no status, COSEWIC: Endangered, provincial: Yellow); and</li> <li>- Townsend's big-eared bat (SARA: no status, COSEWIC: no status, provincial: Blue).</li> </ul> </li> <li>A search of the BC CDC database did not identify any federally-listed (SARA Schedule 1 or COSEWIC) or provincially-listed (Red, Blue, or under BC's <i>Wildlife Act</i>) wildlife species within 2 km of the McMurphy Pump Station (BC CDC 2012, 2014).</li> <li>Given that the McMurphy Pump Station is an existing facility and all work will occur within the existing fenced area, the McMurphy Pump Station is not considered suitable habitat for wildlife or plant species at risk.</li> </ul>
Heritage Resources	<ul style="list-style-type: none"> <li>There are no known historical resources located within c-016-L/082-M-11 (BC MFLNRO 2014).</li> <li>There is low heritage resources (archaeological, historic or palaeontological) potential in c-016-L/082-M-11 since the land is previously disturbed for industry.</li> <li><i>Heritage Conservation Act</i> approval will be obtained as part of the Project Archaeological Impact Assessment.</li> </ul>

**TABLE 5.2.1**

**SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE MCMURPHY PUMP STATION (continued)**

Element	Summary of Considerations
Traditional Land and Resource Use	<ul style="list-style-type: none"> <li>The following five Aboriginal groups have been identified as having an interest in the Project or having interests potentially affected by the Project that include the McMurphy Pump Station: Adams Lake Indian Band; Simpcw First Nation; Whispering Pines (Clinton Indian Band); BC Métis Federation; and Métis Nation BC.</li> <li>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 McMurphy Pump Station.</li> </ul>
Social and Cultural Well-Being	<ul style="list-style-type: none"> <li>In 2011, the population of the Fraser-Fort George/Thompson-Nicola Region 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).</li> <li>In 2011, the median income within the Fraser-Fort George/Thompson-Nicola Region was approximately \$24,400.</li> <li>Although the McMurphy Pump Station does not lie within any Indian Reserves, it does lie within the asserted traditional territories and areas of interest of five Aboriginal groups (see Traditional Land and Resource Use above).</li> <li>In terms of community way of life, the McMurphy Pump Station is located in Electoral Area B of the Thompson Nicola Regional District (TNRD) (population 283 in 2011) near the District of Clearwater. 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.</li> </ul>
Human Occupancy and Resource Use	<ul style="list-style-type: none"> <li>The McMurphy 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.</li> <li>Current land use at and around the McMurphy Pump Station is industrial.</li> <li>The pump station does not lie within any parks or protected areas. The nearest park is Wells Gray Provincial Park located approximately 27 km northwest of the McMurphy Pump Station.</li> <li>Although the McMurphy Pump Station does not lie within any Indian Reserves, it does lie within the asserted traditional territories and areas of interest of five Aboriginal groups (see Traditional Land and Resource Use above).</li> <li>The nearest residence to the McMurphy Pump Station is approximately 2 km from the property boundary.</li> <li>No agricultural lands are located at the McMurphy Pump Station.</li> <li>Outdoor recreational use on the lands around this location include hiking, mountain biking, skiing, fishing and hunting.</li> <li>The McMurphy 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.</li> <li>No noise legislation exists for the TNRD.</li> </ul>

**TABLE 5.2.1**

**SUMMARY OF ENVIRONMENTAL AND SOCIO-ECONOMIC ELEMENTS AND CONSIDERATIONS FOR THE MCMURPHY PUMP STATION (continued)**

Element	Summary of Considerations
Infrastructure and Services	<ul style="list-style-type: none"> <li>Access to the McMurphy Pump Station is via Highway 5 (Southern Yellowhead Highway).</li> <li>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.</li> <li>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).</li> <li>Trans Mountain has established emergency response plans and programs at all facilities, including the McMurphy Pump Station. These plans and programs are continually reviewed and upgraded. 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.</li> </ul>
Navigation and Navigation Safety	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is not located in, on, over, under, through or across a navigable watercourse or wetland.</li> </ul>
Employment and Economy	<ul style="list-style-type: none"> <li>The Fraser-Fort George/Thompson-Nicola Region's economic base includes forestry and wood products, agriculture, tourism and government services.</li> <li>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).</li> <li>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%).</li> <li>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).</li> </ul>
Community Health	<ul style="list-style-type: none"> <li>The McMurphy Pump Station is located within the Thompson Cariboo Shuswap Health Service Delivery Area (HSDA).</li> <li>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.</li> <li>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.</li> <li>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.</li> <li>The Dr. Helmcken Memorial Hospital located in the District of Clearwater is the closest medical facility; it hosts a 24-hour emergency department. The Blue River Health Centre is also in proximity; it suffers from chronic staff shortages and has no emergency department capability.</li> <li>Proximate Emergency Medical Services responders (i.e., ambulance) are located in the District of Clearwater.</li> </ul>













201411\_MAP\_TERA\_ESA\_00646\_Rev0\_02.mxd



**FIGURE 5.2-1**

**LOCATION OF PROPOSED  
WORK AT MCMURPHY  
PUMP STATION**

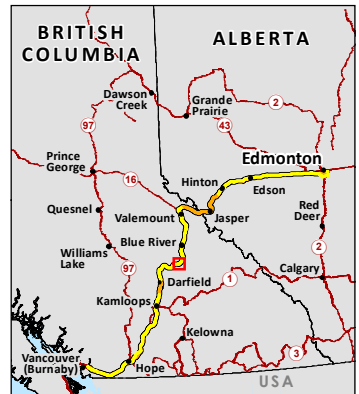
**TRANS MOUNTAIN EXPANSION PROJECT**

-  Proposed TMEP Addition
-  TMPL Kilometre Post (KP)
-  Reference Kilometre Post (RK)
-  Trans Mountain Pipeline (TMPL)
-  TMEP Mapping Reference Line (As Filed)
-  Trans Mountain Expansion Project Proposed Revised Pipeline Corridor
-  Facility Property Boundary
-  Highway
-  Paved Road
-  Railway

Projection: NAD 1983 UTM Zone 10N.  
Routing: Baseline TMPL Route Revision 0, provided by KMC, May 2012; Proposed Corridor V10 (Edmonton to RK 1081), provided by UPI, July 31, 2014; Reference Line & RK/AK VG (to RK 1081), provided by UPI July 31, 2014; Transportation: IHS Inc., 2013, NRCAN, 2011; Geopolitical Boundaries: NRCAN, 2003, IHS Inc., 2011, ESRI, 2005; Colour and B&W Imagery: 2008-2012: provided by KMC, 2012.

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MAP NUMBER		PAGE
201411_MAP_TERA_ESA_00646_REV0_02		SHEET 1 OF 1
DATE	TERA REF.	REVISION
November 2014	7894	0
SCALE	PAGE SIZE	DISCIPLINE
1:2,000	11x17	ESA
DRAWN	CHECKED	DESIGN
TPH	TGG	TGG

0 20 40 60 80 m  
ALL LOCATIONS APPROXIMATE



### **5.3 Environmental and Socio-economic Effects Assessment**

Section 7.1 of Volumes 5A and 5B (Filing IDs A3S1Q9 and A3S1S7) provides a detailed discussion on the effects assessment methodology used for the Project.

#### **5.3.1 *Hargreaves to Blue River Proposed Pipeline Segment***

As mentioned previously, the larger diameter pipe between the Hargreaves Trap Site and Blue River Pump Station will be located within the same proposed pipeline corridor as applied for in the Facilities Application in December 2013. No new indicators, measurement endpoints, spatial boundaries, potential effects, mitigation measures or changes to significance conclusions were identified by the biophysical and socio-economic assessment teams associated with the proposed changes to this segment of the pipeline beyond those already described in Section 7.2 of Volumes 5A and 5B (Filing IDs A3S1Q9 and A3S1S7). In addition, the assessment of species listed under the SARA is not expected to change as a result of the change in diameter of pipe.

The elimination of the proposed pump station at the Rearguard Pump Station will result in the elimination of two crossings of the Fraser River and 4 km of pipeline. The installation of the larger diameter pipe will require 15 cm greater burial depth which will result in some additional volume of trench spoil to be handled; however, it will still be constructed within an approximate 45 m wide construction right-of-way using the topsoil/root zone material handling methods outlined in the Pipeline Environmental Protection Plan (EPP) (Volume 6B) (Filing ID A3S2S3 and A3S2S4).

#### **5.3.2 *Pump Station Activities***

The proposed changes to the Hargreaves Trap Site and Blue River and Blackpool pump stations will be located within the existing fenceline of the facilities on previously disturbed land. As noted in the Facilities Application, 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. No new indicators, measurement endpoints, spatial boundaries, potential effects, mitigation measures or changes to significance conclusions were identified by the biophysical and socio-economic assessment teams associated with the proposed activities at these pump stations beyond those already described in Section 7.4 of Volumes 5A and 5B (Filing IDs A3S1Q9 and A3S1S7). In addition, the assessment of SARA-listed species is not expected to change as a result of the changes to the pump station facilities.

As previously mentioned, the McMurphy Pump Station was not in the scope of the Project at the time the Facilities Application was filed in December 2013. Most of the potential effects and mitigation measures at the McMurphy Pump Station will be the same as those described for other pump stations with activities confined to previously disturbed land within the existing fenceline of the station in Section 7.4 of Volumes 5A and 5B (*i.e.*, Niton, Wolf, Edson, Jasper, Blue River, Blackpool, Kamloops and Sumas pump stations) (Filing IDs A3S1Q9 and A3S1S7). No new indicators, measurement endpoints, spatial boundaries, potential effects, mitigation measures or changes to significance conclusions were identified by the biophysical and socio-economic assessment teams associated with the proposed activities at the McMurphy Pump Station beyond those already described in Section 7.4 of Volumes 5A and 5B (Filing IDs A3S1Q9 and A3S1S7). In addition, the assessment of SARA-listed species is not expected to change as a result of the scope of work at the McMurphy Pump Station.

A noise impact assessment was conducted for the proposed activities at the McMurphy Pump Station where noise is expected to increase as a result of the proposed activities (*i.e.*, addition of a 2-unit 5,000 HP pump station). The results of the noise assessment are provided in Appendix D and the potential effects of the proposed activities at the McMurphy Pump Station on the acoustic environment are described in Section 5.3.2.1 of this environmental and socio-economic assessment (ESA). An incremental increase in air emissions is expected from the proposed activities at the McMurphy Pump Station. The effects are anticipated to be similar to those described in Section 7.4.4 of Volume 5A (Filing ID A3S1Q9).

No additional acoustic work is necessary at the other pump stations considered in this assessment since the additional pump units will either be used as a spare or the number of operating units would decrease. The noise at the Hinton, Blue River and Blackpool pump stations and Hargreaves Trap Site is not expected to increase from what was presented in the Facilities Application (refer to the Terrestrial Noise and Vibration Technical Report in Volume 5C-3 of the Facilities Application [Filing IDs A3S1T7 to A3S1T9]).

#### 5.3.2.1 *Potential Effects and Mitigation Measures*

The potential environmental effects on the acoustic environment associated with the proposed activities at the McMurphy Pump Station during construction and operations were identified by the assessment team and are listed in Table 5.3.1.

Mitigation measures, as defined under the *Canadian Environmental Assessment 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. No new mitigation measures beyond those already provided in the Facilities Application are recommended.

**TABLE 5.3.1**

**POTENTIAL EFFECTS, MITIGATION MEASURES AND RESIDUAL EFFECTS OF  
PROJECT ACTIVITIES AT MCMURPHY PUMP STATION ON ACOUSTIC ENVIRONMENT**

Potential Effect	Spatial Boundary <sup>1</sup>	Key Recommendations/Mitigation Measures [EPP Reference] <sup>2</sup>	Potential Residual Effect(s)
<b>1. Acoustic Environment Indicator – Sound Level</b>			
1.1 Changes in sound levels during construction	LSA	<ul style="list-style-type: none"> <li>Adhere to all federal (<i>i.e.</i>, Environment Canada, <i>Motor Vehicle Safety Act</i>, <i>Oil and Gas Occupational Safety and Health Regulations</i>, Health Canada) and provincial (<i>i.e.</i>, Alberta's Energy Resource Conservation Board through Directive 038: Noise Control, BC OGC, <i>Worker's Compensation Act</i>, <i>Occupational Health and Safety Regulations</i> [BC Reg 296/97 as amended] Section 7.2 [BC Reg. 382/2004, s.1]) guidelines and legislation for noise management [Section 7.0].</li> <li>Noise abatement and construction scheduling will be considered at noise-sensitive locations and during noise-sensitive periods, to limit disruption to sensitive receptors (<i>i.e.</i>, neighbouring landowners, wildlife migratory periods, nesting birds) [Section 7.0].</li> <li>Maintain equipment in good working condition and in accordance with manufacturer guidelines [Section 7.0].</li> <li>Maintain noise suppression equipment on all construction machinery and vehicles in good order [Section 7.0].</li> <li>Enclose noisy equipment and use baffles, where and when feasible, to limit the transmission of noise beyond the construction site.</li> <li>Use only the size and power of tools necessary limit noise from power tool operations [Section 7.0].</li> </ul>	<ul style="list-style-type: none"> <li>Increase in sound levels at pump station and associated facilities during construction period.</li> </ul>
1.2 Changes in sound levels during operations	LSA	<ul style="list-style-type: none"> <li>Review and analyze equipment specifications to ensure sound emissions from mechanical equipment are equal to or less than the sound emissions used in the Terrestrial Noise and Vibration Technical Report.</li> </ul>	<ul style="list-style-type: none"> <li>Increase in continuous sound levels from operations of the new pump station.</li> </ul>

**Notes:**

1. LSA = Acoustic Environment LSA. Section 7.2.6.2 of Volume 5A (Filing ID A3S1Q9) provides the description and rationale of the Acoustic Environment LSA.
2. Detailed mitigation measures are outlined in the Facilities EPP (Volume 6C of the Facilities Application [Filing IDs A3S2S6 to A3S2S7]).

**5.3.2.2 Significance Evaluation of Potential Residual Effects**

Table 5.3.2 provides a summary of the significance evaluation of the potential residual environmental effects on the acoustic environment indicator resulting from proposed activities at the McMurphy Pump Station.

A quantitative assessment of the acoustic environment was determined to be the most appropriate approach to evaluate the significance of potential residual environmental effects at the McMurphy Pump Station. The evaluation of significance of each of the potential residual effects for the acoustic environment relies primarily on the magnitude, duration and frequency of the potential change. The general definitions for these elements are provided in Appendix K. However, magnitude of residual effects requires further definition for the acoustic environment evaluation and is indicator specific. As in the Facilities Application, magnitude for sound level has been defined based on the degree of compliance with provincial and suggested Health Canada guidelines. Details on the guidelines and legislation used to establish the magnitude ratings are provided in Technical Report 5C-3 of Volume 5C, Terrestrial Noise and Vibration Technical Report (Filing IDs A3S1T7 to A3S1T9).

The definitions of magnitude for the  $L_{eq}$  in dBA indicator for construction activities at pump station facilities are the same as described in Section 7.4.6.3 of Volume 5A of the Facilities Application (Filing ID A3S1Q9).

The sound levels indicator definitions of magnitude for pump station operations are as follows:

- **Negligible:** Below BC OGC and Alberta Energy Regulator (AER) ASL.
- **Low:** Below BC OGC/AER permissible sound level (PSL) limits and suggested Health Canada percent Highly Annoyed (%HA) guidance.
- **Medium:** Equal to or slightly lower than the BC OGC/AER PSL limit in rural or sub-urban areas; or Health Canada %HA guidance in urban areas.
- **High:** Greater than either the BC OGC/AER PSL limit or the Health Canada %HA guidance.

**TABLE 5.3.2**

**SIGNIFICANCE EVALUATION OF POTENTIAL RESIDUAL EFFECTS OF PROJECT ACTIVITIES AT THE MCMURPHY PUMP STATION ON THE ACOUSTIC ENVIRONMENT**

Potential Residual Effects	Impact Balance	Spatial Boundary <sup>1</sup>	Temporal Context			Magnitude	Probability	Confidence	Significance <sup>2</sup>
			Duration	Frequency	Reversibility				
1. Acoustic Environment Indicator – Sound Levels									
1(a) Increase in sound levels at pump stations and associated facilities during construction period.	Negative	LSA	Short-term	Isolated	Short-term	Negligible	High	Moderate	Not significant
1(b) Increase in continuous sound levels from operations of the new pump station.	Negative	LSA	Long-term	Continuous	Long-term	Low	High	Moderate	Not significant
1(c) Combined effects on the sound levels indicator (1[a] and 1[b]).	Negative	LSA	Long-term	Continuous	Long-term	Low	High	Moderate	Not significant

**Notes:** 1. LSA = Acoustic Environment LSA.

2. Significant Residual Environmental Effect: A high probability of occurrence of a permanent or long-term residual effect of high magnitude that cannot be technically or economically mitigated.

### 5.3.2.3 Sound Levels

#### 5.3.2.3.1 Increase in Sound Levels during Construction

The potential for the increase in sound levels for human receptors associated with construction of the proposed pump units at the McMurphy Pump Station is considered to have a negative impact balance. It is anticipated that the sound levels due to the construction of the pipeline will be greater than the sound levels generated by the construction at the McMurphy Pump Station due to the reduced number of active pieces of construction equipment required. Construction at the McMurphy Pump Station will use already cleared space, and earthworks or excavation is expected to be minimal. Therefore, construction noise is based on the “installation of building structures and equipment” in Figure 7.2.6-1 of Volume 5A of the Facilities Application (Filing ID A3S1Q9).

The results of the noise impact assessment for construction at the McMurphy Pump Station indicates the magnitude of changes in sound levels that will be experienced within 1.5 km of a station where new pumps are proposed. Noise controls that will be used during the construction phase, particularly the use of silencers on mobile equipment, are expected to control the amount of sound to within acceptable levels as established in Technical Report 5C-3 of the Facilities Application [Filing IDs A3S1T7 to A3S1T9]). Controlling the magnitude of sound levels also limits the spatial extent of the potential change.

The magnitude of potential effects varies depending on the distance between the construction activities and the surrounding receptors. No noise sensitive receptors were identified for the McMurphy Pump Station. Table 5.3.3 presents a summary of the relevant parameters and predicted magnitude.

**TABLE 5.3.3**

#### **SUMMARY OF SOUND LEVEL MAGNITUDE FOR MCMURPHY PUMP STATION CONSTRUCTION**

Pump Station Facility	Distance to Closest Receptor (m)	Predicted Sound Level (dBA)	Criteria		Magnitude
			BC OGC/AER Daytime PSL (dBA)	Health Canada Limit (dBA)	
McMurphy, BC	No receptor within the Acoustic Environment LSA. Closest receptor is 2 km away.	<50	65	75	Negligible

A summary of the rationale for all of the significance criteria is provided below (Table 5.3.2, point 1[a]).

- **Spatial Boundary:** Acoustic Environment LSA – compliance with the AER Directive 038 and BC OGC *Noise Control Best Practices Guideline* are achieved within the Acoustic Environment LSA.
- **Duration:** short term – the event causing the increase in sound levels (*i.e.*, installation of the pump units and associated facilities) occurs during the construction phase.
- **Frequency:** isolated – the event causing the increase in sound levels occurs only during the construction phase in which the activity is planned.

- **Reversibility:** short-term – the increases in sound levels will occur during construction activities at the pump station which will last for approximately nine months. All construction sound level changes are reversible as the sound will cease when construction is finished.
- **Magnitude:** negligible – increases in sound are contained to within the Acoustic Environment LSA and no noise sensitive receptors were identified. Sound will be generated to varying degrees within the Acoustic Environment LSA dependant on the amount of equipment and level of activity.
- **Probability:** high – based on the fact that heavy equipment is required to construct the new addition to the pump station, sound will be generated.
- **Confidence:** moderate – based on the nature of data inputs.

#### 5.3.2.3.2 Increase in Continuous Sound Levels from Operations

The potential for the increase in sound levels for human receptors associated with pump station operations is considered to have a negative impact balance. Noise from pump station facility operations will be continuous sound from existing and new pumping and support equipment located at the McMurphy Pump Station. Sounds in the Acoustic Environment LSA surrounding the McMurphy Pump Station would be similar to those already generated.

The spatial extent of the increase in sound levels during operations of the pump station is limited to the Acoustic Environment LSA. The duration of the pump station sounds is long-term, throughout the life of the Project. The increase in sound levels during operations will extend for the life of the operating pipeline and, consequently, is of long-term reversibility. However, the effect is reversible as the increase in sound levels cease as soon as the sound stops, which would be at Project decommissioning.

The magnitude of potential effects varies depending on the relative increase in sound emitting equipment and the distance between the pump station and surrounding receptors. As such, Table 5.3.4 presents a summary of the relevant parameters and resulting predicted magnitude for the McMurphy Pump Station.

**TABLE 5.3.4**

#### **SUMMARY OF SOUND LEVEL MAGNITUDE FOR MCMURPHY PUMP STATION OPERATIONS**

Pump Station Facility	Distance to Closest Receptor (m)	Predicted Sound Level (L <sub>eq</sub> in dBA/%HA)	Criteria		Magnitude
			BC OGC/AER Nighttime PSL (dBA)	Health Canada Limit (% HA)	
McMurphy, BC	No receptor within Acoustic Environment LSA. Compliance is demonstrated at Acoustic Environment LSA limit of 1.5 km.	36/1.2	40	6.5%	Low

A summary of the rationale for all of the significance criteria is provided below (Table 5.3.2, point 1[b]).

- **Spatial Boundary:** Acoustic Environment LSA – compliance with the AER Directive 038 and BC OGC Noise Control Best Practices Guideline are achieved within the Acoustic Environment LSA.
- **Duration:** long-term – the event causing the increase in sound levels is operations of the pump station which occurs over the life of the operating pipeline.
- **Frequency:** continuous – the pump station operates continuously over the life of the operating pipeline.
- **Reversibility:** long-term – the increase in sound levels during operations will extend over the life of the Project. All sound level changes are reversible as the sound will cease when the pipeline is decommissioned.
- **Magnitude:** low – with the implementation of planned mitigation measures at the pump station, noise levels within the Acoustic Environment LSA are expected to comply with AER, BC OGC and Health Canada limits.
- **Probability:** high – the new pumps are mechanical sources of sound and will increase sound levels within the Acoustic Environment LSA during operations.
- **Confidence:** moderate – the assessment is based on a combination of measured existing data, theoretical formulae and current Project design.

#### 5.3.2.3.3 Combined Effects on Sound Levels

The evaluation of the combined effects of Project activities at the McMurphy Pump Station on the acoustic environment considers collectively the assessment of the likely potential residual effects on the sound levels indicator. The residual effects for the sound levels indicator do not combine to result in new ratings since the occurrences of sound happen at different times during the Project. Therefore, the combined effect represents the worst case or most negative effect for each evaluation criteria between the two residual effects (Table 5.3.2, point 1[c]). Effectively, this is the effect from operations, since construction is of short-term duration and reversibility. Pump station operations will occur continuously over the life of the Project. A summary of the rationale for all of the significance criteria of combined effects on sound levels is provided below.

- **Spatial Boundary:** Acoustic Environment LSA – compliance with the AER Directive 038 and BC OGC Noise Control Best Practices Guideline are achieved within the Acoustic Environment LSA.
- **Duration:** long-term – the combined effect on sound levels reflects the operations of the McMurphy Pump Station which occurs over the life of the Project.

- **Frequency:** continuous – the event causing combined effects on sound levels is the operation of the McMurphy Pump Station which occurs continuously over the life of the operating pipeline.
- **Reversibility:** long-term – the combined effect of sound levels reflects operations which will extend over the life of the Project. All sound level changes are reversible since the sound will cease when the pump station is decommissioned.
- **Magnitude:** low – with the implementation of appropriate mitigation measures, noise levels at receptors are expected to comply with AER, BC OGC and Health Canada limits.
- **Probability:** high – the new pumps are mechanical sources of sound and will increase sound levels for nearby receptors during operation.
- **Confidence:** moderate – the assessment is based on a combination of measured existing data, theoretical formulae and current Project design.

#### 5.3.2.4 Summary

As identified in Table 5.3.2, there are no situations that would result in a significant adverse residual environmental effect. Consequently, it is concluded that the environmental effects of the proposed activities at the McMurphy Pump Station on the acoustic environment indicator will be not significant.

### 5.4 Cumulative Effects Assessment

The cumulative effects assessment conducted for the Facilities Application (Section 8.0 of Volumes 5A and 5B [Filing IDs A3S1R1, A3S1R2 and A3S1T0]) took a regional approach and considered reasonably foreseeable developments along the same proposed pipeline corridor between Hargreaves and Blue River, as well as in the vicinity of the Hinton, Rearguard, Blue River, McMurphy and Blackpool pump stations and Hargreaves Trap Site. As such, an additional cumulative effects assessment focused on the proposed scope changes was not warranted.

### 5.5 Conclusion

TERA, a CH2M HILL Company, was retained by Trans Mountain to conduct an ESA for the proposed Hargreaves to Blue River 42 Inch Pipeline proposed revised pipeline design. The proposed changes include increasing the diameter of the proposed pipeline from the Hargreaves Trap Site to the Blue River Pump Station (approximately 121 km) from 914 mm (NPS 36) to 1,067 mm (NPS 42). Scope changes are also proposed at the Hinton, Rearguard, Blue River, McMurphy and Blackpool pump stations and Hargreaves Trap Site.

The larger diameter pipe between the Hargreaves Trap Site and Blue River Pump Station will be located within the same proposed pipeline corridor as applied for in the Facilities Application. The proposed changes to this segment of the proposed pipeline were reviewed and the assessment team determined that no new issues were identified that were not already addressed in the Facilities Application for all of the environmental and socio-economic elements.



The proposed changes to the Hargreaves, Blue River and Blackpool pump stations will be located within the existing fenceline of the facilities on previously disturbed land. As described in the Facilities Application, 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. The proposed changes to these pump stations were reviewed and the assessment team determined that no new issues were identified that were not already addressed in the Facilities Application for all of the environmental and socio-economic elements. No environmental or socio-economic effects are anticipated at the Rearguard Pump Station since this facility is no longer in the scope of the Project.

An assessment of the potential effects of the construction and operations of the proposed activities at the McMurphy Pump Station was conducted since this facility was not considered in the Facilities Application. The description of the environmental setting (current state of the environment) was compared against the description of proposed activities to assess potential environmental and socio-economic effects that might be caused by the proposed changes. Most of the potential effects and mitigation measures at the McMurphy Pump Station will be the same as those described for other pump stations with activities confined to previously disturbed land within the existing fenceline of the station.

A noise impact assessment (Appendix D) was conducted for the proposed activities at the McMurphy Pump Station where noise is expected to increase as a result of the proposed activities. The significance evaluation of the identified potential residual effects on the acoustic environment indicator remaining following the implementation of the recommended mitigation measures is similar to those described in Section 7.4.6 of Volume 5A (Filing ID A3S1Q9). No additional potential effects were identified. With the implementation of planned mitigation measures at the McMurphy Pump Station, noise levels during construction and operations within the Acoustic Environment LSA are expected to comply with AER, BC OGC and Health Canada limits and were determined to be of negligible to low magnitude.

The assessment concludes that the proposed changes do not result in significant adverse residual environmental or socio-economic effects. Consequently, the identified residual effects of construction and operations of the Hargreaves to Blue River 42 Inch Pipeline on environmental and socio-economic indicators will be not significant.

The proposed Hargreaves to Blue River 42 Inch Pipeline scope change will reduce the need for the proposed BC Hydro deep system upgrade in the North Thompson area in BC. In addition, the elimination of the proposed pump station at the Rearguard Pump Station will result in the elimination of two crossings of the Fraser River and 4 km of pipeline.

Implementation of the recommended mitigation measures will reduce the adverse residual environmental and socio-economic effects associated with the construction and operations of the Hargreaves to Blue River 42 Inch Pipeline. No new mitigation measures beyond those already provided in the Facilities Application are recommended. Applicable proposed construction mitigation measures will form the basis of operation and maintenance procedures during the life of the Project.

## **6.0 RISK ASSESSMENT AND MANAGEMENT OF PIPELINE SPILLS UPDATE**

### **6.1 Risk Assessment**

The updated preliminary (*i.e.*, not fully-mitigated) risk results for the Line 2 Hargreaves to Blackpool segment, which incorporates the NPS 42 Hargreaves to Blue River segment are provided in the report entitled “Updated Preliminary Risk Results for TMEP Line 2 – Hargreaves to Blackpool”, (Appendix C). That report is an update to the previous preliminary TMEP Line 2 risk results that were filed as part of Technical Update No. 1 in August, 2014 (Filing ID A3Z8G1), and reflects the proposed use of NPS 42 pipe between Hargreaves and Blue River, rather than the NPS 36 pipe that was previously proposed for that segment.

The effect that the changes between the design configuration as presented in Technical Update No. 1, and the proposed NPS 42 design configuration have on risk can be most readily seen through a comparison of integrated risk values. Integrated risk between two points on a pipeline route represents the combined operating risk for that segment of pipeline. Integrated risk between two points can be determined as the length-averaged risk value between those two points, multiplied by the total length of pipeline between those two points. For the design configuration presented as part of Technical Update No. 1, utilizing NPS 36 pipe, the integrated risk for the Hargreaves to Blue River segment was 3.95. For the current design configuration, utilizing NPS 42 pipe, the integrated risk for the Hargreaves to Blue River segment is 3.90.

The reduction in risk is attributed to the following factors:

- the updated design configuration is 4 km shorter;
- the NPS 42 segment of the updated design configuration is associated with increased wall thickness, which increases damage resistance; this has resulted in a reduction in third-party damage failure frequency by a factor of three compared to the former NPS 36 design; and
- the addition of 3 new remote operated block valves and 6 new check valves to mitigate potential spill volume

Collectively, the above factors act to reduce risk in the updated design configuration relative to that which was associated with Technical Update No. 1. In addition, it is important to note that despite the increase in diameter from NPS 36 to NPS 42 for the Hargreaves to Blue River segment, this segment has been designed such that it will still operate in a fully-turbulent mode, as is the case for the rest of Line 2. As was discussed in Section 3.2 of Attachment A to Preliminary Risk Results for TMEP Line 2 and New Delivery Lines, (Filing ID A3Z8G1), this means that what little water is present will be fully entrained, resulting in oil-wet pipe wall conditions, not susceptible to internal corrosion.

### **6.2 Emergency Preparedness and Response**

The impact of the proposal to increase the diameter of the proposed pipeline from NPS 36 to NPS 42, from an Emergency Preparedness and Response point of view, is the increase in pipeline volumetric capacity, and associated volume of product, which could be spilled in the low likelihood event of a leak.

The Application, Volume 7, Section 4; Emergency Preparedness and Response, outlines the process that will be undertaken to enhance the current Kinder Morgan Canada Inc. Emergency Management Program (EMP), to address the needs of the Project.

The enhanced EMP is currently being developed, using the EMP for existing operations as the foundation, and will take into account pertinent issues such as the pipeline diameter, flow volumes and potential spill volumes. Therefore, increasing the pipeline diameter provides little in the way of impact to Trans Mountain's planned development of the enhanced EMP.

## **7.0 CONCLUSIONS**

The proposed revised pipeline design between Hargreaves and Blue River, BC will result in less demand for electrical power in the North Thompson Valley as a result of the Project, and will eliminate two pipeline crossings of the Fraser River. The resulting change from an NPS 36 diameter pipeline to an NPS 42 pipeline for this 121 km segment of the Project will not result in any additional environmental or socio-economic effects not already assessed in the Application to the NEB. As well, the proposed revised pipeline design will result in a slightly reduced risk compared to the predicted risks for an NPS 36 diameter pipeline, due to the addition of valves in this segment.

## **8.0 REFERENCES**

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## **9.0 APPENDICES**