



SELF-ASSESSMENT OF THE POTENTIAL FOR SERIOUS HARM TO FISH AND FISH HABITAT RESULTING FROM THE TRANS MOUNTAIN PIPELINE ULC TRANS MOUNTAIN EXPANSION PROJECT

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Prepared for:



TRANS MOUNTAIN

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Definition and Acronym Table	
Acronym	Full Name
AAR	Applied Aquatics Research Ltd.
AK	Alternate Kilometre
AENV	Alberta Environment
AESRD	Alberta Environment and Sustainable Resource Development
asl	above sea level
ATK	Aboriginal Traditional Knowledge
ATPR	Alberta Tourism, Parks and Recreation
ATV	all-terrain vehicle
avoidance	A means to prevent a potential adverse effect through routing/siting of the project, changes to project design or construction timing
BC	British Columbia
BC CDC	BC Conservation Data Centre
BC MELP	BC Ministry of Environment, Lands and Parks
BC MFLNRO	BC Ministry of Forests, Lands and Natural Resource Operations
BC MOE	British Columbia Ministry of Environment
BC MOF	British Columbia Ministry of Forests
BC MOT	Ministry of Transportation
BC OGC	BC Oil and Gas Commission
BGC	Biogeoclimatic Zones
BPEF	backpack electrofishing
CAPP	Canadian Association of Petroleum Producers
CCME	Canadian Council of Ministers of the Environment
<i>CEA Act, 2012</i>	<i>Canadian Environmental Assessment Act, 2012</i>
CN	Canadian National Railway
compensation/offset	A means intended to compensate unavoidable and/or unacceptable effects. May consist of offsets (no net loss), research, education programs, and financial compensation (considered only when all other options have been exhausted)
<i>COGOA</i>	<i>Canada Oil and Gas Operations Act</i>
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
Critical Habitat	Habitats considered necessary to support the species survival and recovery and to reach the population and distribution objectives for a target species. Under SARA, critical habitat must be legally protected from destruction once it is identified (Fisheries and Oceans Canada 2012)
CPCN	Certificate of Public Convenience & Necessity
CPUE	catch-per-unit-effort
CRA	commercial, recreational and/or Aboriginal
DOA	deactivated overgrown access, as defined by UPI (2014)
DFO	Fisheries and Oceans Canada (Department of Fisheries and Oceans)
DS	downstream
EI	Environmental Inspector
EPP	Environmental Protection Plan
ES	Eastern Slopes
ESA	Environmental and Socio-Economic Assessment
ESCC	Endangered Species Conservation Committee
Estsek`	Estsek` Environmental Services LLP
FB	fish-bearing
FFP	Fisheries Field Program (2013)
FL	fork length
FLEF	float electrofishing
FPC	Forest Practices Code
<i>FRPA</i>	<i>Forest and Range Practice Act</i>
FRL	fish research licence

Definition and Acronym Table	
Acronym	Full Name
FSZ	Fish Sensitive Zone
4WD	Four-Wheel Drive
FWMIS	Fisheries and Wildlife Management Information System
GIS	Geographic Information System
GOA	Government of Alberta
GOC	Government of Canada
GPS	Global Positioning System
HADD	harmful alteration, disruption, or destruction (of fish habitat)
HDD	horizontal directional drill
HMM	Hatch Mott McDonald
HWY	Highway
IR	Indian Reserve
KMC	Kinder Morgan Canada Inc.
LRBW	Least Risk Biological Window
LSA	Local Study Area
mitigation	Measures for the elimination, reduction or control of the adverse environmental effects of the project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means
MOC	Management of Change
MOU	Memorandum of Understanding
<i>MWWO</i>	<i>Minor Works and Waters Order</i>
Natural Regions Committee	NRC
NCD	non-classified drainage
NEB	National Energy Board
NFB	nonfish-bearing
NPA	<i>Navigation Protection Act</i>
NTA	new temporary access road - a proposed new temporary access road for equipment and vehicle access to the proposed pipeline corridor
NVC	No visible channel
<i>NWPA</i>	<i>Navigable Waters Protection Act</i>
<i>NPA</i>	<i>Navigation Protection Act</i>
<i>OGAA</i>	<i>Oil and Gas Activities Act</i>
offset	A means intended to compensate unavoidable and/or unacceptable effects. May consist of 'in-kind' 'out-of-kind' or 'complementary measures, as defined by DFO (2013b)
OHV	Off-Highway Vehicle
OHWL	Ordinary High Water Level
OS	Operational Statement
PCM	Post-Construction Monitoring
PAD	Permanent Alteration to, or Destruction of Fish Habitat
PFRA-AAFC	Prairie Farm Rehabilitation Administration-Agriculture and Agri-Food Canada
PFSRB	Partners for the Saskatchewan River Basin
PoE	Pathway of Effects
post-construction monitoring	Evaluations post-construction intended to verify that mitigation measures were properly implemented and that such measures effectively mitigate the predicted adverse environmental effects or to identify remedial measures
Previously Proposed Pipeline Corridor	A segment of the corridor that was proposed at the time of filing (December 2013) but with further engineering optimization, construction planning, feedback received through consultation, environmental studies, and others, that particular segment of the pipeline as-filed corridor is no longer being considered for use by the Project.

Definition and Acronym Table	
Acronym	Full Name
Proposed Alternative Pipeline Corridor	A limited number of alternative corridors Trans Mountain is advancing with the proposed revised pipeline corridor, filed with the NEB in August 2014 (Filing ID A4A4A5)
Proposed Pipeline Corridor	Used to describe the final and all inclusive routing proposed for the pipeline corridor, regardless of timeframe or location
Proposed Revised Pipeline Corridor	A segment of the corridor that has been revised since the application was submitted in December 2013
PRT	pipeline right-of-way trail, as defined by UPI (2014)
QA	Quality Assurance
QAES	Qualified Aquatic Environment Specialist (Alberta)
QEP	Qualified Environmental Professional (British Columbia)
QC	Quality Control
RAP	restricted activity period
Residual Effect	An effect that is present after mitigation is applied
RK	Reference Kilometer
ROW	right-of-way
RSA	Regional Study Area
SARA	<i>Species at Risk Act</i>
SFFP	Supplemental Fisheries Field Program (2014)
TEK	Traditional Ecological Knowledge
TMEP or "the Project"	Trans Mountain Expansion Project
TDL	Temporary Diversion Licence
TL	Total Length
TLRU	Traditional Land and Resource Use
TLU	Traditional Land Use
TMPL	Trans Mountain Pipeline
Trans Mountain	Trans Mountain Pipeline ULC
UPI	Universal Pegasus International
US	Upstream
UTM	Universal Transverse Mercator
WQM	water quality monitoring
YOY	young-of-the-year
ZOI	zone-of-influence

Alberta Fish Species Acronym List		
Acronym¹	Common Name	Scientific Name
ARGR	Arctic grayling	<i>Thymallus arcticus</i>
BLTR	bull trout (North and South Saskatchewan River populations and Western Arctic drainage population)	<i>Salvelinus confluentus</i>
BKTR	brook trout	<i>Salvelinus fontinalis</i>
BKTRXBLTR	brook troutXbull trout hybrid	--
LKTR	lake trout	<i>Salvelinus namaycush</i>
BNTR	brown trout	<i>Salmo trutta</i>
RNTR	rainbow trout (Introduced populations)	<i>Oncorhynchus mykiss</i>
ARTR	rainbow trout (Athabasca River population)	<i>Oncorhynchus mykiss</i>
CTTR	cutthroat trout (Introduced populations)	<i>Oncorhynchus clarkii</i>
CTTRXRNTR	cutthroat troutXrainbow trout hybrid	--
LKWH	lake whitefish	<i>Coregonus clupeaformis</i>
MNWH	mountain whitefish	<i>Prosopium williamsoni</i>
LKST	lake sturgeon (Alberta population)	<i>Acipenser fulvescens</i>
BURB	burbot	<i>Lota lota</i>
NRPK	northern pike	<i>Esox lucius</i>
WALL	walleye	<i>Sander vitreus</i>
YLPR	yellow perch	<i>Perca flavescens</i>
SAUG	sauger	<i>Sander canadensis</i>
IWDR	Iowa darter	<i>Etheostoma exile</i>
GOLD	goldeye	<i>Hiodon alosoides</i>
MOON	mooneye	<i>Hiodon tergisus</i>
LNSC	longnose sucker	<i>Catostomus catostomus</i>
WHSC	white sucker	<i>Catostomus commersoni</i>
MNSC	mountain sucker	<i>Catostomus platyrhynchus</i>
SHRD	shorthead redhorse	<i>Moxostoma macrolepidotum</i>
SLRD	silver redhorse	<i>Moxostoma anisurum</i>
QUIL	quillback	<i>Carpoides cyprinus</i>
LKCH	lake chub	<i>Couesius plumbeus</i>
FLCH	flathead chub	<i>Platygobio gracilis</i>
LNDC	longnose dace	<i>Rhinichthys cataractae</i>
PRDC	pearl dace	<i>Margariscus margarita</i>
NRDC	northern redbelly dace	<i>Phoximus eos</i>
FNDC	finescale dace	<i>Phoximus neogaeus</i>
SPSH	spottail shiner	<i>Notropis hudsonius</i>
EMSH	emerald shiner	<i>Notropis atherinoides</i>
RVSH	river shiner	<i>Notropis blennioides</i>
FTMN	fathead minnow	<i>Pimephales promelas</i>
SLSC	slimy sculpin	<i>Cottus cognatus</i>
SPSC	spoonhead sculpin	<i>Cottus ricei</i>
TRPR	trout-perch	<i>Percopsis omiscomaycus</i>
BRST	brook stickleback	<i>Culaea inconstans</i>
GOFS	goldfish	<i>Carassius auratus</i>
UNKN/UNID	Unknown or Unidentified Species	--
NFC	No Fish Captured	--

Source: 1 Mackay *et al.* 1990 with modifications

British Columbia Fish Species Acronym List		
Acronym ¹	Common Name	Scientific Name
AO	salmon (general)	<i>Oncorhynchus</i> spp.
BB	burbot	<i>Lota lota</i>
BCB	black crappie	<i>Pomoxis nigromaculatus</i>
BL	western brook lamprey	<i>Lampetra richardsoni</i>
BMC	brassy minnow	<i>Hybognathus hankinsoni</i>
BNH	brown bullhead	<i>Ameiurus nebulosus</i>
BSU	bridgelip sucker	<i>Catostomus columbianus</i>
BT	bull trout	<i>Salvelinus confluentus</i>
C	minnow (general)	<i>Cyprinid</i> spp.
CAL	coastrange sculpin	<i>Cottus aleuticus</i>
CAS	prickly sculpin	<i>Cottus asper</i>
CC	sculpin (general)	<i>Cottus</i> spp.
CCG	slimy sculpin	<i>Cottus cognatus</i>
CCT	coastal cutthroat trout	<i>Oncorhynchus clarki clarki</i>
CH	chinook salmon	<i>Oncorhynchus tshawytscha</i>
CLA	Pacific staghorn sculpin	<i>Leptocottus armatus</i>
CM	chum salmon	<i>Oncorhynchus keta</i>
CMC	chiselmouth	<i>Acrocheilus alutaceus</i>
CO	coho salmon	<i>Oncorhynchus kisutch</i>
CP	carp	<i>Cyprinus carpio</i>
CRH	torrent sculpin	<i>Cottus rhotheus</i>
CSU	largescale sucker	<i>Catostomus macrocheilus</i>
CT	cutthroat trout (general)	<i>Oncorhynchus clarki</i>
DC	dace (general)	<i>Rhinichthys</i> spp.
DV	dolly varden	<i>Salvelinus malma</i>
EB	brook trout	<i>Salvelinus fontinalis</i>
ESC	emerald shiner	<i>Notropis atherinoides</i>
EU	eulachon	<i>Thaleichthys pacificus</i>
GSG	green sturgeon	<i>Acipenser medirostris</i>
KO	kokanee	<i>Oncorhynchus nerka</i>
L	lamprey (general)	<i>Lampetra</i> spp.
LDC	leopard dace	<i>Rhinichthys falcatus</i>
LKC	lake chub	<i>Couesius plumbeus</i>
LNC	longnose dace	<i>Rhinichthys cataractae</i>
LSM	longfin smelt	<i>Spirincus thaleichthys</i>
LSU	longnose sucker	<i>Catostomus catostomus</i>
LT	lake trout	<i>Salvelinus namaycush</i>
LW	lake whitefish	<i>Coregonus clupeaformis</i>
MSU	mountain sucker	<i>Catostomus platyrhincus</i>
MW	mountain whitefish	<i>Prosopium williamsoni</i>
NDC	nooksack dace	<i>Rhinichthys</i> sp.
NP	northern pike	<i>Esox lucius</i>
NSC	northern pikeminnow	<i>Ptychocheilus oregonensis</i>
PCC	peamouth chub	<i>Mylocheilus caurinus</i>
PK	pink salmon	<i>Oncorhynchus gorbuscha</i>
PL	Pacific lamprey	<i>Lampetra tridentata</i>
PMB	pumpkinseed, sunfish	<i>Lepomis gibbosus</i>
PW	pygmy whitefish	<i>Prosopium coulteri</i>
RB	rainbow trout	<i>Oncorhynchus mykiss</i>
RL	river lamprey	<i>Lampetra ayresi</i>
RSC	reidside shiner	<i>Richardsonius balteatus</i>

British Columbia Fish Species Acronym List		
Acronym ¹	Common Name	Scientific Name
RW	round whitefish	<i>Prosopium cylindraceum</i>
SB	stickleback (general)	<i>Gasterosteus</i> spp.
SFL	starry flounder	<i>Platichthys stellatus</i>
SG	sturgeon (general)	<i>Acipenser</i> spp.
SH	american shad	<i>Alosa sapidissima</i>
SK	sockeye salmon	<i>Oncorhynchus nerka</i>
SSM	surf smelt	<i>Hypomesus pretiosus</i>
ST	steelhead	<i>Oncorhynchus mykiss</i>
SST	summer steelhead	<i>Oncorhynchus mykiss</i>
SSU	salish sucker	<i>Catostomus</i> sp.
STC	spottail shiner	<i>Notropis hudsonius</i>
SU	sucker (general)	<i>Catostomus</i> spp.
TSB	threespine stickleback	<i>Gasterosteus aculeatus</i>
WCT	westslope cutthroat trout	<i>Oncorhynchus clarki lewisi</i>
WF	whitefish (general)	<i>Prosopium</i> spp.
WSG	white sturgeon	<i>Acipenser transmontanus</i>
WSU	white sucker	<i>Catostomus commersoni</i>

Source: 1 Resources Information Standards Committee (RISC) 1997

1.0 INTRODUCTION

Pipeline activities that have the potential to impact fish or fish habitat in Canada must be constructed and operated in compliance with the federal *Fisheries Act*. The *Fisheries Act* prohibits any work, undertaking or activity that results in “serious harm” to fish that are part of a commercial, recreational or Aboriginal (CRA) fishery, or to fish that support such a fishery. The *Fisheries Act* defines serious harm as:

“the death of fish or permanent alteration to, or destruction of, fish habitat.” (Fisheries and Oceans Canada [DFO] 2013a).

In recent months, Fisheries and Oceans Canada (DFO) has revised their approach for routine or “low risk” activities by encouraging proponents to complete an effects self-assessment framework (DFO 2014a). This “Self-Assessment” framework, in part, replaces previous DFO Operational Statements (OSs) and eliminates the requested notification process for low risk project types that commonly occur in various regions of Canada. DFO’s self-assessment framework guides proponents in the evaluation of their project and its potential to cause serious harm. Initial steps in the self-assessment framework include identifying types of waterbodies (e.g., any waterbody that does not contain fish at any time of year) and project activities, when completed in accordance with specific associated criteria, where serious harm to fish is unlikely to result. Where a project activity occurs at these specific types of waterbodies or otherwise meets the provided criteria, notification to or review by DFO is not required. Activity-specific criteria and suitable mitigation measures provided by DFO, or *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2014b), are intended to ensure that proponents comply with the *Fisheries Act* during the construction and operation of commonly occurring project activities. It remains the proponent’s responsibility to ensure the avoidance and/or full mitigation of potential project effects on a CRA fishery or other fish species on which the CRA fishery depends, where possible.

Where a potential adverse project effect to a CRA fishery can neither be avoided nor fully mitigated, as determined through the self-assessment framework, a Residual Effect is likely to result (DFO 2013a). In these cases, it is then the responsibility of the proponent to identify, characterize and predict the likelihood of occurrence and significance of the Residual Effect, thereby determining the potential for serious harm and, where warranted, ensure suitable offsetting measures are achieved in order to maintain the sustainability and productivity of the affected CRA fishery (Figure 1). Where serious harm is expected (following review by the National Energy Board [NEB]), an application for Authorization under the *Fisheries Act*, along with a suitable offset plan, must also be submitted to DFO. Within this document, a Residual Effect is considered to be “effects that are present after mitigation is applied” (NEB 2014).

During any application for an Authorization, proponents are required to demonstrate that measures and standards have been applied to first avoid, then mitigate and then finally offset any/all serious harm to fish that are part of or support a CRA fishery. Project activities that will not result in serious harm do not require Authorization under the *Fisheries Act*.

Following recent policy changes related to the *Fisheries Act*, a Memorandum of Understanding (MOU) between DFO and the NEB was established in December 2013. The MOU outlines the responsibilities of the NEB with respect to the review of fish and fish habitat under the Fisheries Protection Provisions of the *Fisheries Act*. The MOU describes the responsibility of the NEB as follows:

“to conduct assessments of energy infrastructure applications for potential impacts to fish and fish habitat to ensure that the assessment process considers the intent and requirements of the Fisheries Act, Species at Risk Act and their associated regulatory and policy frameworks...and include as conditions in its approval any appropriate measures to avoid, mitigate, or offset those impacts...” (NEB 2013).

If the NEB assessment concludes that a proposed energy infrastructure project may require Authorization under the *Fisheries Act*, the NEB may also refer the application to DFO. The issuance of an Authorization under paragraph 35(2)(b) of the *Fisheries Act* remains the responsibility of DFO.

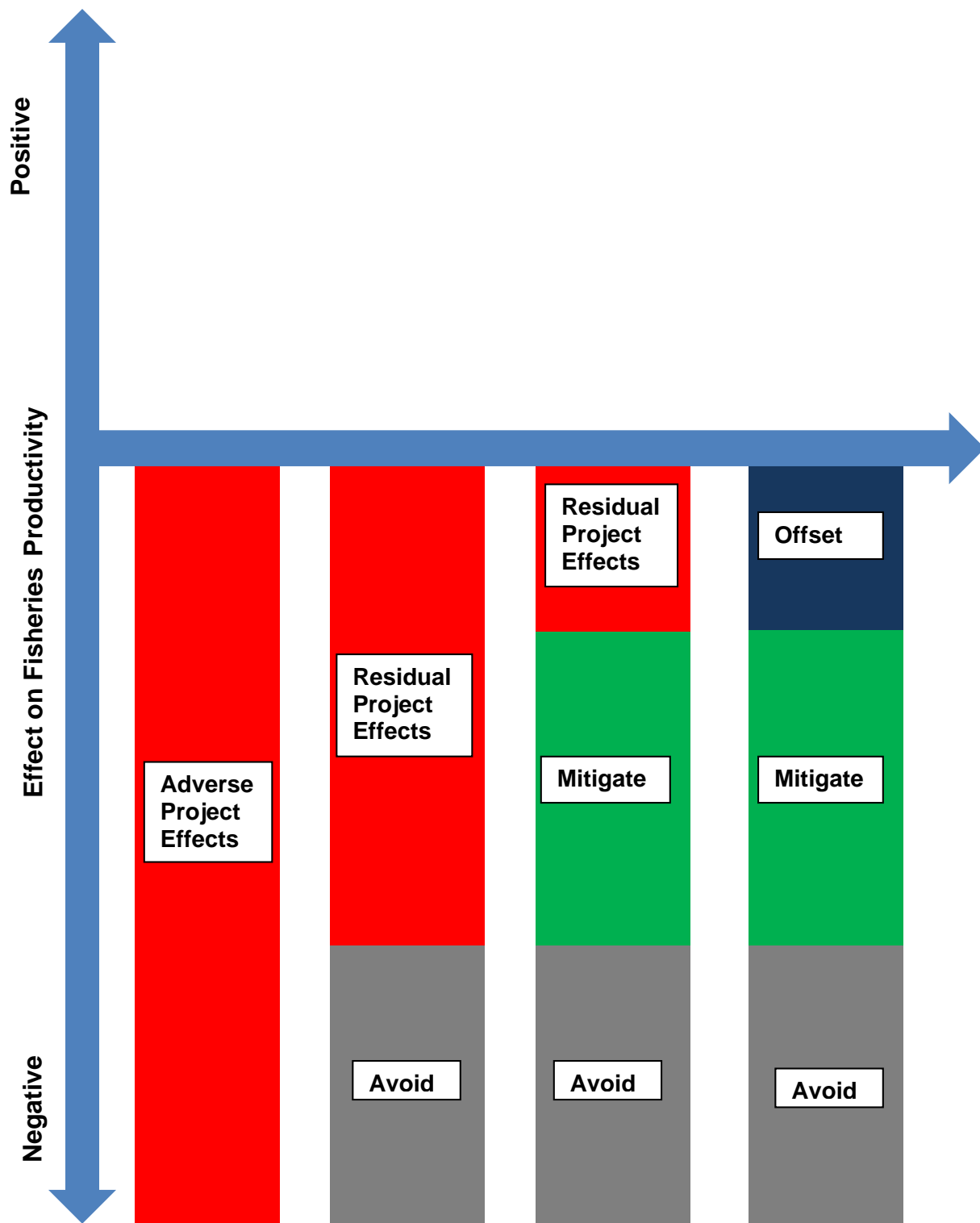
A previous report, titled *The Process For: Self-Assessment of Potential for Serious Harm to Fish and Fish Habitat Resulting from the Trans Mountain Pipeline ULC Trans Mountain Expansion Project*, submitted to the NEB (CH2M HILL Energy Canada, Ltd. 2014; Filing ID [A4F5C7](#)) outlined the methods and the process

for a self-assessment of potential for serious harm (self-assessment process) developed by Trans Mountain Pipeline ULC (Trans Mountain) for the evaluation of fish-bearing waterbodies intersected by the Trans Mountain Expansion Project's (TMEP's or the Project's) proposed pipeline corridor and associated power lines, Burnaby Terminal and new temporary access (NTA), pipeline right-of-way trails (PRT) and deactivated overgrown access (DOA) roads to be constructed or upgraded to support pipeline construction. This report provides the results of this self-assessment and identifies:

- crossings of fish-bearing habitat which are not expected to result in serious harm;
- crossings of fish-bearing habitat with a moderate risk and for which a Request for Review by the NEB/DFO is recommended to confirm that there is no potential for serious harm; and
- crossings of fish-bearing habitat that pose a high risk and, therefore, require a Request for Review by the NEB/DFO, to confirm the need for Authorization under the *Fisheries Act*.

Crossings occurring at select nonfish-bearing habitat were also considered for potential serious harm evaluation during the Project's self-assessment process; this includes several crossings of nonfish-bearing watercourses with an assigned least risk-biological window based on the immediate proximity of a fish-bearing watercourse or reach. In these instances, appropriate mitigation will be adhered to, preventing the likelihood of serious harm.

Figure 1 Conceptual Diagram of the Hierarchy (Adapted from *Fisheries Protection Policy Statement*, DFO 2013a)



1.1 Potential Project Effects

The Project's self-assessment process considers relevant environmental Pathways of Effects (PoE), whereby the implementation (where feasible) of appropriate measures disrupts the pathway to avoid or mitigate potential negative effects on fish and fish habitat. DFO has identified commonly occurring PoE for works in or around water and summarized typical cause-and-effect relationships between activities, stressors and fish habitat (DFO 2013b). In general, DFO's PoE have been categorized on the basis of their location relative to a waterbody; those which are land-based or in water.

The PoE associated with pipeline (and access road) construction and operations in or near aquatic environments are well-known. During the Project's construction phase, clearing, grubbing and grading and the removal of riparian vegetation near fish-bearing watercourses will be necessary, and pipeline construction methods, including trenchless, trenched or blasting techniques, may be used. Installation of the pipeline under fish habitat will occur and instream construction and riparian reclamation measures are proposed. Temporary and permanent supporting infrastructure (including access roads and temporary vehicle and equipment crossing structures) will also be necessary. Operations activities will involve the maintenance of the pipeline, pipeline right-of-way and permanent infrastructure, and the potential installation and removal of temporary crossing structures as warranted.

Definitions and effects of TMEP's construction and operations activities, as adapted from DFO (2013b), are as follows.

- **Vegetation Clearing:** *"The removal or clearing of the existing terrestrial vegetation within a given tract of land. This may be achieved through the manual or mechanized removal of vegetation using industrial equipment, herbicides which kill or inhibit the growth of certain plants, or any other method (i.e., manual) that results in the alteration of terrestrial vegetation"* (DFO 2013c). Changes in habitat structure and cover, sediment, contaminant and nutrient concentrations, water temperature, and food sources are also potential effects.
- **Cleaning and Maintenance of Bridges or Other Structures:** *"The cleaning, maintenance, or surface preparation of bridges or other structures. This may involve industrial cleaning or surface preparation equipment such as high pressure water blasters, mechanical sweepers and scrubbers, sandblasters, or any other technique or chemical product used to clean, strengthen, or prepare surfaces for additional processing or to refine or roughen surfaces to meet finishing requirements"* (DFO 2013d). Changes to sediment and contaminant concentrations are potential effects.
- **Excavation:** *"The process of removing soil and rock from the land. It does not include grading or dredging. This is achieved through mechanical cutting, digging, or scooping which leaves a cut, cavity, trench, or depression in the land surface"* (DFO 2013e). Potential effects include changes to baseline flow, water temperature and sediment concentration.
- **Use of Explosives:** *"Detonation of explosive materials in or near water during construction, maintenance or decommissioning phases"* (DFO 2013f). Potential effects include changes to nutrient, contaminant and sediment concentrations, and lethal or sublethal effects on fish.
- **Grading:** *"The process of altering a land surface or adjusting the landscape slope for drainage. This may be achieved through manual or mechanical compaction, cutting, filling, or smoothing operations in order to meet a designated form and function. It does not include excavation or dredging"* (DFO 2013g). Change in habitat structure as well as cover and alteration in sediment concentrations are potential effects.
- **Use of Industrial Equipment:** *"The use of mechanical equipment for the purpose of construction, maintenance, and/or transportation and generally any activity where machinery is working on land or in water"* (DFO 2013h). Potential mortality of fish/eggs/ova from equipment and changes to sediment and contaminant concentrations are potential effects.
- **Addition or Removal of Aquatic Vegetation:** *"The addition or removal of aquatic vegetation. This may be achieved by hand, with herbicides, or with mechanical equipment"* (DFO 2013i). Changes in water

temperature, dissolved oxygen, sediment, contaminant and nutrient concentrations, food supply, and habitat cover and structure are potential effects.

- Fish Passage Issues: “*Activities that cause physical or physiological impediments to fish movement or migration*” (DFO 2013j). Potential effects include incidental entrainment, impingement or mortality of resident species, changes in access to habitats, and inter-basin transfer of species.
- Placement of Material or Structures in Water: “*The placement of material or structures such as rip-rap, piers, piles, infill material, rafts, dams or other structures that either fully or partially obstruct flow on the bed or banks of a water body/watercourse*” (DFO 2013k). Potential effects include changes in food supply, habitat structure and cover, and sediment and nutrient concentrations.
- Structure Removal: “*The removal of non-natural in-water structures such as rip-rap, docks, bridges, or dams. They may be removed manually or with mechanical equipment*” (DFO 2013l). Potential effects include changes to sediment and contaminant concentrations as well as food supply and habitat structure and cover.
- Water Extraction: “*Water-taking from groundwater sources, lakes, and rivers for a variety of purposes such as municipal drinking water supplies, irrigation of agricultural lands and golf courses, and industrial functions such as nuclear facilities, pulp mills, mining, and hydroelectric power generation. A distinction may be drawn between ‘consumptive’ (water not returned to the watershed, as in water bottling and beverage manufacturing) and ‘non-consumptive’ (such as municipal drinking water supplies) water-taking activities. This is achieved primarily through pumping*” (DFO 2013m). Potential effects include direct mortality of fish.
- Change in Timing, Duration and Frequency of Flow. “*Any activities that result in changes in the timing, duration, and/or frequency of water flow. Causes include water extraction, operation of hydroelectric facilities, installation of culverts, stream bank erosion and sediment deposit, underwater soil erosion, and the construction of temporary or permanent dams*” (DFO 2013n). Potential effects include the displacement or stranding of fish, changes to migration/access to habitat, habitat structure and cover, and food supply as well as changes to water temperature and nutrient, contaminant and sediment concentrations.

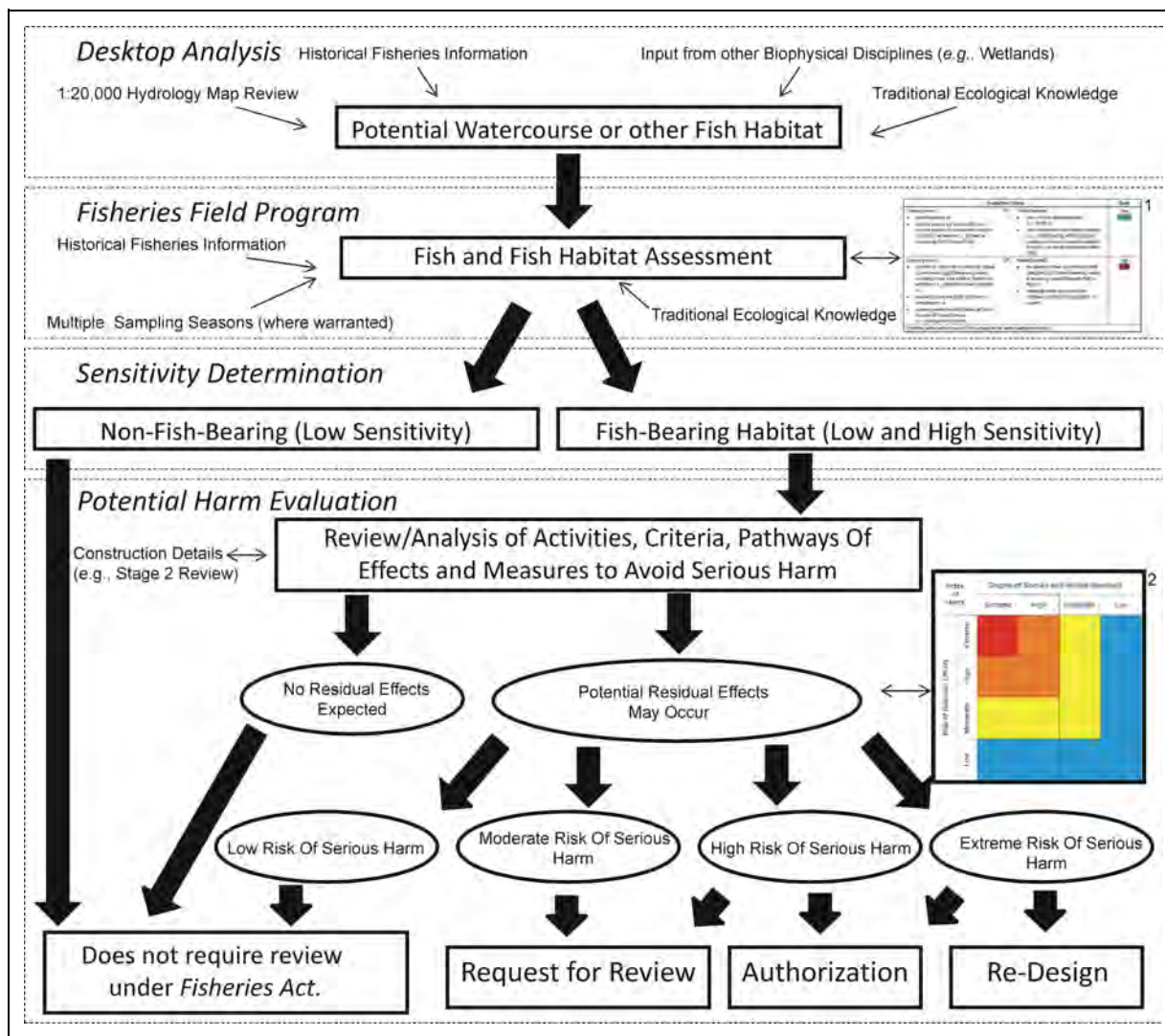
Avoidance of fish habitat (where feasible) as well as the successful implementation of common and best management practices (*i.e.*, mitigation) can break many of these PoE, eliminating the potential for serious harm to fish habitat. General mitigation measures adopted by the Project are provided in Section 8.7 of Volume 6B, Pipeline Environmental Projection Plan (Trans Mountain, December 2013; Filing ID [A3S2S3](#)) and Section 7.0 of Technical Reports 5C-6 (Fisheries [Alberta] Technical Report; Filing ID [A3S1W7](#)) and 5C-7 (Fisheries [British Columbia] Technical Report; Filing ID [A3S2C2](#)). Where warranted, additional site-specific mitigation or offsetting measures may also need to be developed following the self-assessment process.

2.0 A SELF-ASSESSMENT PROCESS FOR THE TRANS MOUNTAIN EXPANSION PROJECT

2.1 Overview

The Project's self-assessment process follows a step-wise approach (Figure 2). Collectively, desktop analyses and field assessments determined fish habitat sensitivity for each of the proposed watercourse crossings with potential fish habitat. Details on the methods and criteria used for these initial stages of the self-assessment process are provided in Section 3.0 of Technical Reports 5C-6 (Fisheries [Alberta] Technical Report) and 5C-7 (Fisheries [British Columbia] Technical Report). Waterbodies in Alberta and British Columbia which were determined to be nonfish-bearing at the proposed pipeline corridor, of Low sensitivity, and where fish-bearing habitat was located outside the zone-of-influence (ZOI) (as defined in Sections 3.7 and 3.4 of Technical Reports 5C-6 and 5C-7) were excluded from subsequent evaluation of potential for serious harm. Alternatively, fish-bearing habitat or waterbodies which were otherwise of High sensitivity or Low sensitivity, but may provide seasonal habitat value for CRA fishery species, were referenced against proposed construction methods and timing during the self-assessment process's Potential Harm Evaluation stage.

Figure 2 The Self-Assessment Process for the Trans Mountain Expansion Project



Note: 1 For more detail, see Section 3.7 of Technical Report 5C-6 and Section 3.4 of Technical Report 5C-7 of the Project's application to the NEB.

2.2 Potential Harm Evaluation

2.2.1 Binary Decisions

Avoidance of fish habitat (where practical) or the successful implementation of common and best management practices (*i.e.*, mitigation) can, in many instances, eliminate all of the Project's PoE, preventing the potential for serious harm. However, in some instances, unavoidable construction or logistical considerations (*e.g.*, method or timing) may render typical avoidance or best management practices unfeasible. In these scenarios, Residual Effects may result from remaining PoE, unless additional or site-specific mitigation can be developed.

Where warranted, additional or site-specific mitigation is typically developed in conjunction with a Qualified Aquatic Environmental Specialist (QAES) (in Alberta) or a Qualified Environmental Professional (QEP) (in British Columbia [BC]) and project engineering and management staff. The intent of additional site-specific measures (if warranted) is to reduce or eliminate the potential for serious harm where general mitigation measures or DFO's *Measures to Avoid Harm to Fish and Fish Habitat* (DFO 2014b) alone are insufficient. Potential site-specific mitigation measures, among others, that could be applied at a given Project site include: the use of pre-spawning surveys; redd surveys; the use of spawning deterrents (*e.g.*, placement of snow-fence, mesh or other matting over spawning gravel); and transporting migrating fishes around instream isolations. Detailed planning for additional site-specific mitigation measures is still required (*e.g.*, spawning survey timing) and will be dependent on final construction design and timing.

As a preliminary step in the Potential Harm Evaluation (Appendix A), the Project's design construction methods for the construction of the pipeline (*i.e.*, primary and contingency) and associated temporary access structures along with associated avoidance and mitigation strategies were first considered with reference to DFO's PoE. This qualitative process followed a sequence of questions requiring binary choice answers (*i.e.*, "Yes" or "No" answers).

1. Can all of the criteria outlined in DFO's Project Activities be met by the Project design?
2. Can all applicable mitigation measures listed in DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO 2014b) be implemented to address the PoE?
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?

If the Project's answer to Question 1 and 2 was "Yes", it can be expected that with successful implementation of standard best management practices (*i.e.*, adhering to DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat*), serious harm will not result and Project review by the NEB/DFO is not required. No further evaluation under Questions 3 and 4 were necessary in this scenario, which allowed the vast majority of Low sensitivity fish-bearing watercourses, with an open Least Risk Biological Window (LRBW), to be "screened out" of the self-assessment process.

Alternatively, should the answer to either Question 1 or 2 be "No", the Potential Harm Evaluation was to be extended to Questions 3 and 4. If the subsequent answers to both Questions 3 and 4 was "Yes", it would again be recommended that with successful implementation of all mitigation measures adopted for the Project (*i.e.*, DFO's *Measures to Avoid Causing Harm to Fish and Fish Habitat* and all additional site-specific mitigation), serious harm will not result and Project review by DFO is not required. If, however, the answer to Question 4 was "No" (*i.e.*, not all PoE can be broken by all practical avoidance or mitigation strategies), some level of Residual Effect has the potential to result. When this occurred, an evaluation of the risk of Residual Effect was then carried out using the Index of Harm (Appendix A).

DFO's Project Activity list is not currently as explicit as DFO's preceding guiding documents (*i.e.*, previously provided OSs with respect to pipeline construction activities). However, it is understood that revision of the activity list (and associated criteria) is underway and standard pipeline construction methods (*e.g.*, trenchless pipeline construction methods) which were previously identified as low risk and managed through OSs will be included in the next version of the Project Activity list. As a result, the Project has assumed that activities previously managed by an OS will also be listed as an activity not requiring DFO review, assuming their associated criteria can be met.

2.2.2 Index of Harm

Where anticipated, potential effects for Project activities and associated criteria not listed by DFO (DFO 2104a) and for which avoidance and mitigation measures may not be adequate (*i.e.*, Residual Effects) were considered further during a severity or “Index of Harm” evaluation (Appendix A). The Index of Harm evaluation, similar to DFO’s Risk Management Framework (DFO 2006), used a matrix to assess the severity of the Residual Effect through simultaneous consideration of parameters related to species and habitat sensitivity and severity of negative Residual Effect at each crossing.

Parameters considered during the evaluation of species and habitat sensitivity at each crossing included:

- fish species rarity;
- fish species sensitivity;
- species potential to comprise or support a CRA fishery;
- habitat sensitivity, rarity and use;
- riparian habitat values;
- the crossing method proposed and the potential spatial extent of Residual Effects;
- construction timing with reference to the crossing’s LRBW (see Sections 3.7 and 3.4 of Technical Reports 5C-6 and 5C-7 [Filing IDs A3S1W7 and A3S2C2, respectively]);
- the area, duration, intensity, frequency and reversibility of the Residual Effect;
- the probability of, and confidence level in, the understanding of the Residual Effect; and
- the potential for multiple or associated Residual Effects.

Each parameter was ranked individually, with a potential effect score ranging from 0 (none) to 4 (extreme) (Appendix B). Scores resulting from the evaluation of all species and habitat sensitivity parameters were then totalled and plotted along the horizontal axis of the Index of Harm. Scores from the risk of Residual Effects parameters were totalled and plotted on the vertical axis. Based on the combined total scores along the two axes, either a Low, Moderate, High or Extreme index rating was assigned to the Residual Effects of the Project activity.

Where a Low rating resulted, serious harm resulting from Residual Effects was determined to be unlikely and, therefore, review by the NEB/DFO is not required. Where a Moderate rating resulted and the potential for serious harm was inconclusive, but unlikely, it is recommended that a Request for Review of the crossing be made to the NEB/DFO. In these instances, additional site-specific mitigation measures will reduce the index severity, thereby reducing the potential for serious harm and need for Authorization under the *Fisheries Act*. An Authorization from DFO may be required for all High and Extreme rated crossings. Crossing location, type and/or construction design revision may need to be considered by the proponent.

Where serious harm may occur in riparian areas, the Residual Riparian Effect was quantified (m^2) as the product of right-of-way width (m) and Functional Riparian Area width(s) (both banks) (m). Residual Instream Effects considers the area (m) directly affected and the indirect downstream effects that occur within the ZOI. The ZOI is generally determined in the field and is based on the professional experience and judgment of a QAES or QEP who takes into account a variety of factors (*e.g.*, stream gradient, channel width, channel depth, channel morphology, flow velocity and discharge, and instream cover). The ZOI typically includes the area of the watercourse where 90% of the sediment load caused by construction activities is expected to fall out of suspension and be deposited (Government of Alberta 2013a,b). The affected riparian and instream areas were then used to estimate offsetting requirements to be implemented to ensure the sustainability and productivity of the area’s CRA fisheries.

Where a proposed contingency pipeline construction method was provided, it was rated individually (if warranted) and separate scores for primary and contingency methods were plotted on the same Index of

Harm matrix, along with the crossing's proposed temporary vehicle crossing method. In these instances, the highest rated index was used to describe the overall index for that crossing. Caution should be applied when considering the overall rating, as in some cases, the rating may result only from a contingency method that may not be required at the time of construction. Where a crossing only requires a vehicle crossing structure (*i.e.*, at NTA and DOA roads), only a single index score was generated, if warranted (*i.e.*, where best management practices and crossing guides are being followed [*e.g.*, use of clear span bridges over fish-bearing watercourses], crossings were not evaluated).

Until further direction is received from the NEB/DFO on the evaluation of serious harm with respect to riparian vegetation, the Index of Harm focused on the quality of functional riparian habitat and if the temporary removal of the riparian vegetation would be considered "limiting". "Functional" is interpreted as providing habitat (*e.g.*, cover and shading) and or food supply areas (*e.g.*, detritus; instream vegetation) to fish species/life stages, and "limiting" is interpreted as meaning offering considerable benefits to fishes which are otherwise absent from other sources, or if that riparian vegetation were to be temporarily removed, its absence would limit the potential for fishes within that watercourse.

3.0 RESULTS OF POTENTIAL HARM EVALUATION

Crossings of habitat with Low sensitivity, and for which the Project's answers to Questions 1 and 2 during the Binary Decisions step were "Yes", were excluded from further consideration. Pending successful implementation of the Project's adopted mitigation measures, no Residual Effects are expected to result at these crossings. A summary of these locations is provided in Table 1.

For convenience, results of the Potential Harm Evaluation (Binary Decisions and Index of Harm where warranted) at each crossing of High sensitivity fish-bearing habitat, or crossing of Low sensitivity fish-bearing habitat where "Yes" could not be answered to Questions 1 and 2 have been attached to the backside of each respective crossing's atlas page. Results of these Potential Harm Evaluations of the watercourse crossings in Alberta are provided in Appendix C; evaluations of crossings in BC are provided in Appendix D. The results of the Potential Harm Evaluation of High sensitivity fish-bearing crossings are also summarized below in Table 2A and 2B (Alberta and BC, respectively).

Of the 193 watercourse crossings of High sensitivity fish-bearing habitat, or habitat otherwise rated as High sensitivity (35 crossings in Alberta, 158 crossings in BC), 72% (24 crossings in Alberta, 115 crossings in BC) are not expected to result in a Residual Effect because standard pipeline mitigation measures are expected to reduce or avoid the occurrence of potential Residual Effects; as such, these watercourses were not evaluated within the Index of Harm and are summarized in Table 2. Of the 54 remaining High sensitivity watercourse crossings (11 in Alberta, 43 in BC), some potential Residual Effect may occur. As a result, these 54 sites were evaluated for the risk of the anticipated Residual Effect, using the Index of Harm (see Tables 3A [Alberta] and 3B [BC]). The results separated for the primary and contingency crossing methods show:

Primary Crossing Methods

	Risk Category for Residual Effect	Number of Watercourse Crossings
Alberta	Low	4
	Moderate	2
	High	5
BC	Low	14
	Moderate	6
	High	23

Contingency Crossing Methods

	Risk Category for Residual Effect	Number of Watercourse Crossings
Alberta	Low	-
	Moderate	-
	High	4
BC	Low	-
	Moderate	-
	High	42

Particulars related to crossings rated as being of Extreme, High, Moderate and Low indices are provided in the following subsections.

3.1 Crossings with an Extreme Index Rating

There are no crossings (primary or contingency pipeline construction methods, or temporary vehicle access structures) of fish-bearing watercourses proposed in either Alberta or BC where the risk of Residual Effect or sensitivity of those watercourses is rated as extreme.

3.2 Crossings with a High Index Rating

All watercourses where either the primary (n=26) or contingency (n=46) pipeline construction method proposed was evaluated as High on the Index of Harm had a corresponding High species and habitat sensitivity. For the majority of these watercourses, a High risk of Residual Effect is associated with an isolated crossing outside of the LRBW proposed. Generally, the use of fish salvages in conjunction with other site-specific mitigation is considered sufficient in negating the potential for serious harm. Trans Mountain is requesting a NEB/DFO review of all watercourse crossings assigned a High risk of residual effect and confirmation that the general and site-specific mitigation proposed is sufficient to avoid serious harm at these locations.

It should also be noted that many of the watercourses evaluated and subsequently ranked with a High risk of Residual Effect were in the lower end of the High category (*i.e.*, scored 23 or 24, where the category ranges from 23-33).

3.3 Crossings with a Moderate Index Rating

A total of eight watercourse crossings were assigned a Moderate index rating; two of these are in Alberta and are associated with the primary (and only proposed) crossing method occurring outside of the LRBW. A completed salvage of fishes at these two locations may not be successful. At the six locations in BC where the primary crossing method has been assigned a moderate index rating, it is assumed that the general and site-specific mitigative measures available will be sufficient to avoid serious harm to fishes and their habitat. These watercourses have still been included for NEB/DFO review and confirmation, but are not expected to require Authorization or offsetting.

3.4 Crossings with a Low Index Rating

The 18 watercourse crossings assigned a Low index rating are all watercourses where a primary trenchless crossing method has been proposed. No serious harm is anticipated; as such Authorization or offsetting will not be required. A contingency method for each trenchless crossing method proposed has been evaluated accordingly.

3.5 Crossings with Potential for Species at Risk

There are total of eight watercourses in BC where proposed critical habitat and/or the presence of *Species at Risk Act* (SARA) listed species (nooksack dace or salish sucker) is relevant. These watercourses are indicated in Table 2B. A Potential Harm Evaluation sheet was not completed for each of these sites because the primary method is either trenchless or isolated trenched (with flow isolation) inside the LRBW that avoids all critical life stages for these species. At each of these sites where a trenchless primary method has been proposed, a contingency method would also be isolated trenched inside the LRBW. Based on the crossing methods and timing proposed, along with additional site-specific mitigation proposed for species at risk (refer to the Supplemental Fisheries [British Columbia] Technical Report for the Trans Mountain Pipeline ULC Trans Mountain Expansion Project [Triton December 2014]; Filing ID [A4H1Z2](#)), no Residual Effects are anticipated.

TABLE 1

**FISH-BEARING WATERCOURSE CROSSINGS WITH A
 LOW SENSITIVITY AND NO EXPECTED RESIDUAL EFFECT - NOT REQUIRING NEB/DFO REVIEW**

Watercourse Crossing	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Alberta				
Unnamed Tributary to Goldbar Creek	AB-1	Low	No	Not Required ¹
Goldbar Creek	AB-2	Low	No	Not Required ¹
Mill Creek	AB-7	Low	No	Not Required ¹
Unnamed Wetland	AB-16	Low	No	Not Required ¹
Unnamed NCD	AB-17	Low	No	Not Required ¹
Dog Creek	AB-18	Low	No	Not Required ¹
Atim Creek	AB-19	Low	No	Not Required ¹
Unnamed Tributary to Atim Creek	AB-20	Low	No	Not Required ¹
Unnamed Tributary to Atim Creek	AB-21	Low	No	Not Required ¹
Kilini Creek	AB-25	Low	No	Not Required ¹
Unnamed Wetland	AB-28	Low	No	Not Required ¹
Unnamed Wetland	AB-31	Low	No	Not Required ¹
Unnamed Tributary to Kilini Creek	AB-34	Low	No	Not Required ¹
Unnamed Tributary to Wabamun Lake	AB-37a	Low	No	Not Required ¹
Unnamed Wetland	AB-39a	Low	No	Not Required ¹
Unnamed Tributary to Wabamun Lake	AB-39h	Low	No	Not Required ¹
Unnamed Tributary to Wabamun Lake	AB-44	Low	No	Not Required ¹
Unnamed Tributary to Sturgeon River	AB-59	Low	No	Not Required ¹
Unnamed Tributary to Isle Lake	AB-60	Low	No	Not Required ¹
Zeb-igler Creek	AB-78	Low	No	Not Required ¹
Unnamed Wetland	AB-79	Low	No	Not Required ¹
Unnamed Tributary to Lobstick River	AB-82	Low	No	Not Required ¹
Unnamed Tributary to Chip Lake	AB-90	Low	No	Not Required ¹
Unnamed Tributary to Chip Lake	AB-92	Low	No	Not Required ¹
Unnamed Tributary to Chip Lake	AB-93	Low	No	Not Required ¹
Unnamed Tributary to Chip Lake	AB-98	Low	No	Not Required ¹
Unnamed NCD at RK 165.6	AB-103	Low	No	Not Required ¹
Unnamed Tributary to Chip Lake	AB-106	Low	No	Not Required ¹
Unnamed Wetland	AB-113	Low	No	Not Required ¹
Unnamed Tributary to Brule Creek	AB-114	Low	No	Not Required ¹
Unnamed Tributary to Lobstick River	AB-118	Low	No	Not Required ¹
Unnamed Tributary to January Creek	AB-123	Low	No	Not Required ¹
January Creek	AB-128	Low	No	Not Required ¹
Unnamed Tributary to McLeod River	AB-140	Low	No	Not Required ¹
Unnamed Tributary to McLeod River	AB-143	Low	No	Not Required ¹
Unnamed Wetland	AB-146	Low	No	Not Required ¹
Unnamed Tributary to Ponoka Creek	AB-154	Low	No	Not Required ¹
Unnamed Tributary to Cache Percotte Creek	AB-176	Low	No	Not Required ¹
Unnamed Tributary to Hardisty Creek	AB-178	Low	No	Not Required ¹
Unnamed Tributary to Hardisty Creek	AB-179	Low	No	Not Required ¹
Happy Creek	AB-185	Low	No	Not Required ¹
Unnamed Tributary to Maskuta Creek	AB-194	Low	No	Not Required ¹
Unnamed Tributary to Maskuta Creek	AB-202	Low	No	Not Required ¹
BC				
Unnamed Channel	BC-6	Low	No	Not Required ¹
Robina Creek	BC-66	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-67	Low	No	Not Required ¹
Unnamed Channel	BC-69	Low	No	Not Required ¹
Unnamed Channel	BC-70	Low	No	Not Required ¹
Unnamed Channel	BC-72a	Low	No	Not Required ¹

TABLE 1 Cont'd

Watercourse Crossing	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Unnamed Channel	BC-73a	Low	No	Not Required ¹
Unnamed Channel	BC-74a	Low	No	Not Required ¹
Unnamed Channel	BC-74b	Low	No	Not Required ¹
Unnamed Channel	BC-89	Low	No	Not Required ¹
Unnamed Channel	BC-91	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-92	Low	No	Not Required ¹
Unnamed Channel	BC-104	Low	No	Not Required ¹
Switch Creek	BC-107	Low	No	Not Required ¹
Unnamed Channel	BC-109a	Low	No	Not Required ¹
Unnamed Channel	BC-113	Low	No	Not Required ¹
Unnamed Channel/Wetland	BC-132	Low	No	Not Required ¹
Unnamed Channel	BC-153	Low	No	Not Required ¹
Unnamed Channel	BC-156	Low	No	Not Required ¹
Whitewater Creek	BC-173	Low	No	Not Required ¹
Unnamed Channel	BC-174	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-185	Low	No	Not Required ¹
Unnamed Channel	BC-187	Low	No	Not Required ¹
Unnamed Channel	BC-189a	Low	No	Not Required ¹
Unnamed Channel	BC-210	Low	No	Not Required ¹
Unnamed Channel	BC-213	Low	No	Not Required ¹
Unnamed Channel	BC-215	Low	No	Not Required ¹
Unnamed Channel	BC-217	Low	No	Not Required ¹
Unnamed Channel	BC-217a	Low	No	Not Required ¹
Unnamed Channel	BC-218	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-219	Low	No	Not Required ¹
Unnamed Channel	BC-220	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-222	Low	No	Not Required ¹
Unnamed Channel	BC-228	Low	No	Not Required ¹
Unnamed Channel	BC-230	Low	No	Not Required ¹
Sager Creek	BC-249	Low	No	Not Required ¹
Bearpark Creek	BC-251	Low	No	Not Required ¹
Unnamed Channel	BC-276	Low	No	Not Required ¹
Montanna Creek	BC-286	Low	No	Not Required ¹
Crossing Creek	BC-302	Low	No	Not Required ¹
School Creek	BC-310	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-314b	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-316	Low	No	Not Required ¹
Unnamed Channel	BC-342	Low	No	Not Required ¹
Unnamed Channel	BC-374	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-414	Low	No	Not Required ¹
Peterson Creek	BC-426	Low	No	Not Required ¹
Unnamed Channel	BC-532	Low	No	Not Required ¹
Skuagam Creek	BC-534	Low	No	Not Required ¹
Unnamed Channel	BC-561	Low	No	Not Required ¹
Unnamed Channel	BC-562	Low	No	Not Required ¹
Unnamed Channel	BC-567	Low	No	Not Required ¹
Unnamed Channel	BC-624	Low	No	Not Required ¹
Unnamed Channel	BC-625	Low	No	Not Required ¹
Unnamed Channel	BC-630	Low	No	Not Required ¹
Menz Creek	BC-652a	Low	No	Not Required ¹
Unnamed Channel	BC-655	Low	No	Not Required ¹
Unnamed Channel	BC-669a	Low	No	Not Required ¹
Unnamed Channel	BC-669b	Low	No	Not Required ¹
Unnamed Channel	BC-669c	Low	No	Not Required ¹

TABLE 1 Cont'd

Watercourse Crossing	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Unnamed Channel	BC-678	Low	No	Not Required ¹
Unnamed Channel	BC-682	Low	No	Not Required ¹
Unnamed Channel	BC-683	Low	No	Not Required ¹
Unnamed Channel	BC-684	Low	No	Not Required ¹
Unnamed Channel	BC-686	Low	No	Not Required ¹
Unnamed Channel	BC-689	Low	No	Not Required ¹
Unnamed Channel	BC-693	Low	No	Not Required ¹
Unnamed Channel	BC-694	Low	No	Not Required ¹
Unnamed Channel	BC-697	Low	No	Not Required ¹
Unnamed Channel	BC-710	Low	No	Not Required ¹
Unnamed Channel	BC-723	Low	No	Not Required ¹
Unnamed Channel	BC-724	Low	No	Not Required ¹
Unnamed Channel	BC-733	Low	No	Not Required ¹
Unnamed Channel	BC-744	Low	No	Not Required ¹
Turkey Brook Creek	BC-748	Low	No	Not Required ¹
Unnamed Channel	BC-749a	Low	No	Not Required ¹
Unnamed Drainage (Wetland)	BC-754	Low	No	Not Required ¹
Unnamed Channel	BC-768b	Low	No	Not Required ¹
Unnamed Channel	BC-770f	Low	No	Not Required ¹
Unnamed Channel	BC-780a1	Low	No	Not Required ¹
Unnamed Channel	BC-780a2	Low	No	Not Required ¹
Unnamed Channel	BC-783a2	Low	No	Not Required ¹
Holmes Creek	BC-783b	Low	No	Not Required ¹
<i>Watercourses Crossed by Power Lines (No Instream Works Proposed)</i>				
North Thompson River	BCT-2	High	No	Not Required ¹
Voght Creek	BCT-14	Low	No	Not Required ¹
Unnamed Channel	BCT-15	Low	No	Not Required ¹
Kanevale Creek	BCT-16	Low	No	Not Required ¹
Howarth Creek	BCT-21	High	No	Not Required ¹
<i>Additional Unmapped Drainages Identified by Engineering (LiDAR)</i>				
Unmapped Drainage	BC-722a	Low	No	Not Required ¹
Unmapped Drainage	BC-722b	Low	No	Not Required ¹
Unmapped Drainage	BC-725a	Low	No	Not Required ¹
Unmapped Drainage	BC-725b	Low	No	Not Required ¹
Unmapped Drainage	BC-725c	Low	No	Not Required ¹
Unmapped Drainage	BC-725d	Low	No	Not Required ¹
Unmapped Drainage	BC-725e	Low	No	Not Required ¹
Unmapped Drainage	BC-726a	Low	No	Not Required ¹
Unmapped Drainage	BC-726b	Low	No	Not Required ¹
Unmapped Drainage	BC-726c	Low	No	Not Required ¹
Unmapped Drainage	BC-726d	Low	No	Not Required ¹
Unmapped Drainage	BC-726e	Low	No	Not Required ¹
Unmapped Drainage	BC-728d	Low	No	Not Required ¹
Unmapped Drainage	BC-728e	Low	No	Not Required ¹
Unmapped Drainage	BC-728f	Low	No	Not Required ¹
Unmapped Drainage	BC-728g	Low	No	Not Required ¹
Unmapped Drainage	BC-728h	Low	No	Not Required ¹
Unmapped Drainage	BC-728i	Low	No	Not Required ¹
Unmapped Drainage	BC-729b	Low	No	Not Required ¹
Unmapped Drainage	BC-729c	Low	No	Not Required ¹
Unmapped Drainage	BC-730a	Low	No	Not Required ¹
Unmapped Drainage	BC-730b	Low	No	Not Required ¹
Unmapped Drainage	BC-730c	Low	No	Not Required ¹
Unmapped Drainage	BC-732a	Low	No	Not Required ¹

TABLE 1 Cont'd

Watercourse Crossing	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Unmapped Drainage	BC-732b	Low	No	Not Required ¹
Unmapped Drainage	BC-733a	Low	No	Not Required ¹
Unmapped Drainage	BC-733b	Low	No	Not Required ¹
Unmapped Drainage	BC-747a	Low	No	Not Required ¹
Unmapped Drainage	BC-747b	Low	No	Not Required ¹
Unmapped Drainage	BC-750a	Low	No	Not Required ¹
Unmapped Drainage	BC-750b	Low	No	Not Required ¹
Unmapped Drainage	BC-751b	Low	No	Not Required ¹
Unmapped Drainage	BC-751c	Low	No	Not Required ¹
Unmapped Drainage	BC-755a	Low	No	Not Required ¹
Unmapped Drainage	BC-755b	Low	No	Not Required ¹
Unmapped Drainage	BC-758a	Low	No	Not Required ¹
Unmapped Drainage	BC-759a	Low	No	Not Required ¹
Unmapped Drainage	BC-759b	Low	No	Not Required ¹
Unmapped Drainage	BC-759c	Low	No	Not Required ¹
Unmapped Drainage	BC-759d	Low	No	Not Required ¹
Unmapped Drainage	BC-759e	Low	No	Not Required ¹
Unmapped Drainage	BC-770a	Low	No	Not Required ¹
Unmapped Drainage	BC-773c	Low	No	Not Required ¹
Unmapped Drainage	BC-780a3	Low	No	Not Required ¹

Note: 1 Meets the criteria of DFO's Project Activities and *Measures to Avoid Harm Causing Harm to Fish and Fish Habitat*, or with sufficient additional/alternative mitigation measures, can avoid potential serious harm and, therefore, does not require DFO review.

TABLE 2

FISH-BEARING WATERCOURSE CROSSINGS WITH A HIGH SENSITIVITY AND NO EXPECTED RESIDUAL EFFECT - REQUESTED NEB/DFO REVIEW

Watercourse Crossing Name	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Alberta				
Fulton Creek**	AB-5	High	No ¹	Yes ¹
Blackmud Creek	AB-12	High	No ¹	Yes ¹
Unnamed Tributary to North Saskatchewan River (locally referred to as Wedgewood Creek)	AB-15	High	No ¹	Yes ¹
Unnamed Wetland	AB-39f	High	No ¹	Yes ¹
Unnamed Wetland	AB-39g	High	No ¹	Yes ¹
Unnamed Tributary to Chip Lake	AB-101	High	No ¹	Yes ¹
Little Brule Creek	AB-111	High	No ¹	Yes ¹
Carrot Creek	AB-119	High	No ¹	Yes ¹
Unnamed Tributary to January Creek	AB-124	High	No ¹	Yes ¹
Unnamed Tributary to January Creek	AB-125	High	No ¹	Yes ¹
Unnamed Tributary to January Creek	AB-126	High	No ¹	Yes ¹
Bench Creek	AB-132	High	No ¹	Yes ¹
Bench Creek	AB-136	High	No ¹	Yes ¹
Unnamed Tributary to McLeod River	AB-141	High	No ¹	Yes ¹
Unnamed Tributary to McLeod River	AB-144	High	No ¹	Yes ¹
Rooster Creek	AB-153	High	No ¹	Yes ¹
Ponoka Creek	AB-155	High	No ¹	Yes ¹
Roundcroft Creek	AB-157	High	No ¹	Yes ¹
Sandstone Creek	AB-162	High	No ¹	Yes ¹
Unnamed Tributary to Hunt Creek	AB-163	High	No ¹	Yes ¹
Hunt Creek	AB-164	High	No ¹	Yes ¹

TABLE 2 Cont'd

Watercourse Crossing Name	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Trail Creek	AB-167	High	No ¹	Yes ¹
Unnamed Tributary to Athabasca River	AB-168	High	No ¹	Yes ¹
Cache Percotte Creek	AB-177	High	No ¹	Yes ¹
BC				
Baer Creek	BC-3	High	No ¹	Yes ¹
Marathon Creek	BC-5	High	No ¹	Yes ¹
Terry Fox Creek	BC-8	High	No ¹	Yes ¹
Teepee Creek	BC-27	High	No ¹	Yes ¹
Crooked Creek	BC-28	High	No ¹	Yes ¹
Unnamed Channel	BC-43	High	No ¹	Yes ¹
Unnamed Channel	BC-51	High	No ¹	Yes ¹
Unnamed Channel	BC-55	High	No ¹	Yes ¹
Unnamed Channel	BC-71	High	No ¹	Yes ¹
Unnamed Channel	BC-80	High	No ¹	Yes ¹
Unnamed Channel	BC-84	High	No ¹	Yes ¹
Unnamed Channel	BC-90	High	No ¹	Yes ¹
Unnamed Channel	BC-175	High	No ¹	Yes ¹
Cook Creek	BC-176	High	No ¹	Yes ¹
Cedar Creek	BC-177	High	No ¹	Yes ¹
Unnamed Channel	BC-181	High	No ¹	Yes ¹
Unnamed Channel	BC-186	High	No ¹	Yes ¹
Unnamed Drainage (Wetland)	BC-214	High	No ¹	Yes ¹
Sundt Creek	BC-224	High	No ¹	Yes ¹
Tumtum Creek	BC-227	High	No ¹	Yes ¹
Unnamed Channel	BC-238	High	No ¹	Yes ¹
Unnamed Channel	BC-239	High	No ¹	Yes ¹
Unnamed Channel	BC-240	High	No ¹	Yes ¹
Avola Creek	BC-242	High	No ¹	Yes ¹
Unnamed Drainage (Wetland)	BC-243a	High	No ¹	Yes ¹
Unnamed Channel	BC-244	High	No ¹	Yes ¹
Unnamed Channel	BC-248	High	No ¹	Yes ¹
Hornet Creek	BC-259	High	No ¹	Yes ¹
Cornet Creek	BC-260	High	No ¹	Yes ¹
Cove Creek	BC-277	High	No ¹	Yes ¹
Peavine Creek	BC-296	High	No ¹	Yes ¹
Mann Creek	BC-315	High	No ¹	Yes ¹
Unnamed Drainage (Wetland)	BC-317	High	No ¹	Yes ¹
Lemieux Creek	BC-330	High	No ¹	Yes ¹
Nehalliston Creek	BC-331	High	No ¹	Yes ¹
Eakin Creek	BC-332	High	No ¹	Yes ¹
Montigny Creek	BC-336	High	No ¹	Yes ¹
Thuya Creek	BC-338	High	No ¹	Yes ¹
Darlington Creek	BC-343	High	No ¹	Yes ¹
Lindquist Creek	BC-344	High	No ¹	Yes ¹
Jamieson Creek	BC-371	High	No ¹	Yes ¹
Lanes Creek	BC-376	High	No ¹	Yes ¹
Dairy Creek	BC-381	High	No ¹	Yes ¹
Anderson Creek	BC-433	High	No ¹	Yes ¹
Moore Creek	BC-459	High	No ¹	Yes ¹
Clapperton Creek	BC-482	High	No ¹	Yes ¹
Shuta Creek	BC-486	High	No ¹	Yes ¹
Godey Creek	BC-512	High	No ¹	Yes ¹
Kwinshatin Creek	BC-531	High	No ¹	Yes ¹
Unnamed Channel	BC-533	High	No ¹	Yes ¹

TABLE 2 Cont'd

Watercourse Crossing Name	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Gillis Creek	BC-549	High	No ¹	Yes ¹
Unnamed Channel	BC-564	High	No ¹	Yes ¹
Juliet Creek	BC-571	High	No ¹	Yes ¹
Mine Creek	BC-579	High	No ¹	Yes ¹
Fallslake Creek	BC-588	High	No ¹	Yes ¹
Ladner Creek	BC-629	High	No ¹	Yes ¹
Dewdney Creek	BC-632	High	No ¹	Yes ¹
Karen Creek	BC-634	High	No ¹	Yes ¹
Unnamed Channel	BC-635	High	No ¹	Yes ¹
Railway Creek	BC-646	High	No ¹	Yes ¹
Chawuthen Creek	BC-658	High	No ¹	Yes ¹
Lorenzetta Creek	BC-666	High	No ¹	Yes ¹
Unnamed Channel	BC-681	High	No ¹	Yes ¹
Unnamed Channel	BC-685	High	No ¹	Yes ¹
Unnamed Channel	BC-688	High	No ¹	Yes ¹
Unnamed Channel	BC-690	High	No ¹	Yes ¹
Unnamed Channel	BC-695	High	No ¹	Yes ¹
Unnamed Channel	BC-700	High	No ¹	Yes ¹
Anderson Creek	BC-705	High	No ¹	Yes ¹
Unnamed Channel	BC-706a1	High	No ¹	Yes ¹
Bridal Creek	BC-706b	High	No ¹	Yes ¹
Nevin Creek	BC-708	High	No ¹	Yes ¹
Dunville Creek	BC-709	High	No ¹	Yes ¹
Unnamed Channel	BC-710a	High	No ¹	Yes ¹
Unnamed Channel (Brown Ditch)	BC-712	High	No ¹	Yes ¹
Elk Creek	BC-713*	High	No ¹	Yes ¹
Semmihault Creek	BC-714*	High	No ¹	Yes ¹
Chilliwack Creek	BC-715*	High	No ¹	Yes ¹
Chilliwack/Vedder River Side Channel	BC-716*	High	No ¹	Yes ¹
Hopedale Slough	BC-718*	High	No ¹	Yes ¹
Unnamed Channel	BC-719*	High	No ¹	Yes ¹
Street Creek	BC-720	High	No ¹	Yes ¹
Unnamed Channel	BC-721	High	No ¹	Yes ¹
Stewart Slough	BC-722	High	No ¹	Yes ¹
Sumas Lake Canal	BC-725	High	No ¹	Yes ¹
Sumas River	BC-726	High	No ¹	Yes ¹
Unnamed Channel	BC-730	High	No ¹	Yes ¹
Clayburn Creek	BC-731	High	No ¹	Yes ¹
Clayburn Creek	BC-732	High	No ¹	Yes ¹
McLennan Creek	BC-734	High	No ¹	Yes ¹
Unnamed Channel	BC-736	High	No ¹	Yes ¹
Nathan Creek	BC-747	High	No ¹	Yes ¹
West Creek	BC-749	High	No ¹	Yes ¹
Unnamed Channel	BC-750	High	No ¹	Yes ¹
Davidson Creek	BC-751	High	No ¹	Yes ¹
Salmon River	BC-753*	High	No ¹	Yes ¹
East Munday Creek	BC-766	High	No ¹	Yes ¹
West Munday Creek	BC-767	High	No ¹	Yes ¹
Yorkson Creek	BC-768	High	No ¹	Yes ¹
Unnamed Drainage (Wetland)	BC-768a	High	No ¹	Yes ¹
Unnamed Channel	BC-770	High	No ¹	Yes ¹
Leoran Creek	BC-770d	High	No ¹	Yes ¹
Unnamed Channel	BC-771	High	No ¹	Yes ¹
Unnamed Channel	BC-772	High	No ¹	Yes ¹

TABLE 2 Cont'd

Watercourse Crossing Name	Watercourse Crossing ID	Sensitivity	Residual Effect Expected	Request for Review
Unnamed Drainage (Wetland)	BC-773	High	No ¹	Yes ¹
Centre Creek	BC-774a	High	No ¹	Yes ¹
Unnamed Channel	BC-776a	High	No ¹	Yes ¹
Unnamed Channel	BC-777	High	No ¹	Yes ¹
Fraser River	BC-780	High	No ¹	Yes ¹
Unnamed Channel	BC-780b	High	No ¹	Yes ¹
Como Creek	BC-781	High	No ¹	Yes ¹
Nelson Creek	BC-782	High	No ¹	Yes ¹
Unnamed Channel	BC-783a4	High	No ¹	Yes ¹
Austin Creek	BC-784a	High	No ¹	Yes ¹
Stoney Creek	BC-785*	High	No ¹	Yes ¹

Note: 1 Meets the criteria of DFO's Project Activities and Measures to Avoid Harm Causing Harm to Fish and Fish Habitat, or with sufficient additional/alternative mitigation measures, can avoid potential serious harm; NEB/DFO review requested.

TABLE 3A

**INDEX OF HARM RESULTS FOR ALBERTA
HIGH SENSITIVITY FISH-BEARING WATERCOURSE CROSSINGS**

Watercourse Crossing Name	Watercourse Crossing ID	Species and Habitat Sensitivity Category	Risk Category for Residual Effect (Primary Pipeline)	Risk Category for Residual Effect (Contingency Pipeline)	Risk Category for Residual Effect (Vehicle Crossing)
Whitemud Creek (Alberta)	AB-13	17	24	(N/A) ²	7
North Saskatchewan River (Alberta)	AB-14	20	10	26	1
Pembina River (Alberta)	AB-66	17	8	26	1
Brule Creek (Alberta)	AB-116	12	20	(N/A) ²	7
Lobstick River (Alberta)	AB-117	15	20	(N/A) ²	7
Wolf Creek (Alberta)	AB-129	19	6	24	7
McLeod River (Alberta)	AB-131	20	6	27	1
Little Sundance Creek (Alberta)	AB-137	17	24	(N/A) ²	8
Sundance Creek (Alberta)	AB-138	19	24	(N/A) ²	9
Hardisty Creek (Alberta)	AB-180	19	24	(N/A) ²	9
Maskuta Creek (Alberta)	AB-188	19	24	(N/A) ²	9

TABLE 3B

**INDEX OF HARM RANKING RESULTS FOR BC
HIGH SENSITIVITY FISH-BEARING WATERCOURSE CROSSINGS**

Watercourse Crossing Name	Watercourse Crossing ID	Species and Habitat Sensitivity Category	Risk Category for Residual Effect (Primary Pipeline)	Risk Category for Residual Effect (Contingency Pipeline)	Risk Category for Residual Effect (Vehicle Crossing)
Fraser River	BC-10	19	30	(N/A) ²	(N/A) ¹
Swift Creek	BC-32	18	24	27	5
Canoe River	BC-36	17	24	26	5
Camp Creek	BC-38	16	23	25	5
Camp Creek	BC-52	16	23	25	5
Camp Creek	BC-56	18	23	25	5
Albreda River	BC-65a	19	23	25	5
Clemina Creek	BC-76	16	23	24	5

TABLE 3B Cont'd

Watercourse Crossing Name	Watercourse Crossing ID	Species and Habitat Sensitivity Category	Risk Category for Residual Effect (Primary Pipeline)	Risk Category for Residual Effect (Contingency Pipeline)	Risk Category for Residual Effect (Vehicle Crossing)
Dora Creek	BC-78	19	20	24	5
Albreda River	BC-82a	19	24	26	5
Albreda River	BC-85	19	24	26	5
Dominion Creek	BC-93	19	23	28	5
Moonbeam Creek	BC-94	17	23	28	5
Serpentine Creek	BC-110	17	23	28	5
North Thompson River	BC-111	19	5	29	(N/A) ¹
Chappell Creek	BC-112	17	23	28	5
Miledge Creek	BC-151	19	23	28	5
Thunder River	BC-168	18	24	29	5
Blue River	BC-178	19	5	27	5
Goose Creek	BC-180	18	19	24	5
North Thompson River	BC-182	19	5	29	(N/A) ¹
Froth Creek	BC-189	18	23	28	5
Foam Creek	BC-193b	16	22	26	5
Finn Creek	BC-201	18	23	28	5
North Thompson River	BC-236	19	5	29	(N/A) ¹
Mad River	BC-275	19	23	25	5
Raft River	BC-309	19	5	26	(N/A) ¹
Clearwater River	BC-312	20	5	31	(N/A) ¹
Thompson River	BC-413	18	5	29	(N/A) ¹
Nicola River	BC-504	19	5	24	5
Coldwater River	BC-548	20	5	24	5
Coldwater River	BC-559	20	5	24	5
Coldwater River	BC-570	20	5	24	5
Coldwater River	BC-582	20	5	23	5
Coquihalla River	BC-631	18	24	29	5
Coquihalla River	BC-636	18	21	29	(N/A) ¹
Coquihalla River	BC-639	18	21	29	(N/A) ¹
Coquihalla River	BC-645	18	21	29	(N/A) ¹
Coquihalla River	BC-654	18	5	29	(N/A) ¹
Silverhope Creek	BC-657	17	24	26	(N/A) ¹
Hunter Creek	BC-662	16	24	26	5
Wahleach Creek	BC-668	16	23	26	5
Chilliwack/Vedder River	BC-717	20	5	31	(N/A) ¹

- Notes:**
- 1 Meets the criteria of DFO's Project Activities and *Measures to Avoid Harm Causing Harm to Fish and Fish Habitat*, or with sufficient additional/alternative mitigation measures, can avoid potential serious harm and, therefore, does not require DFO review.
 - 2 No contingency crossing method identified.
 - * Watercourses with proposed critical habitat for SARA-listed species.
 - ** Nonfish-bearing habitat, but rated as High sensitivity habitat due to habitat potential for a species of management concern.

Species and Habitat Sensitivity Category

Low = 1-7	Moderate = 8-12	High = 13-21	Extreme = > 21
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Risk Category for Residual Effect from Primary or Contingency Pipeline Crossing Proposed

Low = 1-11	Moderate = 12-22	High = 23-33	Extreme = > 33
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4.0 FISH AND FISH HABITAT OFFSETTING

It is important to note that the evaluations completed in this self-assessment process include the potential for serious harm associated with contingency pipeline crossing methods and, therefore, are considered a “worst-case scenario”. As a result, the potential for serious harm for the Project may not be known until the successful completion of trenchless construction of the proposed pipeline at select watercourse crossings.

Regardless of whether offsetting will be required for either primary or contingency pipeline construction methods, or for access road construction and operations, Trans Mountain has initiated conceptual planning for the requirement of offsetting, should this be required to support an application for Authorization of serious harm under the *Fisheries Act*. If required, the Project's final Fish and Fish Habitat Offset Plan will be designed in consultation with regulators, fisheries managers, Aboriginal groups and other stakeholders, and with specific consideration for the guiding principles outlined in DFO's *Fisheries Productivity Investment Policy: A Proponents Guide to Offsetting* (DFO 2013o). More specifically, offset plans will:

- be designed to support local fisheries management objectives or local restoration priorities (*i.e.*, through consultation);
- result in benefits that balance Residual Effects through DFO's hierarchy of preferences (*i.e.*, through “in-kind” or “out-of-kind” approaches);
- result in additional benefits to the fishery; and
- result in self-sustaining, low maintenance benefits over the long-term.

It is anticipated that the types of offset measures considered will include habitat restoration and/or enhancement, habitat creation, biological or chemical manipulations, and/or complementary measures, including research-based projects, as defined in DFO's hierarchy of preferences (DFO 2013o).

5.0 SUMMARY

Trans Mountain's self-assessment process was developed to provide a measurable evaluation of the potential for serious harm and the risk level of potential Residual Effects (where required) resulting from the Project's construction and operations. The self-assessment was completed by QAESs and QEPs on behalf of the Project, with reference to construction methods and timings confirmed at the time of the assessment, and with the knowledge of the Project's intent to successfully implement all general and site-specific mitigation measures recommended.

Watercourse crossings rated as High in the Index of Harm for the risk of Residual Effects have a greater potential for serious harm than those ranked as Low. As such, Trans Mountain is requesting a review of all watercourse crossings with a High risk of Residual Effect and confirmation that the general and site-specific mitigation proposed is sufficient to avoid serious harm at these locations. Trans Mountain's goal is to construct the Project in a manner that avoids serious harm. For all watercourse crossings evaluated for the Project, the use of current industry best management practices in conjunction with both general and site-specific mitigation (where required) is intended to avoid serious harm; this is particularly true for all primary crossing methods evaluated for the Project. Should construction methods or timing be subsequently altered, or the adopted mitigation is determined to be unfeasible at the time of construction, a re-evaluation of the potential for serious harm may be necessary. Where general or site-specific mitigation measures may not be deemed sufficient by the DFO/NEB for standard pipeline construction and operations practices, there may be potential for serious harm and Authorization under the *Fisheries Act* may be required.

Sincerely,



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APPENDIX A

POTENTIAL HARM EVALUATION AND INDEX OF HARM TEMPLATE

Potential Harm Evaluation and Index of Harm

SUMMARY OF AQUATIC ENVIRONMENT: [Watercourse Name]

Federally/provincially-listed species present:	
Fishes present which comprise part of CRA fishery or which support a CRA fishery: (Yes/No)	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	
Riparian buffer setback distance:	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	
Zone-of-influence:	
Additional information provided in: [Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of Fisheries (BC) Technical Report (Filing ID A3S2C1-A3S2E1)]	

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	
LRBW proposed:	Inside or outside LRBW
Primary pipeline construction method/timing:	
Contingency pipeline construction method/timing:	
Vehicle crossing methods:	
Number of construction days of instream work anticipated:	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	
[Provide rationale]	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	
[Provide rationale]	

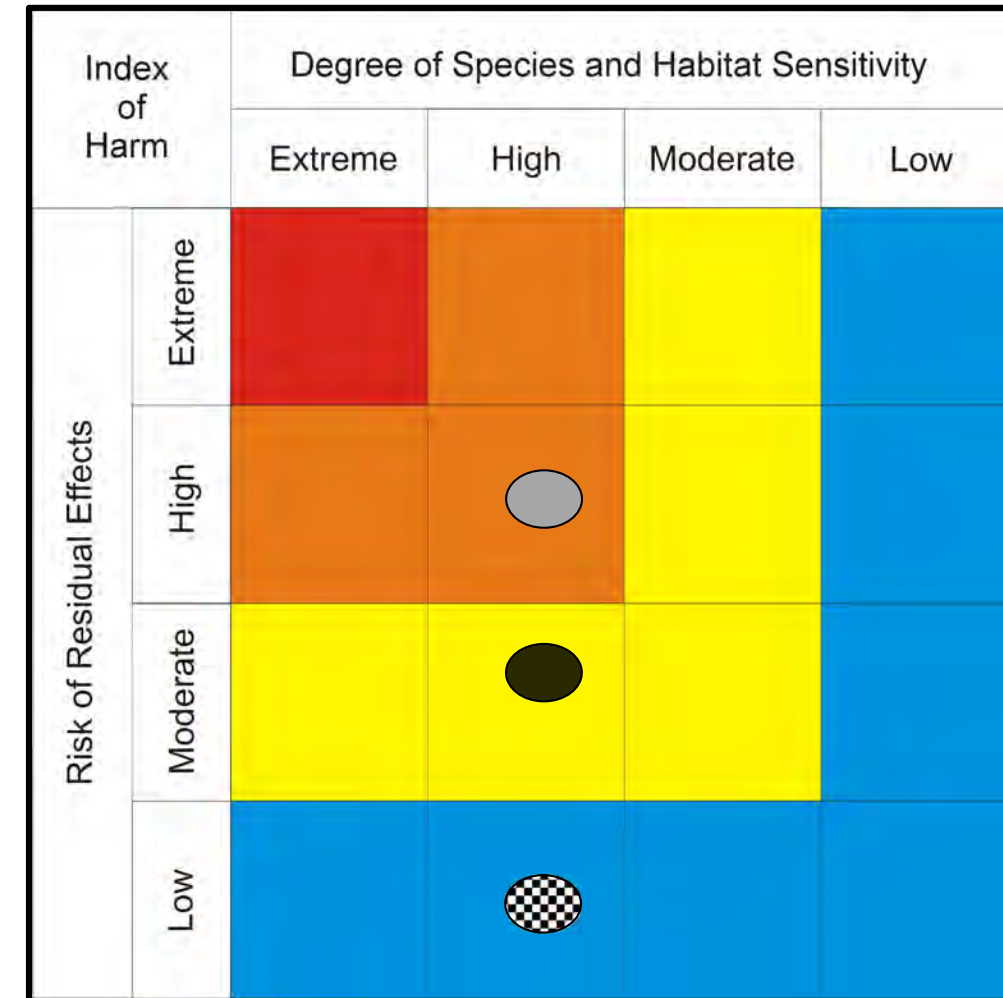
<i>If YES is answered to Questions 3 and 4 below, DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	
[Provide description/rationale]	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	
[Provide rationale]	

5. Using the Index of Harm matrix, what ranking did the proposed watercourse crossing receive?	
[Provide rationale]	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

INDEX OF HARM:



Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for Authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for Authorization under the Fisheries Act may not be required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Restricted Activity Period/LRBW) Reversibility of Potential Unmitigated Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

APPENDIX B
SENSITIVITY AND RISK RANKING MATRIX TEMPLATE

Sensitivity Rating of Fish and Fish Habitat						
Attribute	Extreme (4)	High (3)	Moderate (2)	Low (1)	None (0)	Score
Fish Species Present - Rarity (Alberta)	SARA - Schedule 1 listed species	Provincially Listed as Endangered or Threatened (under <i>Alberta's Wildlife Act</i>) during Detailed Status Assessment, or listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but are not a SARA-Schedule 1 listed species	Provincially Listed as Special Concern (under <i>Alberta's Wildlife Act</i>) during Detailed Status Assessment or otherwise as Sensitive (Alberta Sustainable Resource Development [ASRD] 2010) and are not a SARA-Schedule 1 or COSEWIC listed species	Provincially Listed as Data Deficient (under <i>Alberta's Wildlife Act</i>) during Detailed Status Assessment and are not a SARA-Schedule 1 or COSEWIC listed species	Provincially Listed as Not At Risk (under <i>Alberta's Wildlife Act</i>) during Detailed Status Assessment and are not a SARA-Schedule 1 or COSEWIC listed species	
Fish Species Present - Rarity (BC)	SARA-Schedule 1 listed species	Provincially Listed as having Red-List status (by the BC Conservation Data Centre [CDC]) or listed by COSEWIC, but are not a SARA-Schedule 1 listed species	Provincially Listed as having Blue-List status (by BC CDC) and are not a SARA-Schedule 1 or COSEWIC listed species	Provincially Listed as having Unknown or No Status (by BC CDC) and are not a SARA-Schedule 1 or COSEWIC listed species	Provincially Listed as having Yellow-List status (by BC CDC) and are not SARA-Schedule 1 or COSEWIC listed species	
Fish Species Present - CRA	n/a	Species present comprise part of a Commercial, Aboriginal and Recreational Fishery	Species present comprise part of a Commercial and/or Aboriginal and/or Recreational Fishery	Species present may support a Commercial, Aboriginal or Recreational Fishery	No fish present or species present do not support a Commercial, Aboriginal or Recreational Fishery	
Fish Species Sensitivity	n/a	Species present include those highly sensitive to aquatic and riparian disturbance (e.g., salmonids, burbot) - cold water species	Species present limited to those moderately sensitive to perturbation (e.g., Percidae and Catostomidae) - coolwater species	Species present are resilient to change and perturbation (e.g., many Cyprinidae species [i.e., Lake Chub] and Cottidae).	No fish present	
Functional Riparian Habitat Availability	Functional riparian habitat within watercourse limited to Project footprint only. Riparian habitat is adjacent to high value rearing or off-channel habitat. Removal of riparian vegetation would be considered limiting to fishes within a Commercial, Recreational or Aboriginal Fishery or species that supports such a fishery. (e.g., functional recovery time >10 years)	Functional riparian habitat within watercourse limited to Project footprint only. Riparian habitat is adjacent to moderate rearing habitat. Removal of riparian vegetation would be considered limiting to fishes within a Commercial, Recreational or Aboriginal Fishery or species that supports such a fishery. (e.g., functional recovery time <10 years, but >2 years)	Moderate level of functional riparian habitat present within footprint (i.e., overhanging vegetation [OHV] cover present). Somewhat limiting to fish throughout reach within LSA. Species composition/diversity moderate. (e.g., functional recovery time <2 years, but >1 year)	Abundant riparian vegetation. Not limited to Project footprint. Temporary loss of riparian vegetation would not be considered limiting. Instream habitat used for migration only or by fishes that support a Commercial, Recreational or Aboriginal Fishery. (e.g., functional recovery time <1 growing season)	No riparian habitat present	
Sensitivity of Habitat	n/a	High	n/a	Low	n/a	
Habitat Use	Habitat within footprint is used year round for all life stages	Habitat within footprint is used for spawning and/or wintering life stages	Habitat within footprint used seasonally for feeding or rearing life stages only	Habitat within footprint used as migratory corridor only	No use expected	
Habitat Availability/Rarity	Habitat type is limited to pipeline right-of-way (PROW) only	Habitat type in PROW is rare or limited throughout study site	Habitat type in the PROW is present elsewhere in the LSA but is limited in distribution or abundance	Habitat within PROW is not limited elsewhere in the LSA (i.e., common and abundant throughout LSA)	No fish habitat present	
Total (AB)						0
Total (BC)						0
Sensitivity Category						

Fish Habitat Sensitivity Category

Low = 1-7	Moderate = 8-12	High = 13-21	Extreme = >21
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Risk Categories for Residual Effect from Primary Pipeline Crossing Proposed						
Attribute	Extreme (4)	High (3)	Moderate (2)	Low (1)	None (0)	Score
Pipeline Crossing Type/Potential Spatial Extent of Effects	Trenched construction without isolation during flowing conditions/considerable zone-of-influence	Trenched construction with partial isolation (e.g., silt curtain) during flowing conditions/moderate zone-of-influence	Trenched construction with site isolation; limited instream equipment activity/limited extent for zone-of-influence	Trenchless construction with favourable geo-technical information; Trenched construction during dry or frozen to bottom conditions	n/a	
Construction Timing (AB)	Instream work outside least risk biological windows (i.e., within restricted activity period) despite confirmation of spawning or overwintering occurring within the footprint and/or LSA	Instream work within restricted activity period with no attempt to confirm spawning or overwintering occurring within the footprint and/or LSA	Instream work to occur outside restricted activity period but immediately adjacent to restricted activity period	Instream work occurring outside restricted activity period and not immediately adjacent to restricted activity period	No instream work required	
Construction Timing (BC)	Work outside least risk biological window despite confirmation of spawning or overwintering occurring within the footprint and/or LSA	Work outside least risk biological window with no attempt to confirm spawning or overwintering occurring within the footprint and/or LSA	Work within least risk biological window but immediately adjacent to beginning or end of window	Work within least risk biological window and sufficiently away from beginning or end of window	n/a	
Reversibility of Potential Residual Effects to Instream Habitat	Effects instream are long-term (i.e., > 10 years) or permanent (irreversible)	Effects instream will extend >1 year post-construction (medium-term) but are reversible	Effects instream will extend < 1 year post-construction (short-term) but are reversible	Effects instream are limited to time of construction only (immediately reversible)	No residual effects anticipated on instream habitat	
Reversibility of Potential Residual Effects to Riparian Habitat	Effects within functional riparian areas are long-term (i.e., >10 years) or permanent (irreversible)	Effects within functional riparian areas will extend >1 year post-construction (medium-term) but are reversible	Effects within functional riparian areas will extend < 1 year post-construction (short-term) but are reversible	Effects within functional riparian areas are limited to time of construction only (immediately reversible)	No residual effects anticipated on riparian areas	
Area of Residual Effect (Instream and Riparian)	>10,000 m ²	1,000 – 10,000 m ²	100 - 999 m ²	<100 m ²	0 m ²	
Duration of Residual Effect (e.g., time needed for instream works)	>30 days	15-30 days	2-15 days	<2 days	No instream activity	
Frequency of Potential Effect (within one year period)	Residual effects likely to occur continuously	Residual effect likely to occur seasonally or intermittently	Residual effect likely to occur rarely (e.g., once a year)	Residual effect likely to occur only once	n/a	
Probability of Residual Effect	Certain	High	Moderate	Low	None	
Confidence in the Understanding of the Potential Residual Effect	Low	Moderate	High	Certain	n/a	
Potential for Multiple Residual Effects (e.g., associated construction needs such as removal of beaver dam for trenched construction; blasting; and type of reclamation methods applied)	Continuous connective residual effects expected (e.g., remove entire established complex, which provides overwintering habitat [in winter]; hypoxic water release >500 m downstream; blasting instream outside least risk biological window and key life history stages present [i.e., spawning and/or incubating eggs])	Considerable associated residual effects possible (e.g., remove entire dam which provides overwintering habitat [in winter]; hypoxic water release <100 m downstream; blasting instream outside least risk biological window but no key life history stages present)	Partial associated residual effects possible (e.g., breach dam with partial loss of overwintering habitat only [in winter]; no hypoxic water release); blasting instream but within least risk biological window and compliant with available guidelines)	Related but benign associated residual effect possible (e.g., breach of dam in open water with time for dam re-establishment; no hypoxic water release; or no blasting instream)	None	
					Total (AB)	0
					Total (BC)	0
					Risk Category	

Risk Category for Residual Effect from Primary Pipeline Crossing Proposed

Low = 1-11	Moderate = 12-22	High = 23-33	Extreme = >33
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Risk Categories for Contingency Pipeline Crossing Proposed						
Attribute	Extreme (4)	High (3)	Moderate (2)	Low (1)	None (0)	Score
Pipeline Crossing Type/Potential Spatial Extent of Effects	Trenched construction without isolation during flowing conditions/considerable zone-of-influence	Trenched construction with partial isolation (e.g., silt curtain) during flowing conditions/moderate zone-of-influence	Trenched construction with site isolation; limited instream equipment activity/limited extent for zone-of-influence	Trenchless construction with favourable geo-technical information; Trenched construction during dry or frozen to bottom conditions	n/a	
Construction Timing (AB)	Instream work outside least risk biological windows (i.e., within restricted activity period) despite confirmation of spawning or overwintering occurring within the footprint and/or LSA	Instream work within restricted activity period with no attempt to confirm spawning or overwintering occurring within the footprint and/or LSA	Instream work to occur outside restricted activity period but immediately adjacent to restricted activity period	Instream work occurring outside restricted activity period and not immediately adjacent to restricted activity period	No instream work required	
Construction Timing (BC)	Work outside least risk biological window despite confirmation of spawning or overwintering occurring within the footprint and/or LSA	Work outside timing window with no attempt to confirm spawning or overwintering occurring within the footprint and/or LSA	Work within least risk biological window but immediately adjacent to beginning or end of window	Work within least risk biological window and sufficiently away from beginning or end of window	n/a	
Reversibility of Potential Residual Effects to Instream Habitat	Effects instream are long-term (i.e., >10 years) or permanent (irreversible)	Effects instream will extend >1 year post-construction (medium-term) but are reversible	Effects instream will extend <1 year post-construction (short-term) but are reversible	Effects instream are limited to time of construction only (immediately reversible)	No residual effects anticipated on instream habitat	
Reversibility of Potential Residual Effects to Riparian Habitat	Effects within functional riparian areas are long-term (i.e., >10 years) or permanent (irreversible)	Effects within functional riparian areas will extend >1 year post-construction (medium-term) but are reversible	Effects within functional riparian areas will extend <1 year post-construction (short-term) but are reversible	Effects within functional riparian areas are limited to time of construction only (immediately reversible)	No residual effects anticipated on riparian areas	
Area of Residual Effect (Instream and Riparian)	>10,000 m ²	1,000 – 10,000 m ²	100 - 999 m ²	<100 m ²	0 m ²	
Duration of Residual Effect (e.g., time needed for instream works)	>30 days	15-30 days	2-15 days	<2 days	No instream activity	
Frequency of Potential Effect (within one year period)	Residual effects likely to occur continuously	Residual effect likely to occur seasonally or intermittently	Residual effect likely to occur rarely (e.g., once a year)	Residual effect likely to occur only once	n/a	
Probability of Residual Effect	Certain	High	Moderate	Low	None	
Confidence in the Understanding of the Potential Residual Effect	Low	Moderate	High	Certain	n/a	
Potential for Multiple Residual Effects (e.g., associated construction needs such as removal of beaver dam for trenched construction; blasting; and type of reclamation methods applied)	Continuous connective residual effects expected (e.g., remove entire established complex, which provides overwintering habitat [in winter]; hypoxic water release >500 m downstream; blasting instream outside least risk biological window and key life history stages present [i.e., spawning and/or incubating eggs])	Considerable associated residual effects possible (e.g., remove entire dam which provides overwintering habitat [in winter]; hypoxic water release <100 m downstream; blasting instream outside least risk biological window but no key life history stages present)	Partial associated residual effects possible (e.g., breach dam with partial loss of overwintering habitat only [in winter]; no hypoxic water release); blasting instream but within least risk biological window and compliant with available guidelines)	Related but benign associated residual effect possible (e.g., breach of dam in open water with time for dam re-establishment; no hypoxic water release; or no blasting instream)	None	
					Total (AB)	0
					Total (BC)	0
					Risk Category	

Risk Category for Residual Effect from Contingency Pipeline Crossing Proposed

Low = 1-11	Moderate = 12-22	High = 23-33	Extreme = >33
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Risk Categories for Residual Effects from Vehicle Access Crossing Proposed						
Attribute	Extreme (4)	High (3)	Moderate (2)	Low (1)	None (0)	Score
Vehicle Equipment Crossing Type	Multiple Culverts (Closed Bottom Structures)	Culvert; multiple ford crossing	Multi-span structure	Clear-span structure; ice bridge/snowfill; single ford crossing; existing with structure modifications	Existing, no upgrades required	
Construction Timing (AB)	Instream work outside least risk biological windows (<i>i.e.</i> , within restricted activity period) despite confirmation of spawning or overwintering occurring within the footprint and/or LSA	Instream work within restricted activity period with no attempt to confirm spawning or overwintering occurring within the footprint and/or LSA	Instream work to occur outside restricted activity period but immediately adjacent to restricted activity period	Instream work occurring outside restricted activity period and not immediately adjacent to restricted activity period	No instream work required	
Construction Timing (BC)	Work outside least risk biological window despite confirmation of spawning or overwintering occurring within the footprint and/or LSA	Work outside timing window with no attempt to confirm spawning or overwintering occurring within the footprint and/or LSA	Work within least risk biological window but immediately adjacent to beginning or end of window	Work within least risk biological window and sufficiently away from beginning or end of window	n/a	
Reversibility of Potential Residual Effects to Instream Habitat	Effects instream are long-term (<i>i.e.</i> , >10 years) or permanent (irreversible)	Effects instream will extend >1 year post-construction (medium-term) but are reversible	Effects instream will extend <1 year post-construction (short-term) but are reversible	Effects instream are limited to time of construction only (immediately reversible)	No residual effects anticipated on instream habitat	
Reversibility of Potential Residual Effects to Riparian Habitat	Effects within functional riparian areas are long-term (<i>i.e.</i> , >10 years) or permanent (irreversible)	Effects within functional riparian areas will extend >1 year post-construction (medium-term) but are reversible	Effects within functional riparian areas will extend <1 year post-construction (short-term) but are reversible	Effects within functional riparian areas are limited to time of construction only (immediately reversible)	No residual effects anticipated on riparian areas	
Area of Residual Effect (Instream and Riparian)	>10,000 m ²	1,000 – 10,000 m ²	100 - 999 m ²	<100 m ²	0 m ²	
Duration of Residual Effect (e.g., time needed for instream works)	>30 days	15-30 days	2-15 days	<2 days	No instream activity	
Frequency of Potential Effect (within one year period)	Residual effects likely to occur continuously	Residual effect likely to occur seasonally or intermittently	Residual effect likely to occur rarely (<i>e.g.</i> , once a year)	Residual effect likely to occur only once	n/a	
Probability of Residual Effect	Certain	High	Moderate	Low	None	
Confidence in the Understanding of the Potential Residual Effect	Low	Moderate	High	Certain	n/a	
Potential for Multiple Residual Effects (e.g., associated construction needs such as removal of beaver dam for trenched construction; blasting; and type of reclamation methods applied)	Continuous connective residual effects expected (<i>e.g.</i> , remove entire established complex, which provides overwintering habitat [in winter]; hypoxic water release >500 m downstream; blasting instream outside least risk biological window and key life history stages present [<i>i.e.</i> , spawning and/or incubating eggs])	Considerable associated residual effects possible (<i>e.g.</i> , remove entire dam which provides overwintering habitat [in winter]; hypoxic water release <100 m downstream; blasting instream outside least risk biological window but no key life history stages present)	Partial associated residual effects possible (<i>e.g.</i> , breach dam with partial loss of overwintering habitat only [in winter]; no hypoxic water release); blasting instream but within least risk biological window and compliant with available guidelines)	Related but benign associated residual effect possible (<i>e.g.</i> , breach of dam in open water with time for dam re-establishment; no hypoxic water release; or no blasting instream)	None	
					Total (AB)	0
					Total (BC)	0
					Risk Category	

Risk Category for Residual Effect from Vehicle Access Crossing Proposed

Low = 1-11	Moderate = 12-22	High = 23-33	Extreme = >33
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TRANS MOUNTAIN EXPANSION PROJECT: SELF-ASSESSMENT OF POTENTIAL FOR SERIOUS HARM (ALBERTA)

**PREPARED AS APPENDIX C OF THE SELF-ASSESSMENT OF THE POTENTIAL FOR SERIOUS HARM TO FISH AND FISH HABITAT
RESULTING FROM THE TRANS MOUNTAIN PIPELINE ULC
TRANS MOUNTAIN EXPANSION PROJECT**



Prepared for:

Trans Mountain Pipelines ULC
Calgary, Alberta



Submitted by:



CH2M HILL Energy Canada, Ltd.
Calgary, Alberta

February 2015
SREP-NEB-TERA-00037



View upstream through centre of the proposed pipeline corridor (20-05-14).



View downstream through centre of the proposed pipeline corridor (20-05-14).



View of left bank approach at centre of the proposed pipeline corridor (20-05-14).



View of right bank approach at centre of the proposed pipeline corridor (20-05-14).

Channel Morphology

Pattern: Irregular wandering
 Confinement: Unconfined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run
 Gradient (%): 0.5
 Main Stem: Goldbar Creek, FB, 0.6 km DS

Water Quality/Quantity

Water Temperature (°C): 16.7
 Conductivity (µS/cm): 914
 pH: 7.8
 D. Oxygen (mg/L): 4.4
 Discharge (m³/s): Negligible
 Flow Regime: Perennial
 Turbidity: Stained
 Substrate %
 Organics: 36
 Fines: 47
 Sml Gravel: 17
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0
 Cover
 Dominant: Woody debris
 Subdominant: Instream vegetation
 Riparian
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 1-20 %

	Mean (m)	Range (m)
Wetted Width:	1.3	0.8-2.5
Channel Width:	1.7	0.8-4.2
Bank Height:	1.1	0.6-2.2
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

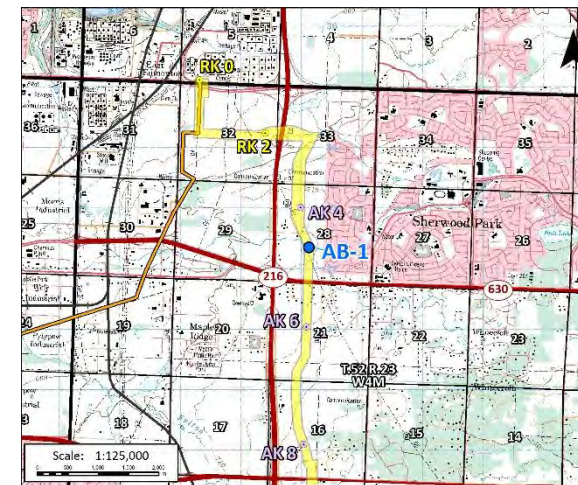
Species	YOY	Juv	Adult	Unknown
BRST				2 (observed)
FTMN				1 (observed)

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	L	N	M
BURB	L	L	N	M
NRDC	L	L	N	M
BKTR	L	L	N	M

Sampling Effort

Method	Time	Distance	Date
MT	55 h	n/a	08-06-13



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Class 1 as per Section 11 (2)

Reason for Decision: D < 0.3 m

Barriers to Fish Movement: None

Active Beaver Dams: No

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

FTMN previously documented (FWMIS 2014).

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing, clear span bridge or Type 3 culvert.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, snowfill/ice-bridge or clear span bridge.

Comments: Watercourse with wetland features. A subdivision and artificial springs are located approximately 220 m and 250 m upstream, respectively. No fish captured; however, fish observed during the 2013 field studies within the proposed pipeline corridor. The migration habitat potential rating was reduced channel morphology was updated following the 2014 supplemental studies. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Trib. to Goldbar Creek		AK 4.7		
		Survey Date:	June 8, 2013, May 20, 2014	LSD	SW 28-52-23 W4M	TMEP site:	AB-1	Sensitivity
		Drawn By:	B. Lunn	Approved By:	G. Eisler	UTM Zone:	12 345121 E 5932355 N NAD 83	
Date Issued:	June 6, 2014							

SUMMARY OF AQUATIC ENVIRONMENT: AB-1, Unnamed Tributary to Goldbar Creek at AK 4.7

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	No		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge, snowfill/ice bridge or Type 3 culvert		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

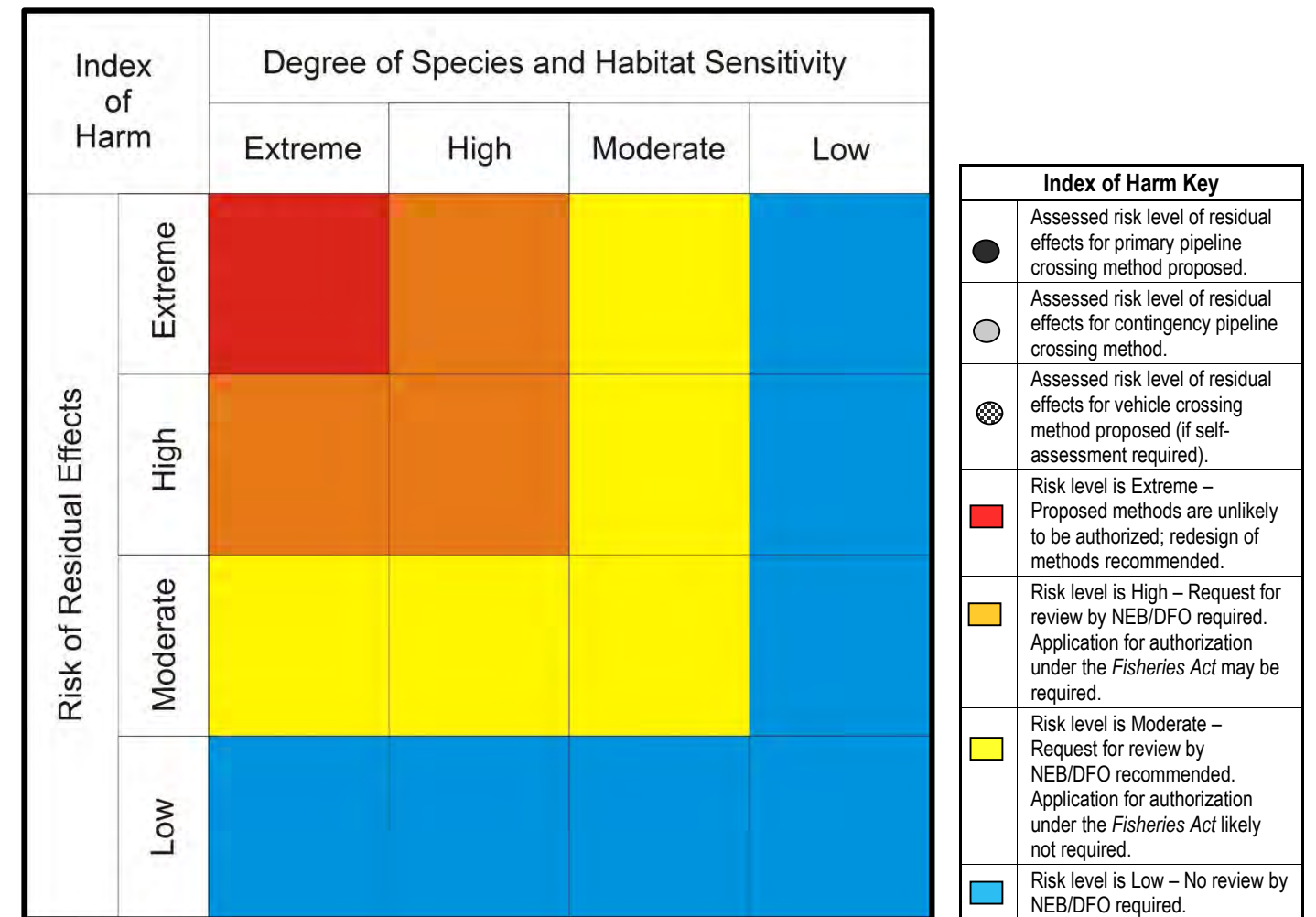
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (*i.e.*, provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> • Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect • Construction Timing vs. LRBW (Least Risk Biological Window) • Reversibility of Potential Residual Effect • Area of Residual Effect • Duration of Residual Effect • Intensity of Residual Effect • Frequency of Residual Effect • Probability of and Confidence in the Understanding of the Residual Effect • Potential for Multiple or Associated Residual Effects (<i>e.g.</i>, beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> • Fish Species Rarity • Presence of Species Belonging to or Supporting a CRA Fishery • Fish Species Sensitivity • Habitat Sensitivity, Rarity and Use • Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (10-06-13).



View downstream through centre of the proposed pipeline corridor (10-06-13).



View of left bank approach at centre of the proposed pipeline corridor (10-06-13).



View of right bank approach at centre of the proposed pipeline corridor (10-06-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Confined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Impoundment
 Habitat Unit through ZOI: Riffle-Pool
 Gradient (%): 0.7
 Main Stem: North Saskatchewan River, FB, 17 km DS

Water Quality/Quantity

Water Temperature (°C): 13
 Conductivity (µS/cm): 760
 pH: 8.3
 D. Oxygen (mg/L): 7.3
 Discharge (m³/s): 0.3
 Flow Regime: Perennial
 Turbidity: Moderately turbid
 Substrate %
 Organics: 0
 Fines: 38
 Sml Gravel: 17
 Lrg Gravel: 19
 Cobble: 13
 Boulder: 13
 Bedrock: 0
 Cover
 Dominant: Boulder
 Subdominant: Depth
 Riparian
 Type: Mixed C and D
 Maturity: Not recorded
 Crown Closure: 1-20 %

	Mean (m)	Range (m)
Wetted Width:	7.5	4.2-10
Channel Width:	8.5	4.5-11
Bank Height:	4.6	1.1-13.0
Pool Depth:	1.0	0.7-1.5

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
NFC	-	-	-	-

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	L	M	M-H
BURB	M-H	M-H	M	M-H
NRDC	M	M	M	M-H
BKTR	M	M	M	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	1,067 s	600 m	10-06-13



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

July 1 to April 15

Construction Timing:

To be determined

Stream Classification AB: Class C

Navigability: Potentially Navigable

Reason for Decision: Class cannot be established

Barriers to Fish Movement: Potential – beaver dam

Active Beaver Dams: Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring or open cut if frozen to the bottom.

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge or clear span bridge.

Historical Fish Presence:

BRST, FTMN, LKCH, LNDC, LNSC and WHSC previously documented (FWMIS 2014).

Comments: Habitat composed mainly of flat/slow run habitat with short sections of riffle. No fish captured; however, fish observed approximately 350 m downstream and 100 m upstream from the proposed pipeline corridor. Banks are steep and highly erodible causing embeddedness throughout. Steep, erodible and unstable banks at the centre of the proposed pipeline corridor. Realignment recommended for trenched construction to avoid steep banks and a site-specific bank reclamation plan may be needed. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Blackmud Creek		RK 24.2	
		Survey Date: June 10, 2013 Drawn By: K. Johnson Date Issued: June 11, 2013	Approved By: G. Eisler	LSD NW 29 – 51 – 24 W4M UTM Zone: 12 333196 E 5923414	TMEP site: AB-12 NAD 83	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-12, Blackmud Creek

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	500 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to April 15	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
	Low			

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Light Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (10-06-13).



View downstream through centre of the proposed pipeline corridor (10-06-13).



View of left bank approach at centre of the proposed pipeline corridor (10-06-13).



View of right bank approach at centre of the proposed pipeline corridor (10-06-13).

Channel Morphology

Pattern: Irregular wandering
 Confinement: Confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Flat
 Habitat Unit through ZOI: Flat
 Gradient (%): 1
 Main Stem: North Saskatchewan River, FB,
 14 km DS

	Mean (m)	Range (m)
Wetted Width:	9.2	6.0-13
Channel Width:	10.1	7.0-13
Bank Height:	2.9	1.2-8.4
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
NFC	-	-	-	-

Water Quality/Quantity

Water Temperature (°C): 12.0
 Conductivity (µS/cm): 844.0
 pH: 8.4
 D. Oxygen (mg/L): 9.0
 Discharge (m³/s): Not recorded
 Flow Regime: Perennial
 Turbidity: Turbid

Substrate %

Organics: 0
 Fines: 46
 Sml Gravel: 20
 Lrg Gravel: 14
 Cobble: 8
 Boulder: 13
 Bedrock: 0

Cover

Dominant: Boulder
 Subdominant: Woody debris

Riparian

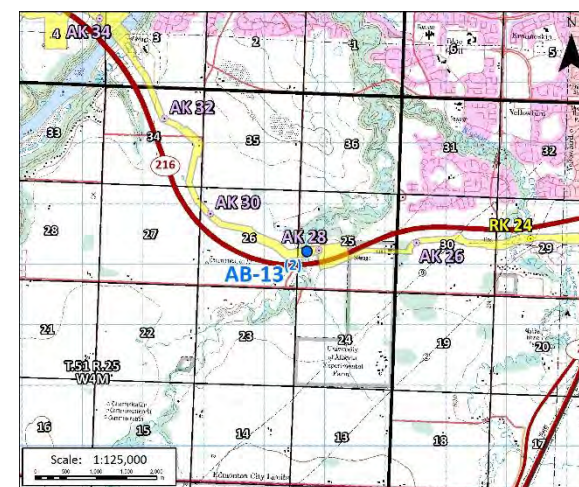
Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 1-20 %

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M-H	M-H	M	M-H
BURB	L	M	M	M-H
NRDC	L	M	M	M-H
BKTR	L	L	M	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	775 s	400 m	10-06-13



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring (if trenchless construction is determined as being not technically or environmentally feasible) or open cut if frozen to the bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

NRPK, BURB, MNSC, BRST, FTMN, LKCH, LNDC, LNSC, PRDC, RVSH, SPSH, TRPR and WHSC previously documented (FWMIS 2014).

Comments: Channel is highly embedded. Banks are steep and highly erodible causing embeddedness throughout. Realignment is recommended for trenched construction to avoid steep banks and a site -specific bank reclamation plan may be needed. QAES-led fish salvage required if isolated trenched construction occurs.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

July 1 to April 15

Construction Timing:

To be determined

Stream Classification AB:

Class B

Navigability:

Potentially Navigable

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

Potential – beaver dam

Active Beaver Dams:

Yes

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ ice bridge or clear span bridge.

		Trans Mountain Expansion Project		Whitemud Creek		AK 28.2	
		Survey Date: June 10, 2013 Drawn By: K. Johnson Date Issued: June 12, 2013	Approved By: G. Eisler	LSD SW 25 – 51 – 25 W4M UTM Zone: 12 329705 E 5923217 N NAD 83	TMEP site: AB-13	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-13, Whitemud Creek

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High	
Riparian buffer setback distance:	30 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	800 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	July 1 to April 15	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	No
Winter construction would limit fish salvage effectiveness and isolated trenched pipeline construction will result in deposition of mobilized sediment in an area of provincially recognized sensitive fish habitat (i.e., designated as Class B).	

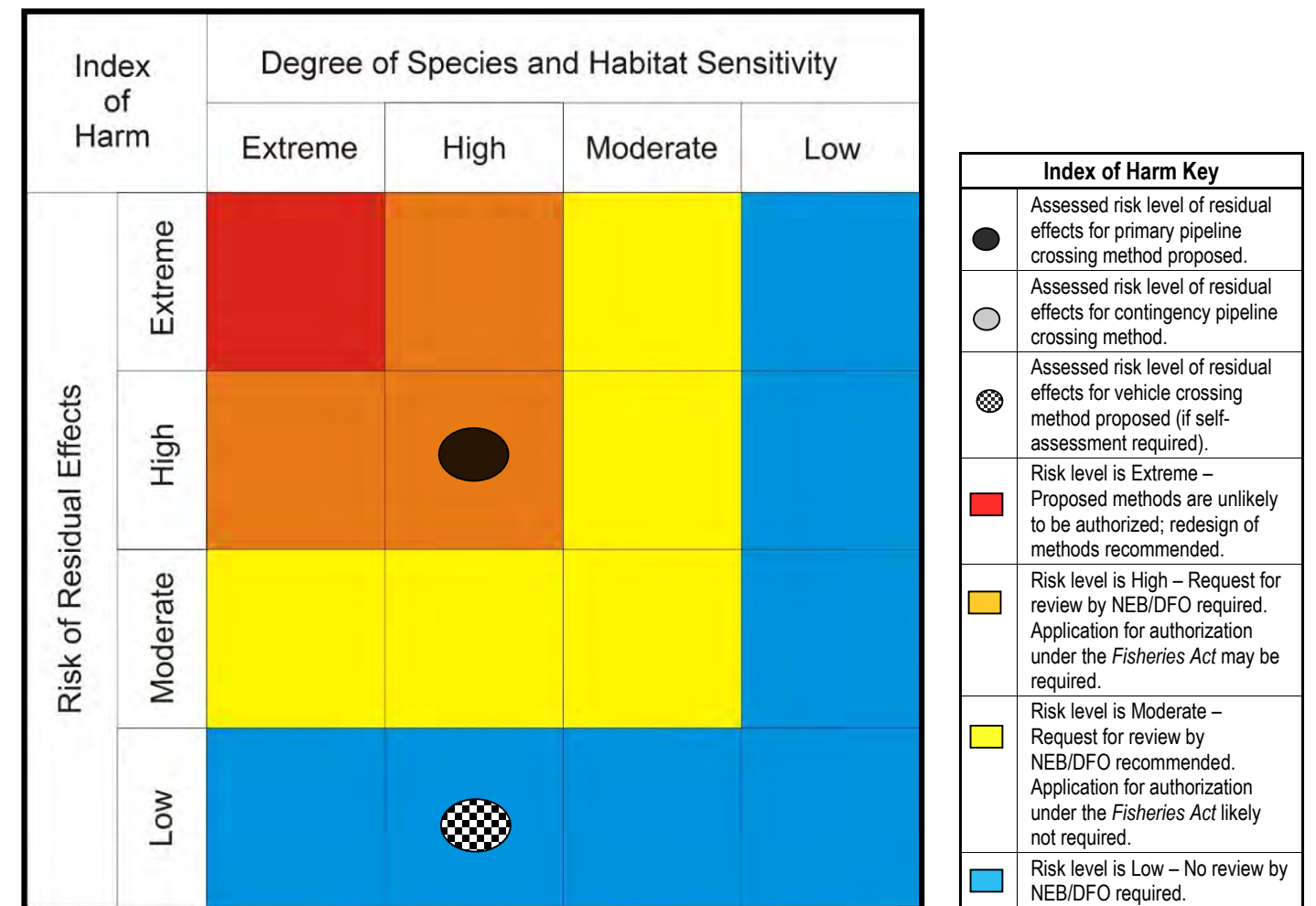
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	High
The primary trenched pipeline construction method would result in a high overall risk, while the vehicle crossing methods method would pose a low risk of residual effect.	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):	45	Est. Instream Footprint (m ²): 45 m (ROW) x 10.1 m (bankfull)	≤ 455 m ²
	Bankfull Channel Width (m):	10.1	Est. Functional Rip. Footprint (m ²): 45 m (ROW) x 40 m (riparian)	≤ 1,800 m ²
	Functional ¹ Rip. Width (m):	L: 20 R: 20	Max Instream + Riparian Footprint (m ²): 455 m ² + 1,800 m ²	≤ 2,255 m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through the centre of the proposed pipeline corridor (29-07-14).



View downstream through the centre of the proposed pipeline corridor (29-07-14).



View of left bank approach at centre of the proposed pipeline corridor (29-07-14).



View of right bank approach at centre of the proposed pipeline corridor (29-07-14).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Confined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run
 Gradient (%): 1
 Main Stem: n/a

Water Quality/Quantity

Water Temperature (°C): 22.6 D. Oxygen (mg/L): 7.4
 Conductivity (µS/cm): 341.4 Discharge (m³/s): Not recorded
 pH: 8.6 Flow Regime: Perennial
 Turbidity: Turbid

Substrate %
 Organics: 0
 Fines: 12
 Sml Gravel: 18
 Lrg Gravel: 19
 Cobble: 46
 Boulder: 5
 Bedrock: 0

Cover
 Dominant: Depth
 Subdominant: Undercut banks
 Type: Mixed C and D
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	188.2	169.0-211.0
Channel Width:	192.8	163.0-207.0
Bank Height:	6.8	4.0-7.5
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

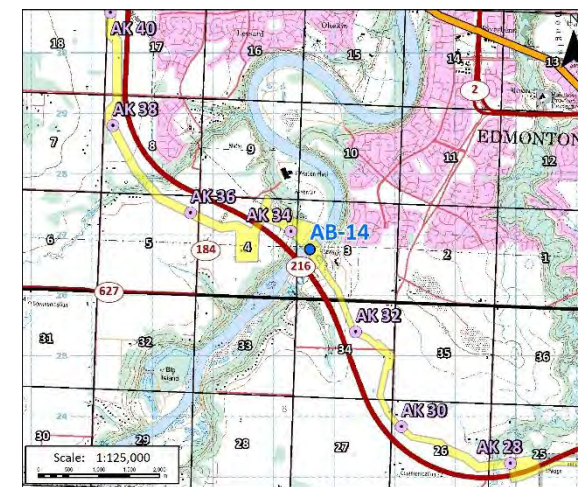
Species	YOY	Juv	Adult	Unknown
MOON			2	1
MNWH		3		
LNSC		13		1
WHSC			8	
NRPK		2		
WALL		4		
SHRD			2	3
GOLD			5	
BURB		1		
SPSH				1

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
GOLD	M	H	L	H
MOON	M	H	L	H
WALL/SAUG	L	M	L	H
NRPK	L	M	L	H
MNWH	L	H	L	H
SHRD/WHSC	L	H	L	H

Sampling Effort

Method	Time	Distance	Date
BTEF	2287 s	4740 m	30-05-06
BTEF	1554 s	2000 m	29-07-14



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

September 16 to July 31

Least Risk Biological Window Proposed:

August 1 to September 15

Construction Timing:

To be determined

Stream Classification AB: Class C*

Navigability: Navigable

Reason for Decision: n/a

Barriers to Fish Movement: None

Active Beaver Dams: No

Recommended Primary Pipeline Crossing Method:

Trenchless with water quality monitoring.

Recommended Contingency Pipeline Crossing Method:

Open cut outside RAP with water quality monitoring.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing.

Historical Fish Presence:

BKTR, BNTR, BLTR, BURB, CTRR, CTRRxRNT, GOLD, LKST, LKTR, MNSC, MNWH, NRPK, NRDC, RNTR, SAUG, WALL, YLPR, GOFS, BRST, ESMH, FTMN, FNDC, FLCH, IWDR, LKCH, LNDC, LNSC, MOON, PRDC, QUIL, RVSH, SHRD, SLRD, SLSC, SPSC, SPSH, TRPR and WHSC were previously documented (FWMIS 2014).

Comments: Data from AAR (2006) (May 30, 2006) and TERA 2014 supplemental studies used for this summary. Habitat consists primarily of long run (1600 m) units with secondary backwaters. Banks are unstable and consist of silt and clay at the existing TMPL right-of-way and within the proposed pipeline corridor. If a trenched method is required as a contingency, a site-specific bank reclamation and/or compensation/offset plan may be needed. Habitat was confirmed throughout the entire LSA during the July 2014 assessment.* Sampling by TERA in 2012 (at an alternate downstream location) resulted in the capture of similar species. The only notable difference in the 2012 sampling results was the capture of sauger.

		Trans Mountain Expansion Project		North Saskatchewan River		AK 33.6	
		Survey Date: May 30, 2006; September 6, 2012, July 29, 2014 Drawn By: B. Lunn Date Issued: August 5, 2014	Approved By: G. Eisler	LSD NW 3 to SW 3 – 52 – 25 W4M UTM Zone: 12 326598 E 5926764 N NAD 83	TMEP site: AB-14 Sensitivity 		

SUMMARY OF AQUATIC ENVIRONMENT: AB-14, North Saskatchewan River

Federally/provincially-listed species present:	BLTR, LKST, NRDC, SPSC		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	6,000 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	August 1 to September 15	Inside or outside LRBW	
Primary pipeline construction method/timing:	Trenchless/ To be determined	To be determined	
Contingency pipeline construction method/timing:	Trenched (open cut)/ To be determined	Inside	
Vehicle crossing methods:	Existing crossing		
Number of construction days of instream work anticipated:	15-30 days if contingency trenched (open cut) pipeline construction methods required		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Contingency trenched pipeline construction without flow isolation is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the contingency pipeline construction method: site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is not proposed.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage if contingency trenched pipeline construction methods required. Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment will be installed prior to construction and remain in place throughout construction. A site specific reclamation plan will be implemented if contingency trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of proposed pipeline corridor (if contingency trenched pipeline construction required) to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	No
Contingency trenched (open cut) pipeline construction method (if required) will limit fish salvage and sediment control measure effectiveness.	

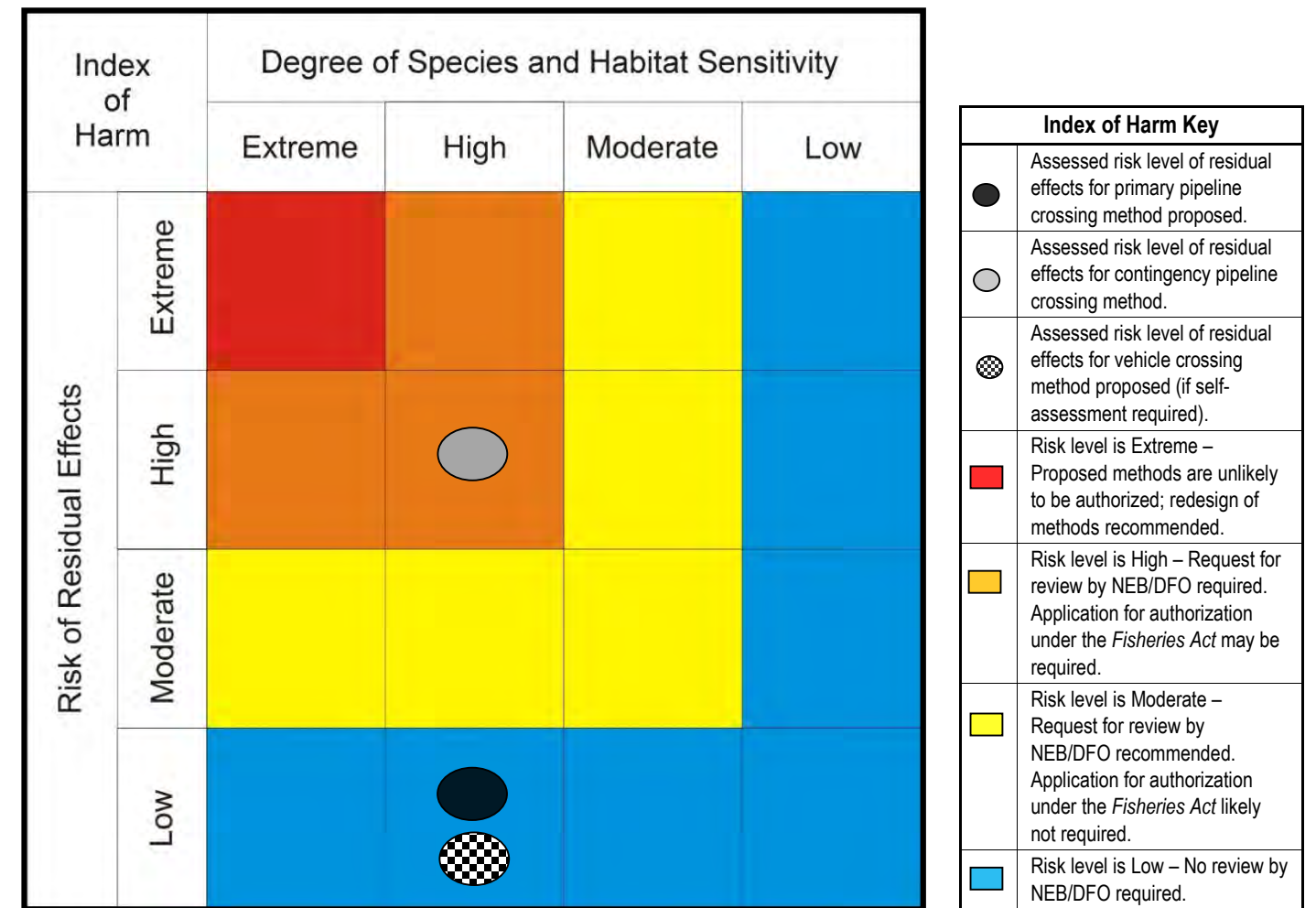
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	High
The primary trenchless pipeline construction method and proposed vehicle crossing methods would result in a low overall risk, while the contingency trenched pipeline construction method would pose a high risk of residual effect.	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):	45	Est. Instream Footprint (m ²): 45 m (ROW) x 188 m (bankfull) +ZOI	≤ 196,460 m ²
	Bankfull Channel Width (m):	188	Est. Functional Rip. Footprint (m ²): 45 m (ROW) x 30 m (riparian)	≤ 1,350 m ²
	Functional ¹ Rip. Width (m):	L: 20 R: 10	Max Instream + Riparian Footprint (m ²): 196,460 m ² + 1,350 m ²	≤ 197,810 m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through the centre of the proposed pipeline corridor (18-06-14).

View downstream through the centre of the proposed pipeline corridor (18-06-14).

View of left bank approach at centre of the proposed pipeline corridor (18-06-14).

View of right bank approach at centre of the proposed pipeline corridor (18-06-14).

Channel Morphology

Pattern:	Irregular wandering	
Confinement:	Frequently confined	
Bank Shape	LB:	Sloping
	RB:	Vertical
Habitat Unit at ROW:	Impoundment	
Habitat Unit through ZOI:	Impoundment-Run	
Gradient (%):	0.5	
Main Stem:	North Saskatchewan River, FB, 2.3 km DS	
	Mean (m)	Range (m)
Wetted Width:	7.3	1.1-20.0
Channel Width:	4.9	1.1-8.0
Bank Height:	7.4	0.5-20.0
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C):	15.9	D. Oxygen (mg/L):	10.2
Conductivity (µS/cm):	119.0	Discharge (m³/s):	0.01
pH:	6.6	Flow Regime:	Perennial
		Turbidity:	Turbid
Substrate %		Cover	
Organics:	15	Dominant:	Instream vegetation
Fines:	36	Subdominant:	Depth
Sml Gravel:	13	Type:	Grass
Lrg Gravel:	2	Maturity:	Not recorded
Cobble:	0	Crown Closure:	1-20 %
Boulder:	7		
Bedrock:	0		



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

July 1 to April 15

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Class 3 as per TERA criteria

Reason for Decision:

D < 0.6 m

Barriers to Fish Movement:

Potential – beaver dam

Active Beaver Dams:

Yes

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
WHSC				1
BRST				7
Dace spp.				3

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	M	M
NRDC	M-H	M-H	M-H	M
BURB	L	L	M	M
BKTR	L	M	M	M

Sampling Effort

Method	Time	Distance	Date
BPEF	335	200	18-06-14

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring or open cut if frozen to the bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, snowfill/ice-bridge or clear span bridge.

Historical Fish Presence:

BRST and FTMN previously documented (FWMIS 2014).

Comments: Locally known as Wedgewood Creek. Watercourse with wetland features. Realignment is recommended for trenched construction to avoid steep banks. Alternatively, a site-specific bank reclamation recommended. QAES-led fish salvage required if isolated trenched construction occurs. Several beaver dams are located up and downstream of the centre of the proposed pipeline corridor; recommend that they be breached for trenched construction. Springs located between 400 and 450 m downstream. For methods of assessment at this site refer to Risk Management Strategy for Access Refusal Sites (Section 3.9.2 Fisheries (Alberta) Supplemental Technical Report).

		Trans Mountain Expansion Project		Unnamed Trib. to the North Saskatchewan River		AK 37.0		
		Survey Date:	June 18, 2014	LSD	SW 8-52-25 W4M	TMEP site:	AB-15	Sensitivity
		Drawn By:	K. Wantola	Approved By:	G. Eisler	UTM Zone:	12 323858 E 5927914 N NAD 83	
Date Issued:	June 23, 2014							

SUMMARY OF AQUATIC ENVIRONMENT: AB-15, Unnamed Tributary to the North Saskatchewan River at AK 37.0

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	600 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to April 15	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction. Beaver dam removal may be required.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the contingency pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures to coincide with isolated trenched pipeline construction methods include water quality monitoring and QAES-led fish salvage. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5). Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (*i.e.*, provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
	Low			

Index of Harm Key

- Assessed risk level of residual effects for primary pipeline crossing method proposed.
- Assessed risk level of residual effects for contingency pipeline crossing method.
- Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
- Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
- Risk level is High – Request for review by NEB/DFO required. Application for authorization under the *Fisheries Act* may be required.
- Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the *Fisheries Act* likely not required.
- Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (<i>e.g.</i>, beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View northeast through centre of the proposed pipeline corridor (11-06-13).

View southeast through centre of the proposed pipeline corridor (11-06-13).

View east at centre of the proposed pipeline corridor (11-06-13).

View west at centre of the proposed pipeline corridor (11-06-13).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: Wetland
 Habitat Unit through ZOI: Wetland
 Gradient (%): 0.5
 Main Stem: North Saskatchewan River, FB, 3 km DS

Water Quality/Quantity

Water Temperature (°C): Dry
 Conductivity (µS/cm): Dry
 pH: Dry
 D. Oxygen (mg/L): Dry
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Dry

Substrate %

Organics: n/a
 Fines: n/a
 Sml Gravel: n/a
 Lrg Gravel: n/a

Cover

Dominant: n/a
 Subdominant: n/a

	Mean (m)	Range (m)
Wetted Width:	n/a	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Cobble: n/a
 Boulder: n/a
 Bedrock: n/a
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %

Fish Presence and Life History Stage

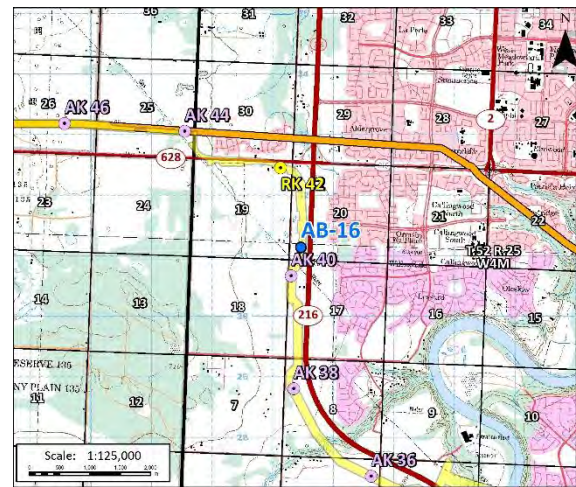
Species	YOY	Juv	Adult	Unknown
NFC	-	-	-	-

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	N
NRDC	N	N	N	N
BURB	N	N	N	N
YLPR	N	N	N	N

Sampling Effort

Method Time Distance Date



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

BRST and FTMN previously documented (FWMIS 2014).

Comments: Drainage confirmed to be a wetland with no defined bed or banks. Fish presence previously documented downslope. Fish sampling precluded in 2013 by shallow/dry conditions. If water is present at the time of construction, fish salvage should occur.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Wetland

Navigability:

Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision:

Class could not be established

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

No

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

		Trans Mountain Expansion Project		Unnamed Wetland		AK 40.5	
		Survey Date: June 11, 2013 Drawn By: K. Johnson Date Issued: July 8, 2013	Approved By: G. Eisler	LSD SW 20 – 52 – 25 W4M UTM Zone: 12 323465 E 5931143 N NAD 83	TMEP site: AB-16	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-16, Unnamed Wetland at AK 40.5

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	10 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.

3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5). Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

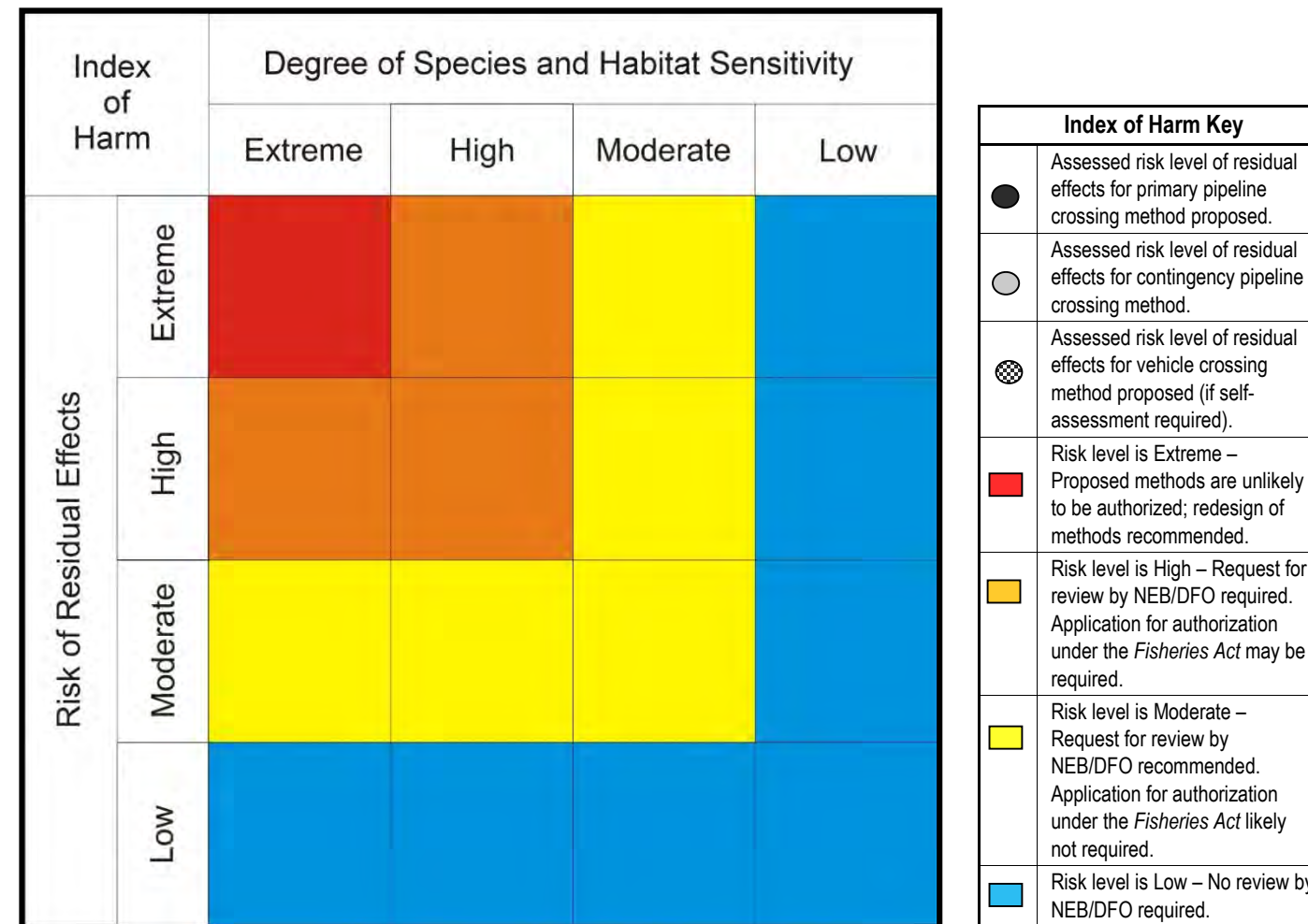
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north at centre of the proposed pipeline corridor (11-06-13).

View south at centre of the proposed pipeline corridor (11-06-13).

View west at centre of the proposed pipeline corridor (11-06-13).

View east at centre of the proposed pipeline corridor (11-06-13).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: NCD
 Habitat Unit through ZOI: NCD
 Gradient (%): 4
 Main Stem: North Saskatchewan River, FB, 5 km DS

	Mean (m)	Range (m)
Wetted Width:	0	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
NFC	-	-	-	-

Water Quality/Quantity

Water Temperature (°C): Dry
 Conductivity (µS/cm): Dry
 pH: Dry
 D. Oxygen (mg/L): Dry
 Discharge (m³/s): Dry
 Flow Regime: Ephemeral
 Turbidity: Dry

Substrate %

Organics: 0
 Fines: 80
 Sml Gravel: 10
 Lrg Gravel: 10

Cover

Dominant: n/a
 Subdominant: n/a

Cobble: 0
 Boulder: 0
 Bedrock: 0

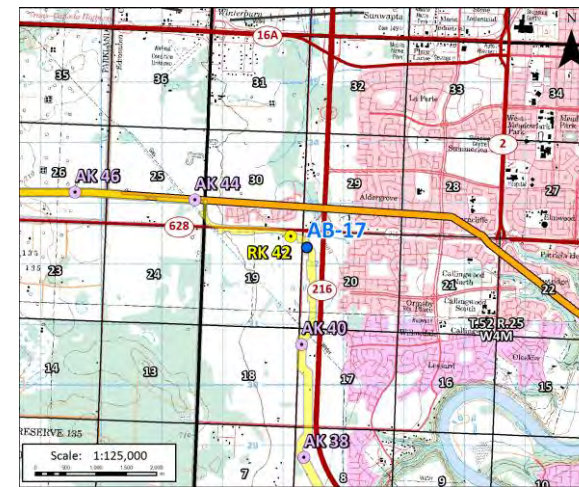
Type: Grasses
 Maturity: Not recorded
 Crown Closure: n/a

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	N
NRDC	N	N	N	N
BURB	N	N	N	N

Sampling Effort

Method Time Distance Date



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: NCD

Navigability: Class 1 as per Section 11(2)

Reason for Decision: CW < 1.2 m

Barriers to Fish Movement: Yes – undefined channel

Active Beaver Dams: No

Recommended Vehicle Crossing Method (Non-Frozen):

Type 3 culvert or Type 5 logfill/swamp mat.

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

Historical Fish Presence:

BRST and FTMN previously documented (FWMIS 2014).

Comments: No defined channel within 100 m of the centre of the proposed pipeline corridor. No connectivity to fish habitat. Previous fish information documented downslope. Fish sampling precluded in 2013 by shallow/dry conditions. If water is present at the time of construction, fish salvage should occur.

		Trans Mountain Expansion Project		Unnamed NCD		AK 41.7	
		Survey Date: June 11, 2013 Drawn By: K. Johnson Date Issued: July 8, 2013	Approved By: G. Eisler	LSD NW 20 – 52 – 25 W4M UTM Zone: 12 323394 E 5932276 N NAD 83	TMEP site: AB-17	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-17, Unnamed NCD at AK 41.7

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	10 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include fish salvage during isolated trenched pipeline construction methods.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
	Low			

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north through centre of the proposed pipeline corridor (12-06-13).



View south through centre of the proposed pipeline corridor (12-06-13).



View east at centre of the proposed pipeline corridor (12-06-13).



View west at centre of the proposed pipeline corridor (12-06-13).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: n/a
 Habitat Unit through ZOI: n/a
 Gradient (%): n/a
 Main Stem: Atim Creek, Fish-bearing, 6 km DS

Water Quality/Quantity

Water Temperature (°C): 13.8 D. Oxygen (mg/L): 8.0
 Conductivity (µS/cm): 471.5 Discharge (m³/s): Negligible
 pH: 8.3 Flow Regime: Perennial
 Turbidity: Clear

Substrate %

Organics: 100
 Fines: 0
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: n/a
 Subdominant: n/a

Riparian

Type: Grasses
 Maturity: Not recorded
 Crown Closure: n/a

	Mean (m)	Range (m)
Wetted Width:	n/a	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
NFC	-	-	-	-

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
BURB	N	N	N	N
YLPR	N	N	N	N
NRPK	N	N	N	N
NRDC	N	N	N	N

Sampling Effort

Method Time Distance Date



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Potentially Navigable

Reason for Decision: Class could not be established

Barriers to Fish Movement: Yes – no connectivity

Active Beaver Dams: Potential

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

Historical Fish Presence:

BRST and FTMN were previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. No connectivity to west. Appears to be fed by runoff draining from an industrial complex north of the proposed crossing. Assessment did not include full 100 m upstream due to access restriction. Channel and bank definition not evident due to flooding/impoundment. Fish sampling precluded in 2013 by shallow/dry conditions. If water is present at the time of construction, fish salvage should occur.

		Trans Mountain Expansion Project		Dog Creek		RK 59.4		
		Survey Date: June 12, 2013			LSD SE 33 – 52 – 27 W4M	TMEP site: AB-18		Sensitivity
		Drawn By: K. Johnson	Approved By: G. Eisler		UTM Zone: 12 306581 E 5935596	N NAD 83		
Date Issued: July 18, 2013								

SUMMARY OF AQUATIC ENVIRONMENT: AB-18, Dog Creek

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	30 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
--	--

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm		Degree of Species and Habitat Sensitivity			
		Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (07-05-13).



View downstream through centre of the proposed pipeline corridor (07-05-13).



View of left bank approach at centre of the proposed pipeline corridor (07-05-13).



View of right bank approach at centre of the proposed pipeline corridor (07-05-13).

Channel Morphology

Pattern: Sinuous
 Confinement: Frequently confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run-Pool
 Gradient (%): 0.5
 Main Stem: Atim Creek, FB, 2.3 km DS

Water Quality/Quantity

Water Temperature (°C): 13.7 D. Oxygen (mg/L): 9.7
 Conductivity (µS/cm): 760.0 Discharge (m³/s): 0.04
 pH: 7.8 Flow Regime: Perennial
 Turbidity: Clear

Substrate %
 Organics: 14
 Fines: 73
 Sml Gravel: 0
 Lrg Gravel: 1
 Cobble: 12
 Boulder: 0
 Bedrock: 0

Cover
 Dominant: Undercut banks
 Subdominant: Overhanging vegetation

Riparian
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	1.1	0.8-1.6
Channel Width:	1.0	0.8-1.4
Bank Height:	0.8	0.7-0.9
Pool Depth:	0.3	0.3-0.4

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				32
WHSC				7
FTMN				2
PRDC				1

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	L	N	M-H
NRDC	M	M	L	M-H
BURB	L	M	N	M-H
YLPR	L	L	N	M-H

Sampling Effort

Method	Time	Distance	Date
MT	92 hrs	n/a	07-05-13
MT	45 hrs	n/a	26-10-12



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Class 1 as per Section 11(2)

Reason for Decision:

CW < 1.2 m

Barriers to Fish Movement:

None

Active Beaver Dams:

No

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ ice bridge.

Historical Fish Presence:

BRST, FTMN, WHSC and LKCH previously documented (FWMIS 2014).

Comments: Channel is located in a low area within a cultivated field. Suitable channel complexity and cover elements. Slumping left bank observed at centre of the proposed pipeline corridor within the proposed pipeline corridor. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Tributary to Atim Creek		RK 64.2	
		Survey Date: October 25, 2012; May 7, 2013 Drawn By: C. Tunks Date Issued: May 8, 2013	Approved By: G. Eisler	LSD NW 6 – 53 – 27 W4M UTM Zone: 12 302780 E 5938022 N NAD 83	TMEP site: AB-20	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-20, Unnamed Tributary to Atim Creek at RK 64.2

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

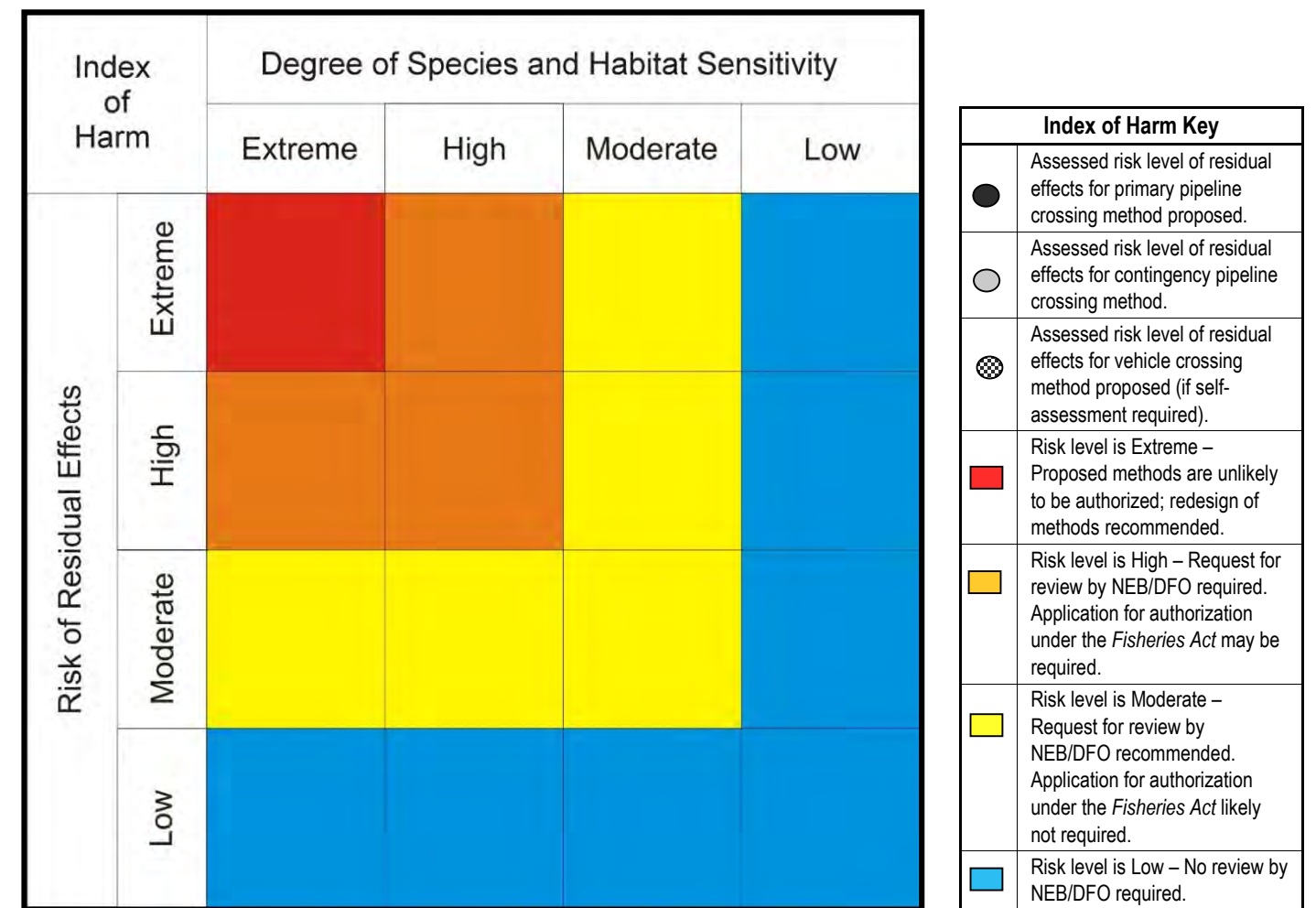
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (04-06-13).



View downstream through centre of the proposed pipeline corridor (04-06-13).



View of left bank approach at centre of the proposed pipeline corridor (04-06-13).



View of right bank approach at centre of the proposed pipeline corridor (04-06-13).

Channel Morphology

Pattern: Meandering
 Confinement: Unconfined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Flat
 Habitat Unit through ZOI: n/a
 Gradient (%): 0.5
 Main Stem: North Saskatchewan River, FB, 20 km DS

	Mean (m)	Range (m)
Wetted Width:	7.5	n/a
Channel Width:	6.0	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C): 16.1
 Conductivity (µS/cm): 757.0
 pH: 7.3
 D. Oxygen (mg/L): 0.2
 Discharge (m³/s): Negligible
 Flow Regime: Perennial
 Turbidity: Stained

Substrate %

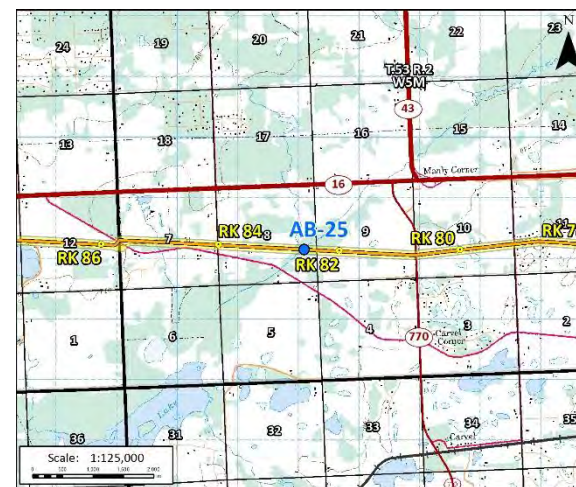
Organics: 100
 Fines: 0
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: n/a

Riparian

Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 21-40 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Class 1 as per Section 11(3)

Reason for Decision:

D < 0.3 m

Barriers to Fish Movement:

Unknown

Active Beaver Dams:

Unknown

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST			6	

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	N	M
YLPR	N	N	N	M
BURB	N	N	N	M
NRDC	L	L	N	M

Sampling Effort

Method	Time	Distance	Date
MT	99 hrs	n/a	22-09-06

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

BRST, FLCH, IWDR, NRPK LNDC and WHSC previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. Assessment conducted only within existing TMPL right-of-way, given land access restrictions, limiting data collection and navigability determination. AAR (2006) data corroborates current habitat potential ratings and indicates that habitat in the remaining portion of the LSA consists of marginally defined channel and beaver activity. Fish capture information presented was collected in 2006. Flooded area prevented bank and channel observations. QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing or snowfill/ice bridge.

		Trans Mountain Expansion Project		Kilini Creek		RK 82.6		
		Survey Date:	September 22, 2006; July 4, 2013			LSD	SE 8 – 53 – 2 W5M	
		Drawn By:	K. Johnson		Approved By:	G. Eisler		TMEP site:
Date Issued:	July 11, 2013			UTM Zone:	11 682099 E 5938160		NAD 83	Sensitivity

SUMMARY OF AQUATIC ENVIRONMENT: AB-25, Kilini Creek

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.

3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream at centre of the proposed pipeline corridor (08-05-13).



View downstream at centre of the proposed pipeline corridor (08-05-13).



View of left bank at centre of the proposed pipeline corridor (08-05-13).



View of right bank at centre of the proposed pipeline corridor (08-05-13).

Channel Morphology

Pattern: Impoundment
 Confinement: Occasionally confined
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: Wetland
 Habitat Unit through ZOI: Wetland
 Gradient (%): 0
 Main Stem: Kilini Creek, FB, 2 km DS

Water Quality/Quantity

Water Temperature (°C): 14.1 D. Oxygen (mg/L): 10.3
 Conductivity (µS/cm): 405.4 Discharge (m³/s): Negligible
 pH: 7.9 Flow Regime: Not recorded
 Turbidity: Clear

Substrate %

Organics: 85
 Fines: 15
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

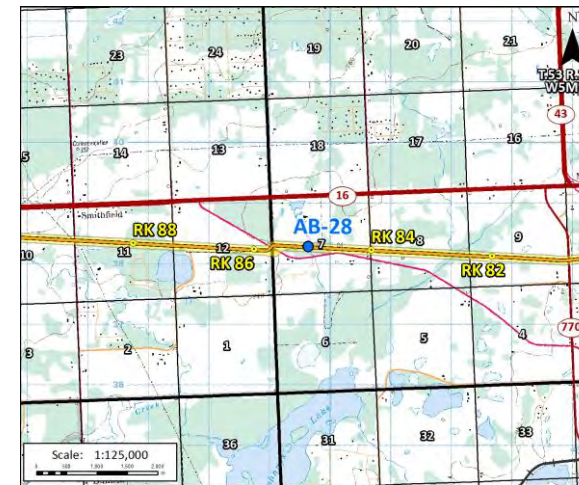
Cover

Dominant: n/a
 Subdominant: n/a

Riparian

Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	37.5	25.0-70.0
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Wetland

Navigability:

Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision:

Class could not be established

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

Yes

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
FTMN				64
BRST				29

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	L
NRDC	L	L	L	L
BURB	N	N	N	L
YLPR	N	N	N	L

Sampling Effort

Method	Time	Distance	Date
MT	38 hrs	n/a	27-10-12
MT	70 hrs	n/a	08-05-13

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Water flows (negligible) from north to south through a golf course and settles in wetland. There are numerous culverts and water diversions throughout the golf course. Beaver activity noted in LSA and breach may be needed to assist trenched construction. A parkland road is also located at the southern edge of the impoundment with a fully submerged culvert below. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Wetland			RK 85.1
		Survey Date: October 27, 2012; May 8, 2013 Drawn By: C. Tunks Date Issued: May 10, 2013	Approved By: G. Eisler	LSD SW 7 – 53 – 2 W5M UTM Zone: 11 679636 E 5938289 N NAD 83	TMEP site: AB-28	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-28, Unnamed Wetland at RK 85.1

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	10 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
	Low			

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north through centre of the proposed pipeline corridor (30-05-14).

View south through centre of the proposed pipeline corridor (30-05-14).

View east at centre of the proposed pipeline corridor (30-05-14).

View west at centre of the proposed pipeline corridor (30-05-14).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: Wetland
 Habitat Unit through ZOI: Wetland
 Gradient (%): n/a
 Main Stem: Clear Lake, FB, 3 km DS

Water Quality/Quantity

Water Temperature (°C): 12.6
 Conductivity (µS/cm): 286
 pH: 9.46
 D. Oxygen (mg/L): 6.3
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Clear

Substrate %

Organics: 97
 Fines: 3
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: n/a
 Subdominant: n/a
Riparian
 Type: Wetland
 Maturity: Not recorded
 Crown Closure: Not recorded

	Mean (m)	Range (m)
Wetted Width:	n/a	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Wetland

Navigability:

Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision:

Class could not be established

Barriers to Fish Movement:

Yes – undefined

Active Beaver Dams:

No

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				3 (observed)

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	M	M
YLPR	M	M	M	M
BURB	N	L	M	M
NRDC	M	M	M	M

Sampling Effort

Method Time Distance Date

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Four inlet/outlets were found around the large open water pond. No connection was observed for the two inlets/outlets on the north end on the pond within the proposed pipeline corridor. The two southern inlets/outlets were outside of the proposed pipeline corridor. No fish captured; however, fish observed in the open water pond located within the proposed pipeline corridor. QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing, clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

		Trans Mountain Expansion Project		Unnamed Wetland		RK 88.5	
		Survey Date: May 30, 2014 Drawn By: B. Lunn Date Issued: June 4, 2014	Approved By: G. Eisler	LSD NW 11-53-3 W5M UTM Zone: 11 676231 E 5938318 N NAD 83	TMEP site: AB-31	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-31, Unnamed Wetland at RK 88.5

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	10 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.

3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (09-05-13).



View downstream through centre of the proposed pipeline corridor (09-05-13).



View of left bank approach at centre of the proposed pipeline corridor (09-05-13).



View of right bank approach at centre of the proposed pipeline corridor (09-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Unconfined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run- Impoundment
 Gradient (%): 1
 Main Stem: Clear Lake, FB, 5 km DS

Water Quality/Quantity

Water Temperature (°C): 12.6 D. Oxygen (mg/L): 8.8
 Conductivity (µS/cm): 662.0 Discharge (m³/s): 0.06
 pH: 7.7 Flow Regime: Ephemeral
 Turbidity: Clear

Substrate %

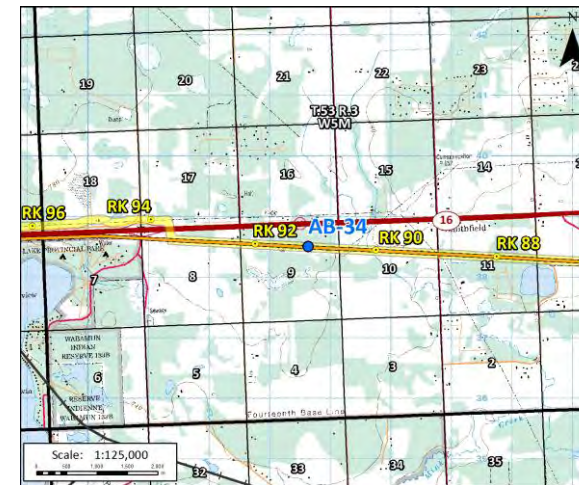
Organics: 50
 Fines: 50
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Overhanging vegetation

Riparian

Type: Grasses
 Maturity: Not recorded
 Crown Closure: 1-20 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Potentially Navigable

Reason for Decision: Class cannot be established

Barriers to Fish Movement: Yes – undefined channel

Active Beaver Dams: Yes

	Mean (m)	Range (m)
Wetted Width:	10.2	0.2 - 40.0
Channel Width:	9.0	0.4 - 30.0
Bank Height:	0.3	0.2 - 0.4
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				11

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	L
YLPR	N	N	N	L
BURB	N	N	N	L
NRDC	L	L	L	L

Sampling Effort

Method	Time	Distance	Date
MT	72 hrs	n/a	09-05-13
MT	108 hrs	n/a	26-09-06

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. Several sections of marginally or undefined channel. There is a large beaver pond/dam approximately 200 m downstream of the proposed pipeline corridor; the dam has been recently breached. Water levels may be decreased in late summer, decreasing the size of the wetland area surrounding the existing vehicle crossing. Beaver dam activity and habitat potential ratings corroborated in AAR (2006) data. QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing, clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

		Trans Mountain Expansion Project		Unnamed Tributary to Kilini Creek		RK 91.1	
		Survey Date: September 26, 2006; October 27, 2012; May 09, 2013 Drawn By: B. Lunn Date Issued: May 17, 2013	Approved By: G. Eisler	LSD NE 9 – 53 – 3 W5M UTM Zone: 11 673634 E 5938512 N NAD 83	TMEP site: AB-34 Sensitivity		

SUMMARY OF AQUATIC ENVIRONMENT: AB-34, Unnamed Tributary to Kilini Creek at RK 91.1

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key

- Assessed risk level of residual effects for primary pipeline crossing method proposed.
- Assessed risk level of residual effects for contingency pipeline crossing method.
- Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
- Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
- Risk level is High – Request for review by NEB/DFO required. Application for authorization under the *Fisheries Act* may be required.
- Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the *Fisheries Act* likely not required.
- Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (28-05-14).



View downstream through centre of the proposed pipeline corridor (28-05-14).



View of left bank approach at centre of the proposed pipeline corridor (28-05-14).



View of right bank approach at centre of the proposed pipeline corridor (28-05-14).

Channel Morphology

Pattern: Irregular wandering
 Confinement: Frequently confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run
 Gradient (%): 1.5
 Main Stem: Wabamun Lake, FB, 0.4 km DS

Water Quality/Quantity

Water Temperature (°C): 8.8 D. Oxygen (mg/L): 10.1
 Conductivity (µS/cm): 277.4 Discharge (m³/s): Negligible
 pH: 9.0 Flow Regime: Perennial
 Turbidity: Clear

Substrate %

Organics: 38
 Fines: 17
 Sml Gravel: 20
 Lrg Gravel: 18
 Cobble: 8
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Overhanging vegetation
 Subdominant: Woody debris

Riparian

Type: Grasses
 Maturity: Not recorded
 Crown Closure: 21-40 %

	Mean (m)	Range (m)
Wetted Width:	1.3	0.7-2.0
Channel Width:	1.0	0.6-1.5
Bank Height:	4.5	0.9-8.0
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				4

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	N
YLPR	N	N	N	N
BURB	N	N	N	N
NRDC	M	M	N	N

Sampling Effort

Method	Time	Distance	Date
BPEF	313 s	200 m	28-05-14
MT	86 h	n/a	28-05-14



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Class 1 as per Section 11(3)

Reason for Decision: D < 0.3 m

Barriers to Fish Movement: Yes – undefined

Active Beaver Dams: No

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing, clear span bridge, Type 3 culvert or Type 5 logfill/

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Banks and approach slopes are high. Existing culvert is present at the centre of the proposed pipeline corridor. Existing recreational vehicle fording has created an area of NCD approximately 50 m downstream of the centre of the proposed pipeline corridor. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Trib. to Wabamun Lake		AK 95.5	
		Survey Date: May 28, 2014 Drawn By: B. Lunn Date Issued: June 9, 2014	Approved By: G. Eisler	LSD NW 7-53-3 W5M UTM Zone: 11 669317 E 5938663	TMEP site: AB-37a NAD 83	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-37a, Unnamed Tributary to Wabamun Lake at AK 95.5

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	30 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat	
Number of construction days of instream work anticipated:	< 2 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
	Low			

Index of Harm Key

- Assessed risk level of residual effects for primary pipeline crossing method proposed.
- Assessed risk level of residual effects for contingency pipeline crossing method.
- Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
- Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
- Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
- Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
- Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north through centre of the proposed pipeline corridor (11-05-13).

View south through centre of the proposed pipeline corridor (11-05-13).

View east at centre of the proposed pipeline corridor (11-05-13).

View west at centre of the proposed pipeline corridor (11-05-13).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: Wetland
 Habitat Unit through ZOI: Wetland
 Gradient (%): n/a
 Main Stem: Wabamun Lake, FB, 1.4 km DS

Water Quality/Quantity

Water Temperature (°C): 14.1
 Conductivity (µS/cm): 857
 pH: 7.8
 D. Oxygen (mg/L): 8.9
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Stained

Substrate %

Organics: 90
 Fines: 10
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Not recorded
 Subdominant: Not recorded

Riparian

Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	n/a	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Wetland

Navigability:

Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision:

Class could not be established

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

Yes

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				5 (observed)

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	M	L
BURB	N	N	M	L
LKWH	N	N	M	L
NRDC	N	N	M	L

Sampling Effort

Method	Time	Distance	Date
MT	79 h	n/a	11-05-13

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: No fish captured; however, fish observed in the open water pond located within the proposed pipeline corridor during the February 2013 site visit. QAES-led fish salvage required if isolated trenched construction occurs. Wintering habitat potential ratings resulted from February 2013 site visit.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing, clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

		Trans Mountain Expansion Project		Unnamed Wetland		AK 98.2	
		Survey Date: February 6, 2013, May 11, 2013 Drawn By: B. Lunn Date Issued: June 11, 2014	Approved By: G. Eisler	LSD NW 11-53-4 W5M UTM Zone: 11 666608 E 5938462 N NAD 83	TMEP site: AB-39a	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-39a, Unnamed Wetland at AK 98.2

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	10 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.

3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north through centre of the proposed pipeline corridor (27-05-14).

View south through centre of the proposed pipeline corridor (27-05-14).

View east at centre of the proposed pipeline corridor (27-05-14).

View west at centre of the proposed pipeline corridor (27-05-14).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: Wetland
 Habitat Unit through ZOI: Wetland
 Gradient (%): n/a
 Main Stem: Wabamun Lake, FB, 1.2 km DS

Water Quality/Quantity

Water Temperature (°C): 15.9
 Conductivity (µS/cm): 283
 pH: 9.2
 D. Oxygen (mg/L): 11.3
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Clear

Substrate %

Organics: 79
 Fines: 21
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: n/a
 Subdominant: n/a

Riparian

Type: Grasses
 Maturity: Not recorded
 Crown Closure: Not recorded

	Mean (m)	Range (m)
Wetted Width:	n/a	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				12
FTMN			19	223

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M-H	M-H	M	M-H
BURB	M	M	M	M-H
LKWH	L	M	M-H	M-H
NRDC	M-H	M-H	M-H	M-H

Sampling Effort

Method	Time	Distance	Date
MT	20 h	n/a	27-05-14



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

July 1 to April 15

Construction Timing:

To be determined

Stream Classification AB: Wetland

Navigability:

Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision:

Class could not be established

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring or open cut if frozen to the bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snowfill/ice bridge.

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Springs around the northern extent of the proposed pipeline corridor feed into two large, connected ponds. Existing road south of pond is actively used by mining personnel. A water source pit used for mining operations is located on the southern edge of the proposed pipeline corridor. QAES-led fish salvage required if isolated trenched construction occurs. RAP was assigned by the assessing QAES due to the High habitat sensitivity for Species of Management Concern.

		Trans Mountain Expansion Project		Unnamed Wetland		RK 100.7		
		Survey Date: May 27, 2014		LSD NW 10-53-4 W5M		TMEP site: AB-39f	Sensitivity 	
		Drawn By: B. Lunn	Approved By: G. Eisler	UTM Zone: 11 665215 E	NAD 83 5938084			
Date Issued: June 10, 2014								

SUMMARY OF AQUATIC ENVIRONMENT: AB-39f, Unnamed Wetland at RK 100.7

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	10 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to April 15	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing method:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key

- Assessed risk level of residual effects for primary pipeline crossing method proposed.
- Assessed risk level of residual effects for contingency pipeline crossing method.
- Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
- Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
- Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
- Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
- Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north through centre of the proposed pipeline corridor (23-05-14).



View south through centre of the proposed pipeline corridor (23-05-14).



View east at centre of the proposed pipeline corridor (23-05-14).



View west at centre of the proposed pipeline corridor (23-05-14).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Impoundment-Beaver Dam
 Habitat Unit through ZOI: Impoundment-Beaver Dam
 Gradient (%): n/a
 Main Stem: Wabamun Lake, FB, 1.2 km DS

	Mean (m)	Range (m)
Wetted Width:	164.0	130.0-200.0
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C): 20.1
 Conductivity (µS/cm): 234
 pH: 8.3
 D. Oxygen (mg/L): 6.6
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Clear

Substrate %

Organics: 100
 Fines: 0
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Woody debris
Riparian
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 1-20 %



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

July 16 to April 15

Construction Timing:

To be determined

Stream Classification AB: Wetland

Navigability: Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision: Class could not be established

Barriers to Fish Movement: Yes – undefined channel

Active Beaver Dams: Yes

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Clear span bridge or snowfill/ice bridge.

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring or open cut if frozen to the bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Three large beaver impoundments/dams were located within the proposed pipeline corridor. North of the proposed pipeline corridor there is another large impoundment/wetland. Springs were noted in the northern extent of the proposed pipeline corridor. Fish were observed in all three impoundments. QAES-led fish salvage required if isolated trenched construction occurs. RAP was assigned by the assessing QAES due to the High habitat sensitivity for Species of Management Concern.

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST			1	6

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	M	N
BURB	N	L	M	N
LKWH	N	N	L	N
NRDC	M-H	M-H	M-H	N

Sampling Effort

Method	Time	Distance	Date
BPEF	208 s	200 m	23-05-14

		Trans Mountain Expansion Project		Unnamed Wetland		RK 102.1		
		Survey Date: May 23, 2014		LSD NE 9-53-4 W5M		TMEP site: AB-39g	Sensitivity 	
		Drawn By: B. Lunn	Approved By: G. Eisler	UTM Zone: 11 663874 E	5937848	N NAD 83		
Date Issued: June 10, 2014								

SUMMARY OF AQUATIC ENVIRONMENT: AB-39g, Unnamed Wetland at RK 102.1

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High	
Riparian buffer setback distance:	10 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	July 1 to April 15	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge	
Number of construction days of instream work anticipated:	2-15 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key

- Assessed risk level of residual effects for primary pipeline crossing method proposed.
- Assessed risk level of residual effects for contingency pipeline crossing method.
- Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
- Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
- Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
- Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
- Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (23-05-14).

View downstream through centre of the proposed pipeline corridor (23-05-14).

View of left bank approach at centre of the proposed pipeline corridor (23-05-14).

View of right bank approach at centre of the proposed pipeline corridor (23-05-14).

Channel Morphology

Pattern: Irregular wandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run- Impoundment
 Gradient (%): 1.5
 Main Stem: Wabamun Lake, FB, 1.3 km DS

Water Quality/Quantity

Water Temperature (°C): 13.0
 Conductivity (µS/cm): 1103
 pH: 7.9
 D. Oxygen (mg/L): 9.2
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Clear

Substrate %

Organics: 41
 Fines: 44
 Sml Gravel: 14
 Lrg Gravel: 1
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Overhanging vegetation

Riparian

Type: Mixed C and D
 Maturity: Not recorded
 Crown Closure: 41-70 %

	Mean (m)	Range (m)
Wetted Width:	5.6	0.5-23.0
Channel Width:	0.8	0.5-1.2
Bank Height:	1.0	0.3-4.0
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				1

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	N	L
BURB	N	L	N	L
LKWH	N	L	N	L
NRDC	M	M	N	L

Sampling Effort

Method	Time	Distance	Date
BPEF	283 s	200 m	23-05-14



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Class 1 as per Section 11 (2)

Reason for Decision: D < 0.3 m

Barriers to Fish Movement: Yes – undefined channel

Active Beaver Dams: No

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

Historical Fish Presence:

BRST previously documented (FWMIS 2014).

Comments: Crew observed an additional 10+ fish throughout the propose pipeline corridor. Multiple historic beaver impoundments/dams were found upstream of the centre of the proposed pipeline corridor. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Trib. to Wabamun Lake		RK 102.4	
		Survey Date: May 23, 2014 Drawn By: B. Lunn Date Issued: June 10, 2014	Approved By: G. Eisler	LSD NE 9-53-4 W5M UTM Zone: 11 663630 E 5937997 N NAD 83	TMEP site: AB-39h	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-39h, Unnamed Tributary to Wabamun Lake at RK 102.4

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.

3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (10-05-13).



View downstream through centre of the proposed pipeline corridor (10-05-13).



View of left bank approach at centre of the proposed pipeline corridor (10-05-13).



View of right bank approach at centre of the proposed pipeline corridor (10-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run-Pool
 Habitat Unit through ZOI: Run-Pool-Riffle
 Gradient (%): 1.5
 Main Stem: Wabamun Lake, FB, 1.4 km DS

Water Quality/Quantity

Water Temperature (°C): 5.3 D. Oxygen (mg/L): 10.1
 Conductivity (µS/cm): 466.0 Discharge (m³/s): 0.02
 pH: 8.1 Flow Regime: Ephemeral
 Turbidity: Clear
 Substrate %
 Organics: 0
 Fines: 26
 Sml Gravel: 13
 Lrg Gravel: 31
 Cobble: 30
 Boulder: 0
 Bedrock: 0
 Cover
 Dominant: Undercut banks
 Subdominant: Overhanging vegetation and woody debris
 Riparian
 Type: Grasses and deciduous trees
 Maturity: Not recorded
 Crown Closure: 41-70 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Class 2 as per Section 11(3)

Reason for Decision: D < 0.6 m

Barriers to Fish Movement: Yes – seasonal flow

Active Beaver Dams: No

	Mean (m)	Range (m)
Wetted Width:	1.0	0.1-1.6
Channel Width:	1.7	1.3-2.5
Bank Height:	1.0	0.4-3.0
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST			2	

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	L
BURB	N	N	N	L
LKWH	N	N	N	L
NRDC	L	L	L	L

Sampling Effort

Method	Time	Distance	Date
BPEF	524 s	400 m	10-05-13
MT	36 hrs	n/a	28-10-12
MT	111 hrs	n/a	27-09-06

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Steep approach slopes for almost the entire reach of the watercourse with erosional runoff. Cobble armoring has been previously done at existing right-of-way. Channel lacks depth and cover and is mostly fines; likely only to provide fish habitat for cyprinids and forage fish. Winter construction is recommended. A potential alternate crossing location (lessened approach slopes) is suggested at 80 m upstream (within proposed pipeline corridor). Habitat potential ratings corroborated in AAR (2006) data. No fish were captured in 2006 (AAR 2006). QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Snow fill/ice bridge or clear span bridge.

		Trans Mountain Expansion Project		Unnamed Trib. to Wabamun Lake		RK 108.6	
		Survey Date: September 27, 2006; October 28, 2012; May 10, 2013 Drawn By: C. Tunks Date Issued: May 13, 2013	Approved By: G. Eisler	LSD NW 13 – 53 – 5 W5M UTM Zone: 11 658348 E 5939655 N NAD 83	TMEP site: AB-44 Sensitivity 		

SUMMARY OF AQUATIC ENVIRONMENT: AB-44, Unnamed Tributary to Wabamun Lake at RK 108.6

Federally/provincially-listed species present:	None	
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes	
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low	
Riparian buffer setback distance:	30 m	
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes	
Zone-of-influence:	300 m	
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.		

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined	
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside
Contingency pipeline construction method/timing:	None	N/A
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge	
Number of construction days of instream work anticipated:	< 2 days	

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring; proposed pipeline corridor does not approach the watercourse at a perpendicular angle.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

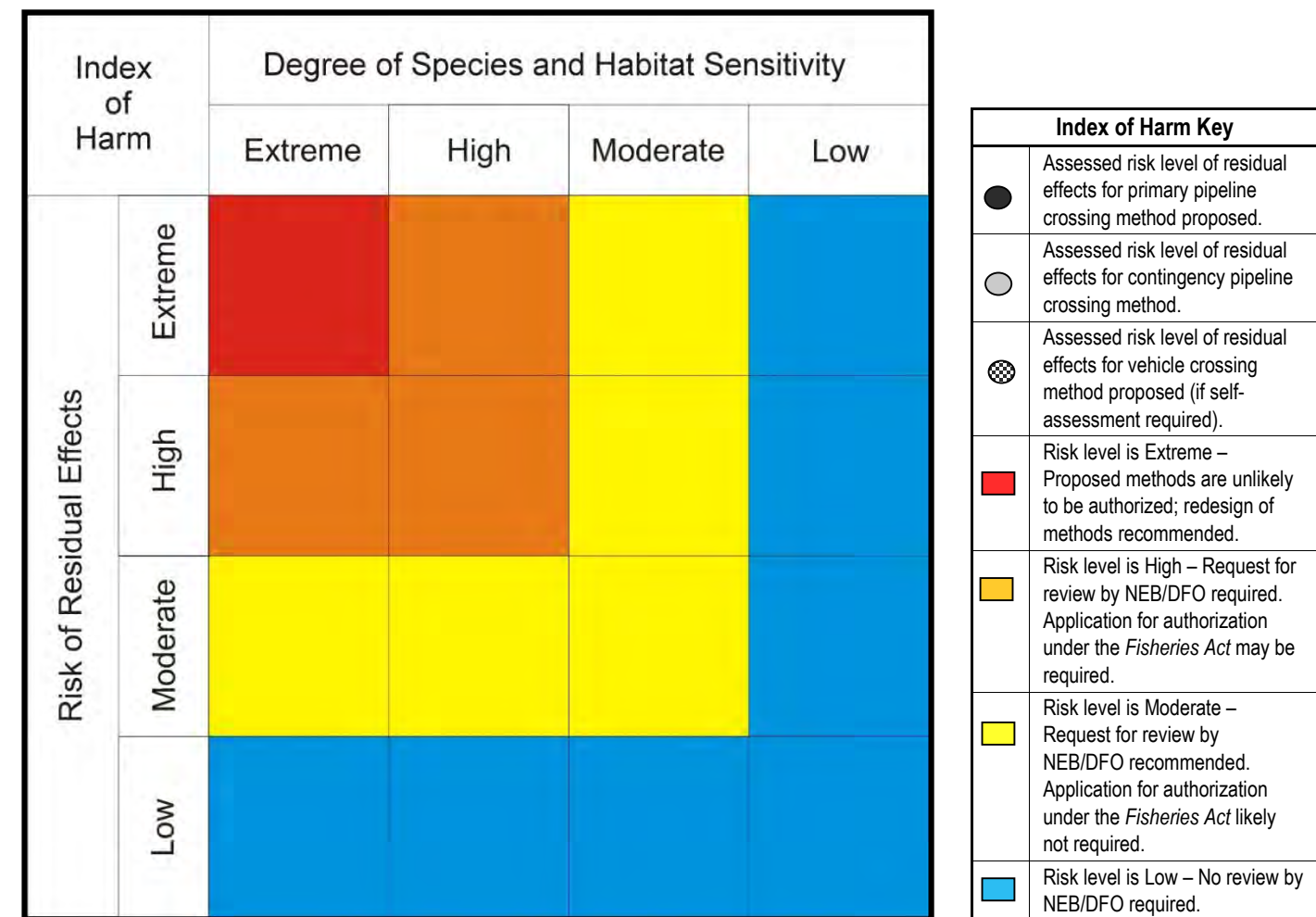
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (13-05-13).



View downstream through centre of the proposed pipeline corridor (13-05-13).



View of left bank approach at centre of the proposed pipeline corridor (13-05-13).



View of right bank approach at centre of the proposed pipeline corridor (13-05-13).

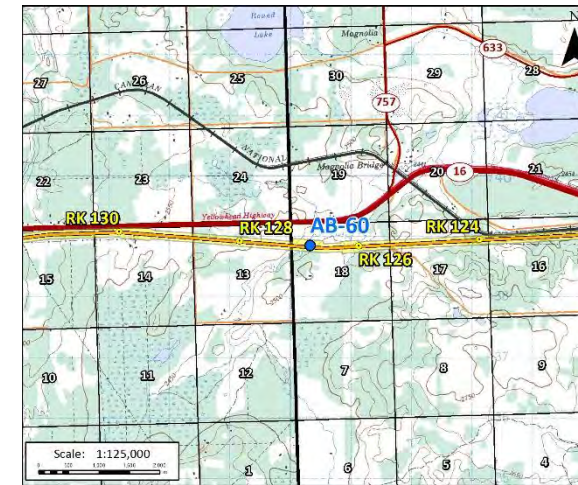
Channel Morphology

Pattern: Irregular meandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Flat
 Habitat Unit through ZOI: Flat-Impoundment
 Gradient (%): 1
 Main Stem: Isle Lake, FB, 6 km DS

	Mean (m)	Range (m)
Wetted Width:	7.5	6.8-9.0
Channel Width:	8.2	7.0-10.0
Bank Height:	2.3	1.8-2.8
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C): 14.0
 Conductivity (µS/cm): 312.3
 pH: 7.5
 D. Oxygen (mg/L): 7.4
 Discharge (m³/s): 0.4
 Flow Regime: Perennial
 Turbidity: Stained
 Substrate %
 Organics: 16
 Fines: 70
 Sml Gravel: 2
 Lrg Gravel: 12
 Cobble: 0
 Boulder: 0
 Bedrock: 0
 Cover
 Dominant: Woody debris
 Subdominant: n/a
 Riparian
 Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 0 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C

Navigability: Potentially Navigable

Reason for Decision: Class cannot be established

Barriers to Fish Movement: Potential – beaver dam

Active Beaver Dams: Yes

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
FTMN				294
BRST				204

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	L	M
YLPR	N	L	L	M
NRDC	M	M	L	M

Sampling Effort

Method	Time	Distance	Date
FLEF	699 s	300 m	13-05-13
MT	123 hrs	n/a	08-05-13
MT	120 hrs	n/a	26-09-06

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

BRST, LKCH, FTMN and WHSC previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. Area from the centre of the proposed pipeline corridor to 50 m downstream is a historic impoundment. Banks and approach slopes are low, but moderately unstable throughout the reach with several bank failures resulting from cattle access. Overall fish habitat limited by lack of cover, substrate and channel complexity. Beaver activity, habitat potential ratings and fish capture information corroborated by AAR (2006) data. QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, snowfill/ice bridge or clear span bridge.

		Trans Mountain Expansion Project		Unnamed Tributary to Isle Lake		RK 126.8	
		Survey Date: September 26, 2006; May 13, 2013 Drawn By: C. Tunks Date Issued: May 14, 2013	Approved By: G. Eisler	LSD NW 18-53-6 W5M UTM Zone: 11 640254 E 5939071 N NAD 83	TMEP site: AB-60 Sensitivity 		

SUMMARY OF AQUATIC ENVIRONMENT: AB-60, Unnamed Tributary to Isle Lake at RK 126.8

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	No		
Zone-of-influence:	500 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

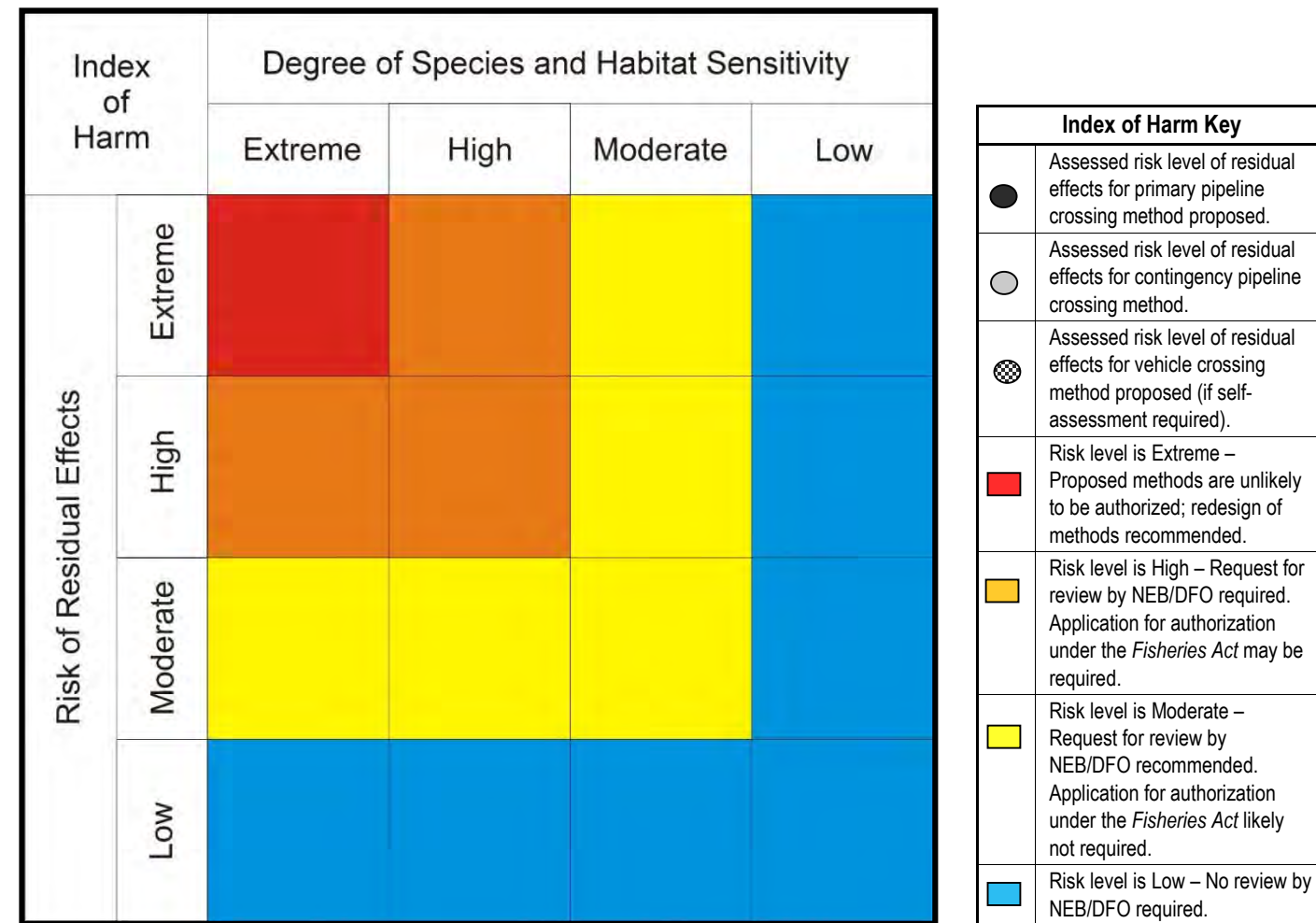
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (14-05-13).



View downstream through centre of the proposed pipeline corridor (14-05-13).



View of left bank approach at centre of the proposed pipeline corridor (14-05-13).



View of right bank approach at centre of the proposed pipeline corridor (14-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Frequently confined
 Bank Shape LB: Sloping
 RB: Vertical
 Habitat Unit at ROW: Riffle-Run
 Habitat Unit through ZOI: Riffle-Run
 Gradient (%): Not recorded
 Main Stem: Athabasca River, FB, 175 km DS

Water Quality/Quantity

Water Temperature (°C): 13.8 D. Oxygen (mg/L): 8.9
 Conductivity (µS/cm): 173.0 Discharge: Not recorded
 pH: 8 Flow Regime: Perennial
 Turbidity: Turbid

Substrate %

Organics: 1
 Fines: 34
 Sml Gravel: 19
 Lrg Gravel: 28
 Cobble: 18
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Depth
 Subdominant: Woody debris

Riparian

Type: Mixed C and D
 Maturity: Not recorded
 Crown Closure: 1-20 %

	Mean (m)	Range (m)
Wetted Width:	55.4	45.0 - 70.0
Channel Width:	67.4	49.0 - 95.0
Bank Height:	41.8 ^E	2.5 ^E - 95.0 ^E
Pool Depth:	Not recorded	Not recorded

Fish Presence and Life History Stage

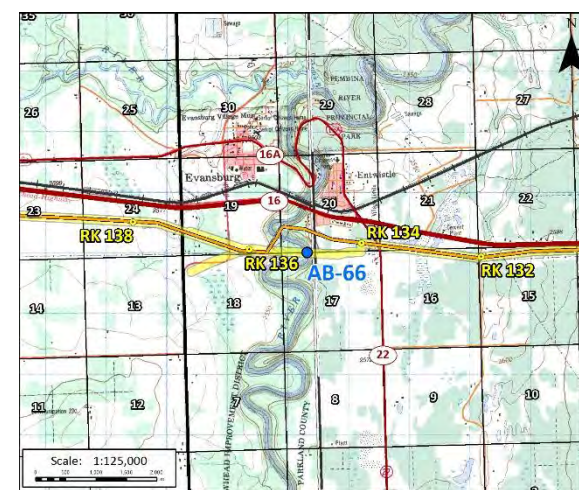
Species	YOY	Juv	Adult	Unknown
MNWH		6	1	
Sucker spp.				75
Trout spp.				4
WALL			16	
EMSH				5

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
ARGR	L	L	M	H
BLTR	M	L	M	H
BURB	M	M	M	H
MNWH	M-H	M-H	M	H
WALL	M-H	M	M-H	H

Sampling Effort

Method	Time	Distance	Date
BPEF	610 s	200 m	15-08-12
FLEF	1,040 s	1,900 m	14-05-13
SS	n/a	5.5 km	19-09-12



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Recommended Primary Pipeline Crossing Method:

Trenchless with water quality monitoring.

Recommended Contingency Pipeline Crossing Method:

Isolated trenched inside RAP or open cut outside RAP with water quality monitoring.

Historical Fish Presence:

ARGR, BKTR, BLTR, BURB, EMSH, FTMN, FNDC, FLCH, GOLD, LKCH, LNDC, LNSC, MNWH, NRPK, PRDC, RNTR, SPSC, TRPR, WALL, WHSC and YLPR were previously documented (FWMIS 2014).

Comments: Trout species observed were not confirmed to species level. Habitat dominated by riffle-run units. Three tributaries were within the LSA between 100-200 m downstream from the proposed pipeline corridor. Banks are steep and moderately unstable. If a trenched method is required as a contingency, then alternate alignment is recommended and a site-specific bank reclamation and/or compensation/offset plan may be needed. Recommended contingency methods are not necessarily reflective of biological considerations but are based primarily on engineering and/or hydrotechnical influences. Fish capture data results from all FFP components.

Restricted Activity Period:

September 1 to June 30

Least Risk Biological Window Proposed:

July 1 to August 31

Construction Timing:

To be determined

Stream Classification AB:

Class C

Navigability:

Navigable

Reason for Decision:

n/a

Barriers to Fish Movement:

None

Active Beaver Dams:

No

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing.

Comments:

		Trans Mountain Expansion Project		Pembina River		RK 135.0	
		Survey Date: August 15, 2012; September 19, 2012; May 14, 2013 Drawn By: B. Lunn Date Issued: May 16, 2013	Approved By: G. Eisler	LSD NW 17 - 53 - 7 W5M UTM Zone: 11 632239 E 5939230 N NAD 83	TMEP site: AB-66	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-66, Pembina River

Federally/provincially-listed species present:	ARGR, BLTR		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	6,000 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to August 31	Inside or outside LRBW	
Primary pipeline construction method/timing:	Trenchless/ To be determined	To be determined	
Contingency pipeline construction method/timing:	Trenched (open cut)/ To be determined	Inside	
Vehicle crossing methods:	Existing crossing		
Number of construction days of instream work anticipated:	15-30 days if contingency trenched (open cut) pipeline construction methods required		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Contingency trenched pipeline construction without flow isolation is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the contingency pipeline construction method: site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment where in-water work is not proposed.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage if contingency trenched pipeline construction methods required. Site isolation measures (e.g., silt boom or silt curtain) for containing suspended sediment will be installed prior to construction and remain in place throughout construction. A site specific reclamation plan will be implemented if contingency trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of proposed pipeline corridor (if contingency required) to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	No
Contingency construction method (if trenched contingency required) will limit fish salvage and sediment control measure effectiveness.	

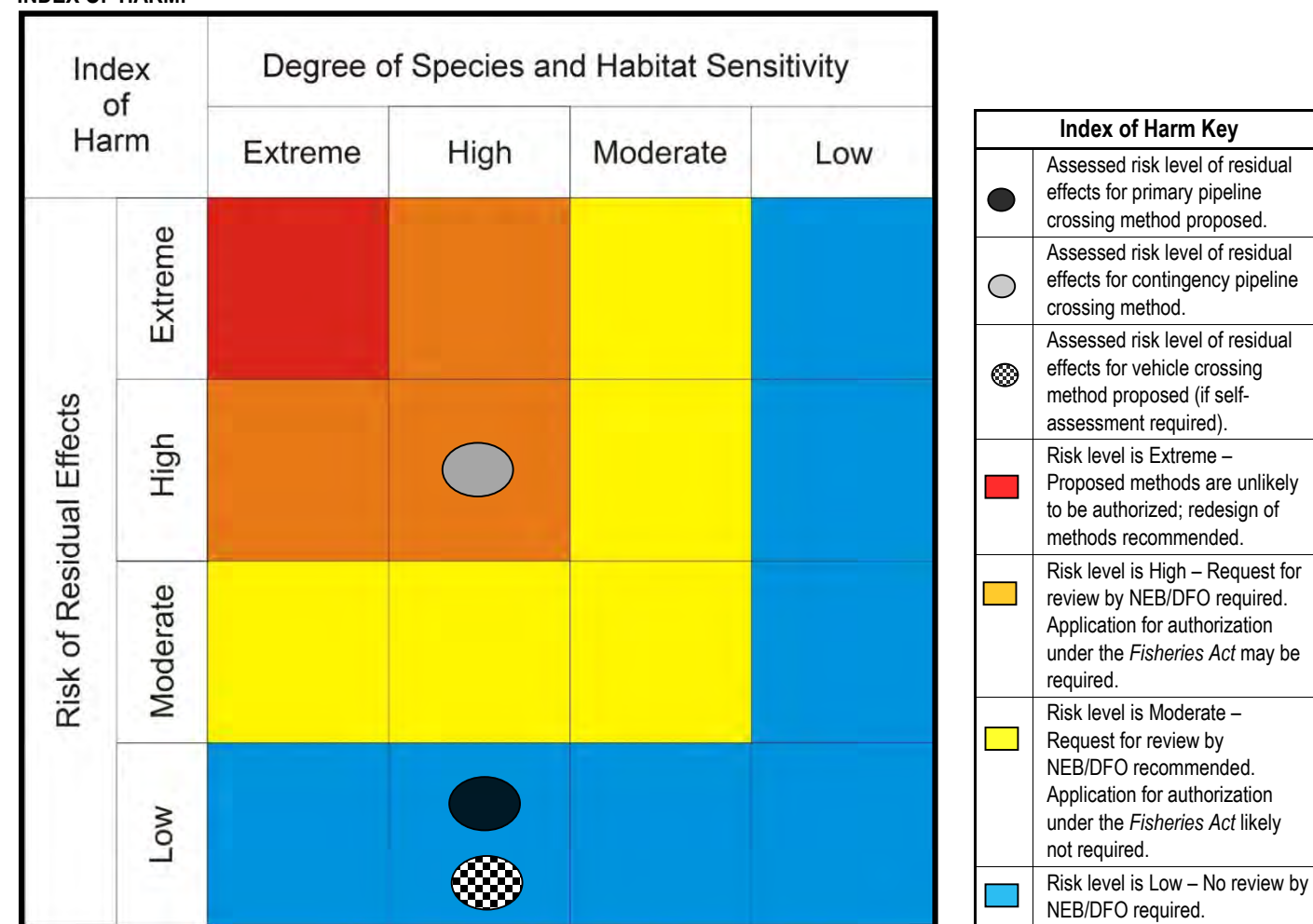
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	High
The primary trenchless pipeline construction method would result in a low overall risk, while the contingency trenched pipeline construction method would pose a high risk of residual effect.	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):	45	Est. Instream Footprint (m ²): 45 m (ROW) x 67 m (bankfull) + ZOI	≤ 70,015 m ²
	Bankfull Channel Width (m):	67	Est. Functional Rip. Footprint (m ²): 45 m (ROW) x X m (riparian)	≤ 1,125 m ²
	Functional ¹ Rip. Width (m):	L: 20 R: 5	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ 71,140 m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (13-05-13).



View downstream through centre of the proposed pipeline corridor (13-05-13).



View of left bank approach at centre of the proposed pipeline corridor (13-05-13).



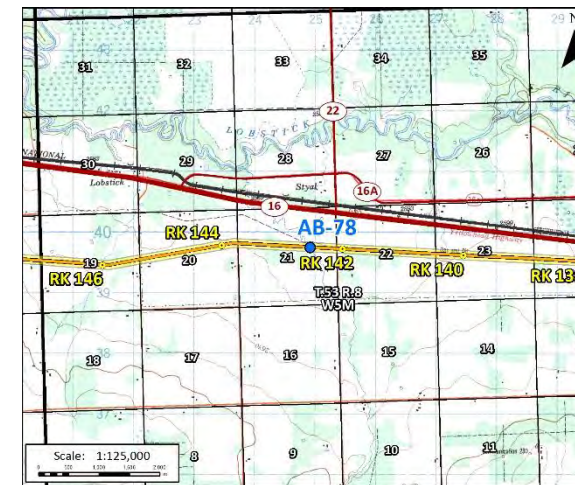
View of right bank approach at centre of the proposed pipeline corridor (13-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Unconfined
 Bank Shape LB: Vertical
 RB: Sloping
 Habitat Unit at ROW: Run-Pool
 Habitat Unit through ZOI: Flat-Run
 Gradient (%): 1
 Main Stem: Lobstick River, FB, 2.2 km DS

Water Quality/Quantity

Water Temperature (°C): 15.8 D. Oxygen (mg/L): 8.3
 Conductivity (µS/cm): 237.0 Discharge (m³/s): 0.02
 pH: 8.1 Flow Regime: Perennial
 Turbidity: Turbid
 Substrate %
 Organics: 0
 Fines: 86
 Sml Gravel: 1
 Lrg Gravel: 6
 Cobble: 6
 Boulder: 1
 Bedrock: 0
 Cover
 Dominant: Depth
 Subdominant: Woody debris
 Riparian
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C

Navigability: Class 3 as per TERA criteria

Reason for Decision: 3 m < CW < 5 m

Barriers to Fish Movement: Potential – beaver dam

Active Beaver Dams: Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present (with water quality monitoring if inside the RAP) or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge or clear span bridge.

Historical Fish Presence:

FTMN were previously documented (FWMIS 2014).

Comments: Banks are highly unstable and heavily eroded from cattle and existing vehicle crossing. Beaver dam immediately upstream, recently breached. Wintering habitat potential ratings result from February 2013 site visit. Habitat potential ratings and fish capture information corroborated by AAR (2006) data. QAES-led QAES-led fish salvage required if isolated trenched construction occurs.

	Mean (m)	Range (m)
Wetted Width:	3.5	2.0 - 5.9
Channel Width:	3.5	2.0 - 5.9
Bank Height:	1.4	0.8 - 2.1
Pool Depth:	0.6	0.1 - 1.0

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
WHSC				17
LKCH				12
PRDC				4
FTMN				11

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	L	H
BURB	N	N	L	H
NRDC	N	M	M	H

Sampling Effort

Method	Time	Distance	Date
BPEF	586 s	200 m	22-09-06
BPEF	1,072 s	250 m	13-05-13

		Trans Mountain Expansion Project		Zeb-igler Creek		RK 142.5	
		Survey Date: September 22, 2006; February 7, 2013; May 13, 2013 Drawn By: B. Lunn Date Issued: May 17, 2013	Approved By: G. Eisler	LSD NE 21 – 53 – 8 W5M UTM Zone: 11 624846 E 5939971 N NAD 83	TMEP site: AB-78 Sensitivity 		

SUMMARY OF AQUATIC ENVIRONMENT: AB-78, Zeb-igler Creek

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	No		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods and water quality monitoring should construction occur within the restricted activity period (April 16 to June 30). A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key

- Assessed risk level of residual effects for primary pipeline crossing method proposed.
- Assessed risk level of residual effects for contingency pipeline crossing method.
- Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
- Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
- Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
- Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
- Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (14-05-13).

View downstream through centre of the proposed pipeline corridor (14-05-13).

View of left bank approach at centre of the proposed pipeline corridor (14-05-13).

View of right bank approach at centre of the proposed pipeline corridor (14-05-13).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: Wetland
 Habitat Unit through ZOI: Wetland
 Gradient (%): 0
 Main Stem: Zeb-igler Creek, FB, 300 m DS

	Mean (m)	Range (m)
Wetted Width:	2.9	1.2 - 5.5
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C): 12.7
 Conductivity (µS/cm): 528.0
 pH: 7.8
 D. Oxygen (mg/L): 5.1
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Stained

Substrate %

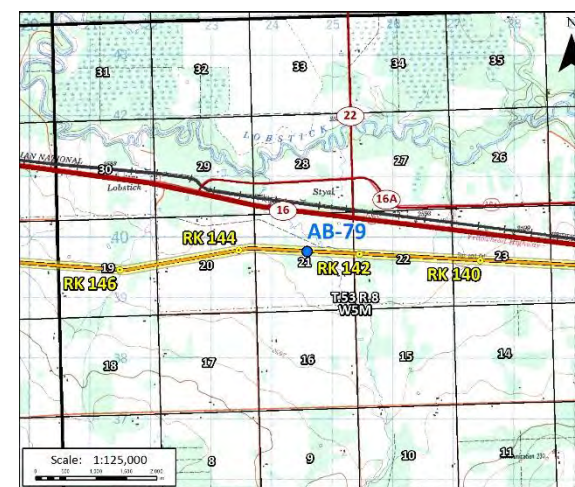
Organics: 11
 Fines: 89
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Overhanging vegetation

Riparian

Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 0 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Wetland

Navigability:

Refer to Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5)

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

No

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge, Type 3 culvert or Type 5 logfill/swamp mat

Recommended Vehicle Crossing Method (Frozen):

Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Approach degradation resulting from bison and OHV travel at the proposed pipeline corridor.

Indiscernible flow at time of assessment, suspect crossing may be dry later in the open water season or frozen to bottom in the winter. QAES-led fish salvage required if isolated trenched construction occurs.

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				1
PRDC				31

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	L
BURB	N	N	N	L
NRDC	N	N	N	L

Sampling Effort

Method	Time	Distance	Date
BPEF	329 s	250 m	14-05-13

		Trans Mountain Expansion Project		Unnamed Wetland		RK 142.9	
		Survey Date: May 13/14, 2013 Drawn By: B. Lunn Date Issued: May 17, 2013	Approved By: G. Eisler	LSD NE 21 – 53 – 8 W5M UTM Zone: 11 624513 E 5939988 N NAD 83	TMEP site: AB-79 Sensitivity		

SUMMARY OF AQUATIC ENVIRONMENT: AB-79, Unnamed Wetland at RK 142.9

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	10 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
	Low			

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through the centre of the proposed pipeline corridor at 50 m downstream (19-06-14).



View downstream through the centre of the proposed pipeline corridor at 50 m downstream (19-06-14).



View of left bank approach at centre of the proposed pipeline corridor at 50 m downstream (19-06-14).



View of right bank approach at centre of the proposed pipeline corridor at 50 m downstream (19-06-14).

Channel Morphology

Pattern:	Irregular wandering	
Confinement:	Unconfined	
Bank Shape	LB:	Sloping
	RB:	Vertical
Habitat Unit at ROW:	n/a	
Habitat Unit through ZOI:	Flat	
Gradient (%):	0.5	
Main Stem:	Lobstick River, FB, 2.8 km DS	
	Mean (m)	Range (m)
Wetted Width:	1.2	0.2-4.1
Channel Width:	1.5	0.4-4.1
Bank Height:	1.5	0.8-2.3
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C):	12.6	D. Oxygen (mg/L):	10.9
Conductivity (µS/cm):	403.6	Discharge (m³/s):	Negligible
pH:	7.9	Flow Regime:	Perennial
		Turbidity:	Stained
Substrate %		Cover	
Organics:	7	Dominant:	Overhanging vegetation
Fines:	90	Subdominant:	Undercut
Sml Gravel:	1	Type:	Deciduous trees
Lrg Gravel:	0	Maturity:	Not recorded
Cobble:	1	Crown Closure:	41-70%
Boulder:	0		
Bedrock:	0		



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Class 1 as per Section 11(2)

Reason for Decision:

D < 0.3 m

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

No

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge or clear span bridge.

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Unstable, vertical banks downstream of centre of the proposed pipeline corridor, slumping observed in several areas. Substrate consists mostly of fines. System lacks channel complexity; mainly flats with some deeper pools above 50 m upstream. Low water levels create a lack of connectivity in downstream reaches. For methods of assessment at this site refer to Risk Management Strategy for Access Refusal Sites (Section 3.9.2 Supplemental Fisheries (Alberta) Technical Report). QAES-led fish salvage required if isolated trenched construction occurs.

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST			2	

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	L	N	N
NRDC	L	L	N	N
BURB	L	L	N	N

Sampling Effort

Method	Time	Distance	Date
BPEF	310 s	300 m	19-06-14
MT	84 hrs	n/a	19-06-14

 A CH2M HILL Company	 TRANSMOUNTAIN	Trans Mountain Expansion Project		Unnamed Trib. to Lobstick River		AK 146.0		
		Survey Date:	June 19, 2014	LSD	SE 19-53-8 W5M	TMEP site:	AB-82	Sensitivity
		Drawn By:	K. Wantola	Approved By:	G. Eisler	UTM Zone:	11 621438 E 5939677 N NAD 83	
Date Issued:	June 23, 2014							

SUMMARY OF AQUATIC ENVIRONMENT: AB-82, Unnamed Tributary to Lobstick River at AK 146.0

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	400 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring. Note, steep and unstable banks presumed at proposed pipeline corridor given observations made at Risk Management Strategy Site (please refer to Supplemental Fisheries (Alberta) Technical Report.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks presumed to occur.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

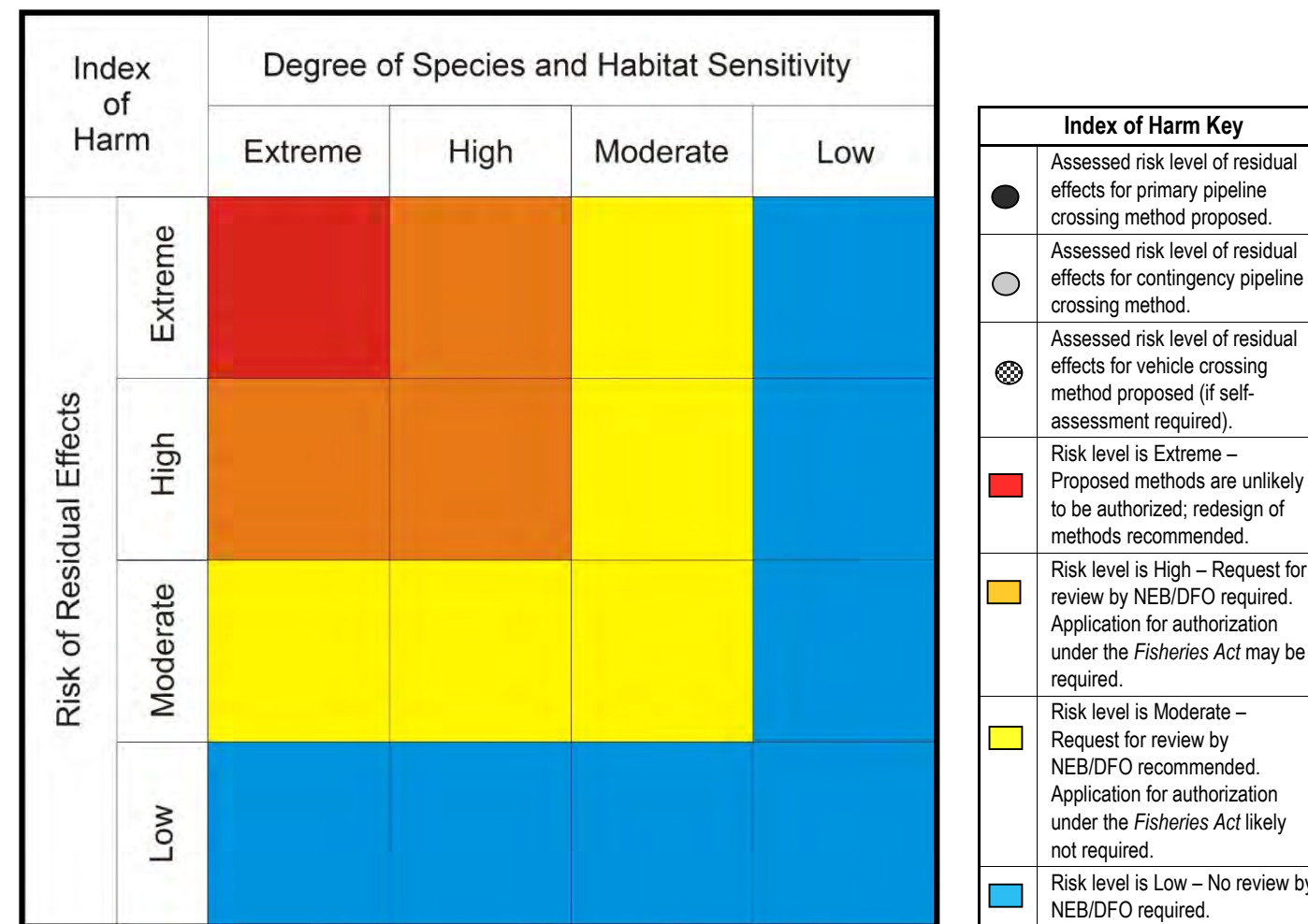
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (08-05-13).



View downstream through centre of the proposed pipeline corridor (08-05-13).



View of left bank approach at centre of the proposed pipeline corridor (08-05-13).



View of right bank approach at centre of the proposed pipeline corridor (08-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Flat-Run
 Habitat Unit through ZOI: Flat-Run-Pool
 Gradient (%): 1
 Main Stem: Chip Lake, FB, 3.3 km DS

Water Quality/Quantity

Water Temperature (°C): 11.8 D. Oxygen (mg/L): 7.6
 Conductivity (µS/cm): 218.0 Discharge (m³/s): Negligible
 pH: 7.2 Flow Regime: Perennial
 Turbidity: Stained

Substrate %

Organics: 14
 Fines: 74
 Sml Gravel: 6
 Lrg Gravel: 6
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Depth
 Subdominant: Instream vegetation

Riparian

Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	2.4	0.6-5.5
Channel Width:	2.3	0.6-5.0
Bank Height:	1.2	0.8-2.1
Pool Depth:	7.5	4.0-10.0

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				39
FTMN				40

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	L	L	M-H
NRDC	M	M	M	M-H
BURB	L	L	L	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	829 s	232 m	08-05-13
MT	96 hrs	200 m	26-09-06
MT	114 hrs	n/a	08-05-13



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Class 2 as per Section 11(3)

Reason for Decision: D < 0.6 m

Barriers to Fish Movement: Potential – beaver dam

Active Beaver Dams: Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

BRST and FTMN previously documented (FWMIS 2014).

Comments: Failing/unstable banks on left bank at 50 m upstream and at the centre of the proposed pipeline corridor.

Evidence of historic beaver dam activity at 85 m downstream. Old beaver impoundment and debris pile at 230 m downstream. System lacks channel complexity; mainly flats with some deep pools and fine substrate. Habitat potential ratings, fish capture information and recommendations corroborated by AAR (2006) data. Watercourse with wetland features. QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing, Type 3 culvert, Type 5 logfill/swamp mat or clear span bridge

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, snowfill/ice bridge, clear span bridge, or Type 3 culvert or Type 5 logfill/swamp mat.

 A QDEM HILL Company		Trans Mountain Expansion Project		Unnamed Tributary to Chip Lake		RK 156.5	
		Survey Date: September 26, 2006; October 26, 2012; May 8, 2013 Drawn By: C. Tunks Date Issued: May 9, 2013	Approved By: G. Eisler	LSD NW 19 – 53 – 09 W5M UTM Zone: 11 611033 E 5939574 N NAD 83	TMEP site: AB-92	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-92, Unnamed Tributary to Chip Lake at RK 156.5

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	No		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge, snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

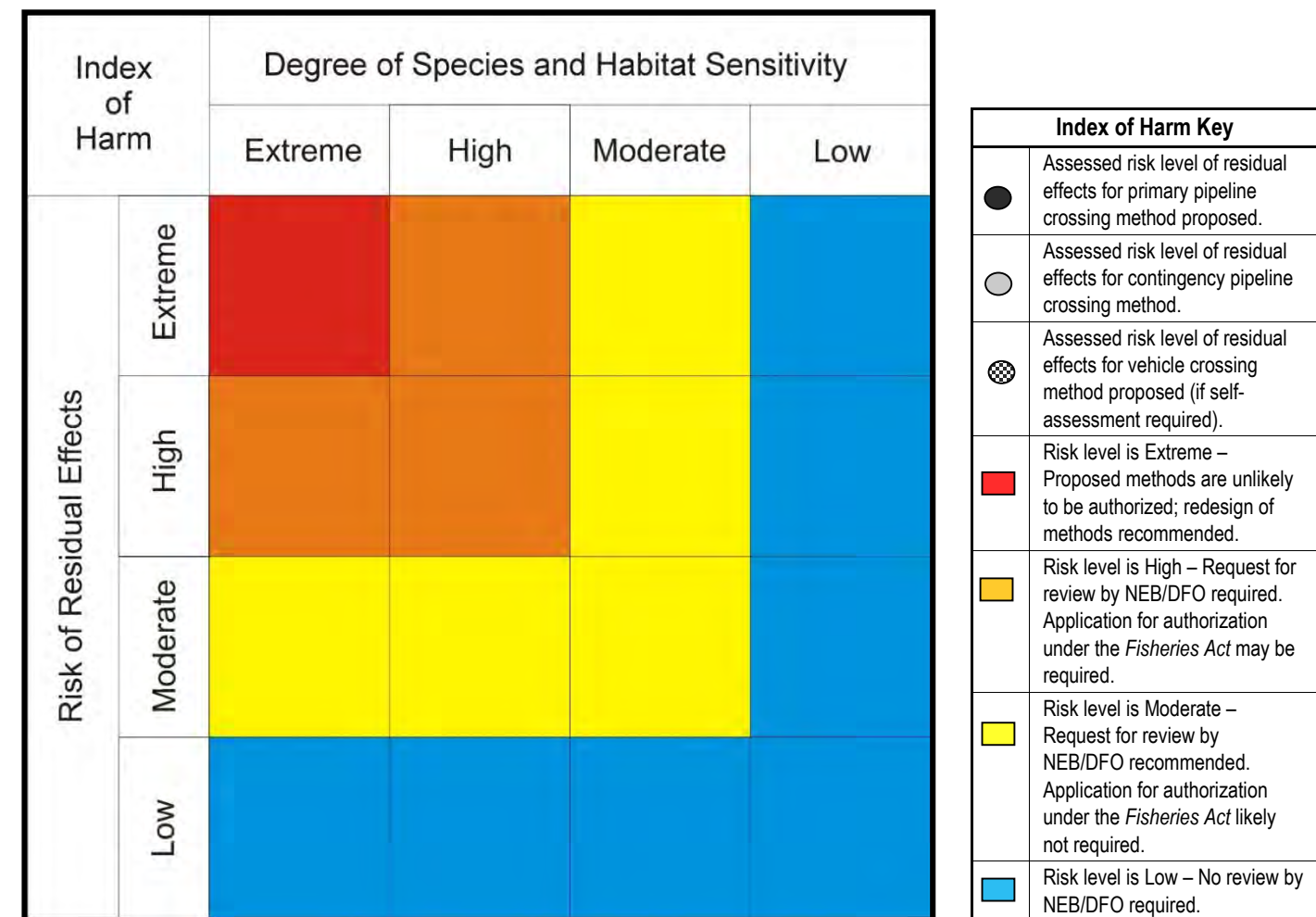
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (10-05-13).



View downstream through centre of the proposed pipeline corridor (10-05-13).



View of left bank approach at centre of the proposed pipeline corridor (10-05-13).



View of right bank approach at centre of the proposed pipeline corridor (10-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Undercut
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run
 Gradient (%): 1
 Main Stem: Chip Lake, FB, 6 km DS

	Mean (m)	Range (m)
Wetted Width:	0.9	0.7-1.1
Channel Width:	1.4	0.9-2.2
Bank Height:	0.5	0.2-0.7
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C): 7.8 D. Oxygen (mg/L): 10.2
 Conductivity (µS/cm): 412.0 Discharge (m³/s): 0.2
 pH: 7.4 Flow Regime: Perennial
 Turbidity: Clear

Substrate %

Organics: 0
 Fines: 100
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Overhanging vegetation
 Subdominant: Woody debris
 Type: Mixed C and D and shrubs
 Maturity: Not recorded
 Crown Closure: 41-70 %

Fish Presence and Life History Stage

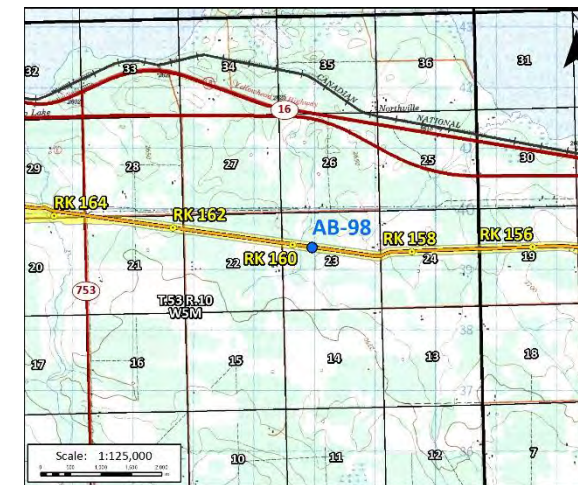
Species	YOY	Juv	Adult	Unknown
BRST				184

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	M
NRDC	L	L	N	M
BURB	N	N	N	M

Sampling Effort

Method	Time	Distance	Date
MT	74 hrs	n/a	24-10-12
MT	17 hrs	n/a	09-05-13
BPEF	612 s	130 m	09-05-13



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: Class C (unmapped)

Navigability: Class 2 as per Section 11(3)

Reason for Decision: D < 0.6 m

Barriers to Fish Movement: Yes – seasonal flow

Active Beaver Dams: No

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge or Type 3 culvert.

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge, clear span bridge or Type 3 culvert.

Historical Fish Presence:

BRST previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. Watercourse lacks channel complexity and is confirmed to be frozen to the bottom during the winter (2012). Centre of proposed pipeline corridor parallels watercourse and crosses at a meander-bend. Wintering habitat potential ratings resulted from February 2013 site visit. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Tributary to Chip Lake		RK 159.7	
		Survey Date: October 24, 2012; February 7, 2012; May 10, 2013 Drawn By: K. Johnson Date Issued: May 23, 2013	Approved By: G. Eisler	LSD NW 23 – 53 – 10 W5M UTM Zone: 11 607885 E 5939589 N NAD 83	TMEP site: AB-98	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-98, Unnamed Tributary to Chip Lake at RK 159.7

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge, snowfill/ice bridge or Type 3 culvert		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor parallels watercourse; proposed pipeline corridor occurs at a meander bend (<i>i.e.</i> , does not approach the watercourse at a perpendicular angle).	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to ensure perpendicular approach to the watercourse and avoidance of meander bend. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
--	--

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (*i.e.*, provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Risk of Residual Effects	Degree of Species and Habitat Sensitivity			
		Extreme	High	Moderate	Low
Index of Harm	Extreme	Red	Orange	Yellow	Blue
	High	Orange	Orange	Yellow	Blue
	Moderate	Yellow	Yellow	Yellow	Blue
	Low	Blue	Blue	Blue	Blue

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the <i>Fisheries Act</i> may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the <i>Fisheries Act</i> likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (<i>e.g.</i>, beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream at 40 m upstream from the centre of the proposed pipeline corridor (30-07-14).



View downstream at 40 m upstream from the centre of the proposed pipeline corridor (30-07-14).



View of left bank approach at at 40 m upstream from the centre of the proposed pipeline corridor (30-07-14).



View of right bank approach at at 40 m upstream from the centre of the proposed pipeline corridor (30-07-14).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Occasionally Confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: n/a
 Habitat Unit through ZOI: Riffle-Pool-Run
 Gradient (%): 0.5
 Main Stem: Chip Lake, FB, 3.3 km DS

	Mean (m)	Range (m)
Wetted Width:	4.9	1.8 – 12.0
Channel Width:	3.7	1.8 – 7.0
Bank Height:	1.8	1.2 – 2.5
Pool Depth:	1.2	0.9-1.5

Water Quality/Quantity

Water Temperature (°C): 19.0 D. Oxygen (mg/L): 5.5
 Conductivity (µS/cm): 620.0 Discharge (m³/s): Negligible
 pH: 8.1 Flow Regime: Perennial
 Turbidity: Stained

Substrate %

Organics: 29
 Fines: 63
 Sml Gravel: 0
 Lrg Gravel: 2
 Sml Cobble: 7
 Lrg Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Depth

Riparian

Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 1-20 %

Fish Presence and Life History Stage

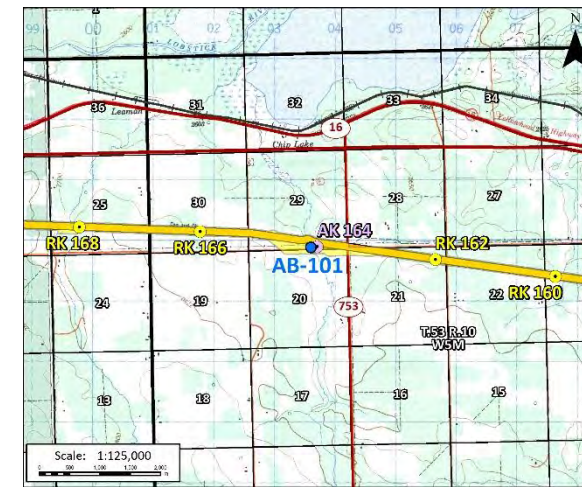
Species	YOY	Juv	Adult	Unknown
NRPK				2 (observed)
Cyprinid				2 (observed)

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M-H	M-HM	M-HMH	M-HLH
BURB	L	M	M	L
NRDC	H	H	H	H

Sampling Effort

Method	Time	Distance	Date
BPEF	190 s	100 m	30-07-14



Source: 1:125,000 NTS Map © 2014 Department of Natural Resources Canada.

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring or open cut if frozen to the bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. Historic beaver dams located 800 m and 850 m downstream of the centre of the proposed pipeline corridor. Unstable banks downstream of centre of the proposed pipeline corridor, slumping in some areas. Abundant instream vegetation throughout the LSA. QAES-led fish salvage required if isolated trenched construction occurs. For methods of assessment at this site refer to Risk Management Strategy for Access Refusal Sites (Section 3.9.2 Supplemental Fisheries (Alberta) Technical Report).

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

July 1 to April 15

Construction Timing:

To be determined

Stream Classification AB: Class C

Navigability: Class 3 as per TERA criteria

Reason for Decision: 3m < CW < 5m

Barriers to Fish Movement: None

Active Beaver Dams: No

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, snowfill/ice bridge or clear span bridge.

		Trans Mountain Expansion Project		Unnamed Tributary to Chip Lake		AK 164.1	
		Survey Date: July 30, 2014 Drawn By: K. Seibel Date Issued: August 6, 2014	Approved By: G. Eisler	LSD SE 29-53-10 W5M UTM Zone: 11 603525 E 5940110 N NAD 83	TMEP site: AB-101 Sensitivity 		

SUMMARY OF AQUATIC ENVIRONMENT: AB-101, Unnamed Tributary to Chip Lake at RK 164.1

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	500 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to April 15	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: potential spawning habitat occurs within the proposed pipeline corridor. Note, spawning potential presumed at proposed pipeline corridor given observations made at Risk Management Strategy Site (please refer to Supplemental Fisheries [Alberta] Technical Report (TERA, December 2014).	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include water quality monitoring and QAES-led fish salvage during isolated trenched pipeline construction methods. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Yellow)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Light Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View north at centre of the proposed pipeline corridor (23-10-12).

View south at centre of the proposed pipeline corridor (23-10-12).

View of west bank at centre of the proposed pipeline corridor (23-10-12).

View of east bank at centre of the proposed pipeline corridor (23-10-12).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: NCD
 Habitat Unit through ZOI: NCD
 Gradient (%): 1
 Main Stem: Chip Lake, FB, 4 km DS

	Mean (m)	Range (m)
Wetted Width:	0	n/a
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Water Quality/Quantity

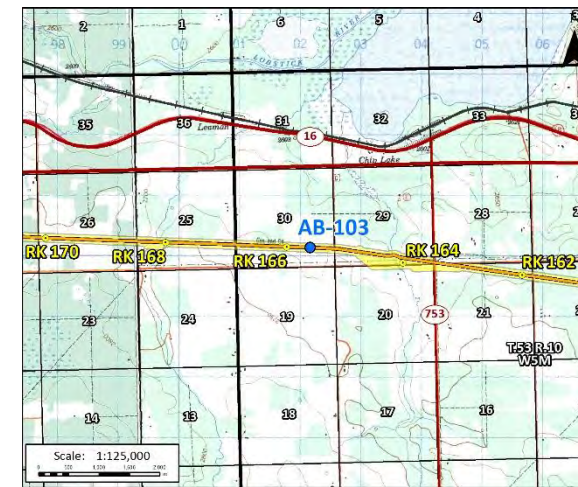
Water Temperature (°C): Dry
 Conductivity (µS/cm): Dry
 pH: Dry
 D. Oxygen (mg/L): Dry
 Discharge (m³/s): Dry
 Flow Regime: Ephemeral
 Turbidity: Dry

Substrate %

Organics: 0
 Fines: 80
 Sml Gravel: 10
 Lrg Gravel: 10
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: n/a
 Subdominant: n/a
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB: NCD

Navigability: Class 1 as per Section 11(2)

Reason for Decision: CW < 1.2 m

Barriers to Fish Movement: Yes – undefined channel

Active Beaver Dams: No

Recommended Vehicle Crossing Method (Non-Frozen):

Type 3 culvert or Type 5 logfill/swamp mat.

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat.

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if dry or frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence:

LNSC previously documented (FWMIS 2014).

Comments: Drainage throughout cultivated land. Dry at the time of assessment with isolated sections of scour detected approximately 300 m south. Fish presence documented previously downslope from proposed pipeline corridor, presumably where channel definition occurs. QAES-led fish salvage required if isolated trenched construction occurs.

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
NFC	-	-	-	-

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	N	N	N	N
NRDC	N	N	N	N
BURB	N	N	N	N

Sampling Effort

Method	Time	Distance	Date
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		Trans Mountain Expansion Project		Unnamed NCD		RK 165.6	
		Survey Date: October 23, 2012 Drawn By: K. Johnson Date Issued: July 8, 2013	Approved By: G. Eisler	LSD SE 30 – 53 – 10 W5M UTM Zone: 11 602088 E 5940366	TMEP site: AB-103 NAD 83	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-103, Unnamed NCD at RK 165.6

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	10 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

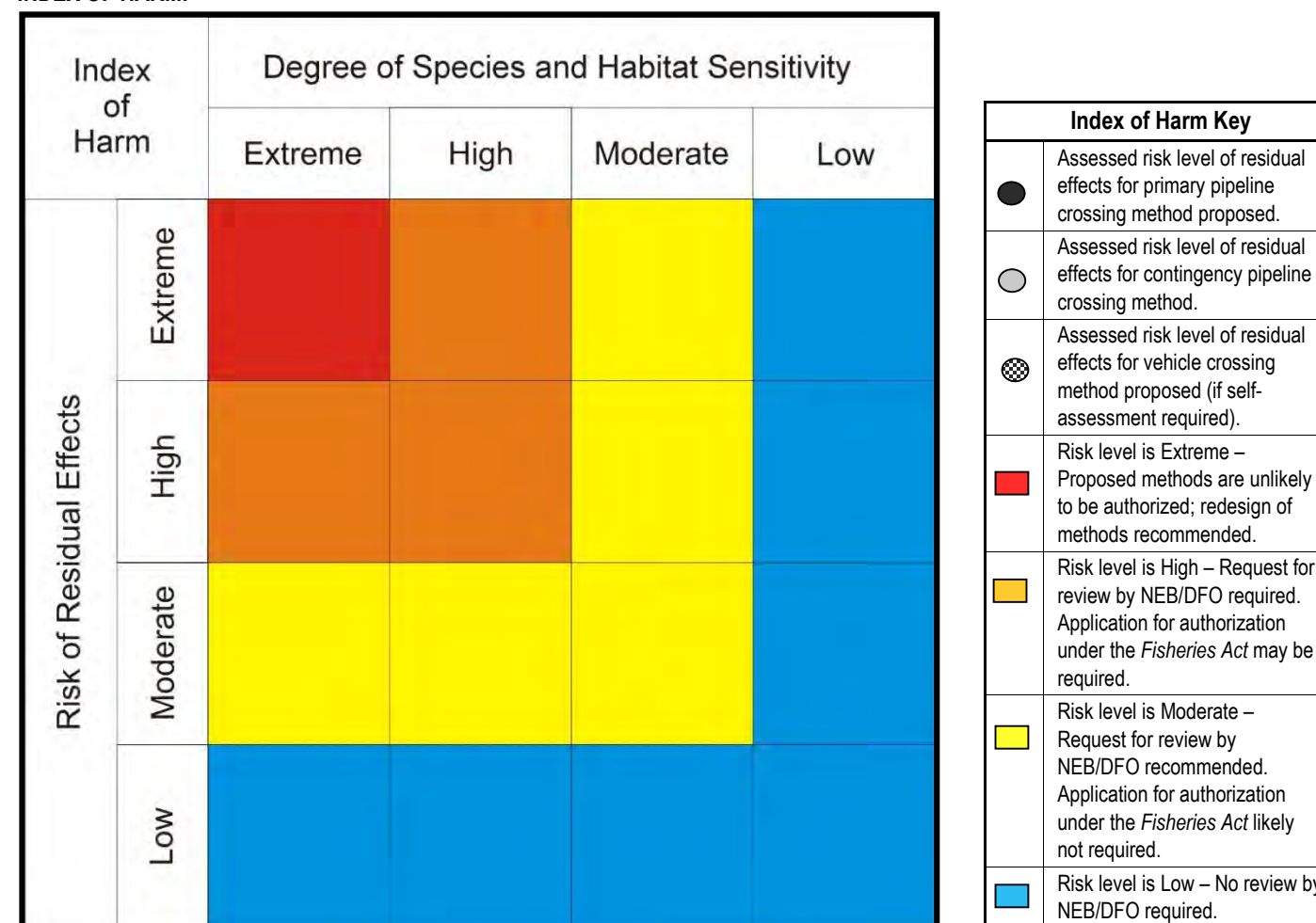
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (11-05-13).



View downstream through centre of the proposed pipeline corridor (11-05-13).



View of left bank approach at centre of the proposed pipeline corridor (11-05-13).



View of right bank approach at centre of the proposed pipeline corridor (11-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Flat
 Habitat Unit through ZOI: Flat-Run-Pool
 Gradient (%):
 Main Stem: Chip Lake, FB, 4.5 km DS

	Mean (m)	Range (m)
Wetted Width:	3.8	1.4-7.0
Channel Width:	3.8	1.4-7.0
Bank Height:	1.3	1.0-1.6
Pool Depth:	0.5	0.4-0.7

Water Quality/Quantity

Water Temperature (°C): 9.9
 Conductivity (µS/cm): 205.0
 pH: 7.8
 D. Oxygen (mg/L): 9.8
 Discharge (m³/s): 0.09
 Flow Regime: Perennial
 Turbidity: Clear

Substrate %

Organics: 0
 Fines: 72
 Sml Gravel: 5
 Lrg Gravel: 13
 Cobble: 10
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Woody debris
 Subdominant: Undercut banks

Riparian

Type: Mixed C and D and grasses
 Maturity: Not recorded
 Crown Closure: 1-20 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

April 16 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Class C

Navigability:

Class 3 as per TERA criteria

Reason for Decision:

3m < CW < 5m

Barriers to Fish Movement:

None

Active Beaver Dams:

No

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				8
WHSC		22		8

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	L	M
NRDC	L	L	L	M
BURB	L	L	L	M

Sampling Effort

Method	Time	Distance	Date
BPEF	1,133 s	400 m	23-09-06
BPEF	560 s	100 m	18-08-12
BPEF	943 s	210 m	10-05-13
MT	85 hrs	n/a	18-08-12
MT	72 hrs	n/a	10-05-13

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present (with water quality monitoring if inside the RAP) or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Historical Fish Presence: BRST and WHSC previously documented (FWMIS 2014).

Comments: Unstable banks throughout most of the LSA resulting from cattle access. Centre of the proposed pipeline corridor parallels creek south of existing TMPL right-of-way. Channel complexity increases upstream of the existing TMPL right-of-way. Wintering habitat potential ratings resulted from February 2013 site visit. Habitat potential, fish capture information and recommendations corroborated by AAR (2006) data and TERA (2010). QAES-led fish salvage required if isolated trenched construction occurs.

Recommended Vehicle Crossing Method (Non-Frozen):

Clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Clear span bridge or snowfill/ice bridge.

		Trans Mountain Expansion Project		Unnamed Tributary to Chip Lake		RK 168.2	
		Survey Date: Sept. 23, 2006; August 18, 2012; February 7, 2013; May 10/11, 2013 Drawn By: C. Tunks Date Issued: May 13, 2013	Approved By: G. Eisler	LSD SW 25 – 53 – 11 W5M UTM Zone: 11 599510 E 5940451	TMEP site: AB-106 NAD 83	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-106, Unnamed Tributary to Chip Lake at RK 168.2

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Sections 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	< 2 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor parallels watercourse; proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods and water quality monitoring if construction occurs within the restricted activity period (April 16 to June 30). A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to ensure perpendicular approach to the watercourse and avoidance of steep and unstable banks. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity			
	Extreme	High	Moderate	Low
Risk of Residual Effects	Extreme			
	High			
	Moderate			
Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (11-05-13).



View downstream through centre of the proposed pipeline corridor (11-05-13).



View of left bank approach at centre of the proposed pipeline corridor (11-05-13).



View of right bank approach at centre of the proposed pipeline corridor (11-05-13).

Channel Morphology

Pattern: Irregular meandering
 Confinement: Occasionally confined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Impoundment
 Habitat Unit through ZOI: Flat-Impoundment-Pool
 Gradient (%): 0.5-1.0^E
 Main Stem: Lobstick River, FB, 6.5 m DS

Water Quality/Quantity

Water Temperature (°C): 5.7 D. Oxygen (mg/L): 7.8
 Conductivity (µS/cm): 174.0 Discharge (m³/s): 0.8
 pH: 7.5 Flow Regime: Perennial
 Turbidity: Clear

Substrate %

Organics: 30
 Fines: 70
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Depth
 Subdominant: Woody debris

Riparian

Type: Shrubs and coniferous trees
 Maturity: Not recorded
 Crown Closure: 0 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to June 30

Least Risk Biological Window Proposed:

July 1 to August 31

Construction Timing:

To be determined

Stream Classification AB:

Class C

Navigability:

Potentially Navigable

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

Potential – beaver dam

Active Beaver Dams:

Yes

	Mean (m)	Range (m)
Wetted Width:	42.6	6.0-110.0
Channel Width:	9.1	6.0-12.5
Bank Height:	1.9	1.4-2.2
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
ARGR		17		20 (observed)
WHSC				43

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	M-H	M
NRDC	M	M-H	M-H	M
BNTR	N	L	M-H	M
ARGR	L	M-H	M-H	M

Sampling Effort

Method	Time	Distance	Date
FLEF	566 s	400 m	26-09-06
MT	249 hrs	n/a	26-09-06
FLEF	2,070 s	450 m	11-05-13

Recommended Primary Pipeline Crossing Method:

Trenchless with water quality monitoring.

Recommended Contingency Pipeline Crossing Method:

Isolated trenched outside RAP with water quality monitoring.

Historical Fish Presence:

ARGR, BNTR, NRPK, PRDC and WHSC previously documented (FWMIS 2014).

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snow fill/ice bridge.

Comments: Impounded culverts have been cleared and no active beaver dams were observed at the centre of the proposed pipeline corridor; this has not changed the wintering habitat potential ratings. An exposed pipe was observed 25 m downstream of the centre of the proposed pipeline corridor. Habitat potential ratings and fish capture information corroborated by AAR (2006) data (although no ARGR captured by AAR). If trenched methods are needed as a contingency, a site-specific bank reclamation and/or compensation/offset plan may be needed. Watercourse with wetland features. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Little Brule Creek		RK 173.7	
		Survey Date: September 26, 2006; February 8, 2013; May 11, 2013, May 30, 2014 Drawn By: C. Tunks Date Issued: May 13, 2013	Approved By: G. Eisler	LSD NE 29 – 53 – 11 W5M UTM Zone: 11 594073 E 5940817 N NAD 83	TMEP site: AB-111	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-111, Little Brule Creek

Federally/provincially-listed species present:	ARGR		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	500 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to August 31	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: proposed pipeline corridor occurs at a meander bend (i.e., does not approach the watercourse at a perpendicular angle).	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures to coincide with isolated trenched pipeline construction methods include water quality monitoring and QAES-led fish salvage. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to ensure perpendicular approach to the watercourse. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> • Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect • Construction Timing vs. LRBW (Least Risk Biological Window) • Reversibility of Potential Residual Effect • Area of Residual Effect • Duration of Residual Effect • Intensity of Residual Effect • Frequency of Residual Effect • Probability of and Confidence in the Understanding of the Residual Effect • Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> • Fish Species Rarity • Presence of Species Belonging to or Supporting a CRA Fishery • Fish Species Sensitivity • Habitat Sensitivity, Rarity and Use • Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (13-05-13).

View downstream through centre of the proposed pipeline corridor (13-05-13).

View of left bank approach at centre of the proposed pipeline corridor (13-05-13).

View of right bank approach at centre of the proposed pipeline corridor (13-05-13).

Channel Morphology

Pattern: n/a
 Confinement: n/a
 Bank Shape LB: n/a
 RB: n/a
 Habitat Unit at ROW: NCD
 Habitat Unit through ZOI: NCD
 Gradient (%): 0.5
 Main Stem: Brule Creek, FB, 1.6 km DS

Water Quality/Quantity

Water Temperature (°C): 10.4
 Conductivity (µS/cm): 94.4
 pH: 8.2
 D. Oxygen (mg/L): 5.6
 Discharge (m³/s): 0.03
 Flow Regime: Ephemeral
 Turbidity: Stained

Substrate %

Organics: 86
 Fines: 14
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Woody debris

Riparian

Type: Grasses and mixed C and D
 Maturity: Not recorded
 Crown Closure: 41-70 %

	Mean (m)	Range (m)
Wetted Width:	11.5	0.7-50.0
Channel Width:	n/a	n/a
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

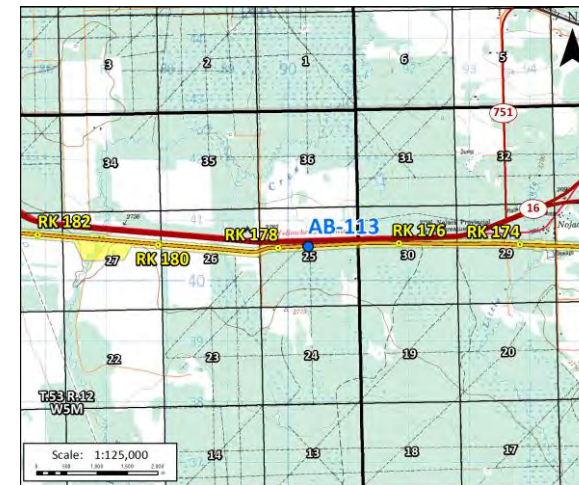
Species	YOY	Juv	Adult	Unknown
BRST				194

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	L	L	L
NRDC	N	N	N	L
BNTR	N	N	N	L
ARGR	N	N	N	L

Sampling Effort

Method	Time	Distance	Date
BPEF	582 s	150 m	13-05-13
MT	92.5 hrs	n/a	22-10-12
MT	80 hrs	n/a	13-05-13



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

None

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Wetland

Navigability:

Class 1 as per section 11 (2)

Reason for Decision:

CW < 1.2m

Barriers to Fish Movement:

Yes – undefined channel

Active Beaver Dams:

Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Vehicle Crossing Method (Non-Frozen):

Type 3 culvert or Type 5 logfill/swamp mat.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Frozen):

Snowfill/ice bridge, Type 3 culvert and Type 5 logfill/swamp mat.

Historical Fish Presence:

No fish previously documented at the crossing location (FWMIS 2014).

Comments: Brook stickleback captured in October 2012, but no fish caught in May 2013. Recent beaver activity downstream from proposed pipeline corridor. Undefined channel for the majority of the LSA. Two small drainages at centre of the proposed pipeline corridor, likely due to the beaver activity spilling over. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Wetland		RK 177.5	
		Survey Date: October 22, 2012; May 13, 2013 Drawn By: C. Tunks Date Issued: May 20, 2013	Approved By: G. Eisler	LSD NE 25 – 53 – 12 W5M UTM Zone: 11 590263 E 5940796 N NAD 83	TMEP site: AB-113	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-113, Unnamed Wetland at RK 177.5

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	10 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Snowfill/ice bridge, Type 3 culvert or Type 5 logfill/swamp mat		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide and potential installation of a culvert or logfill/swamp mat in fish-bearing waters are not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for wetland refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

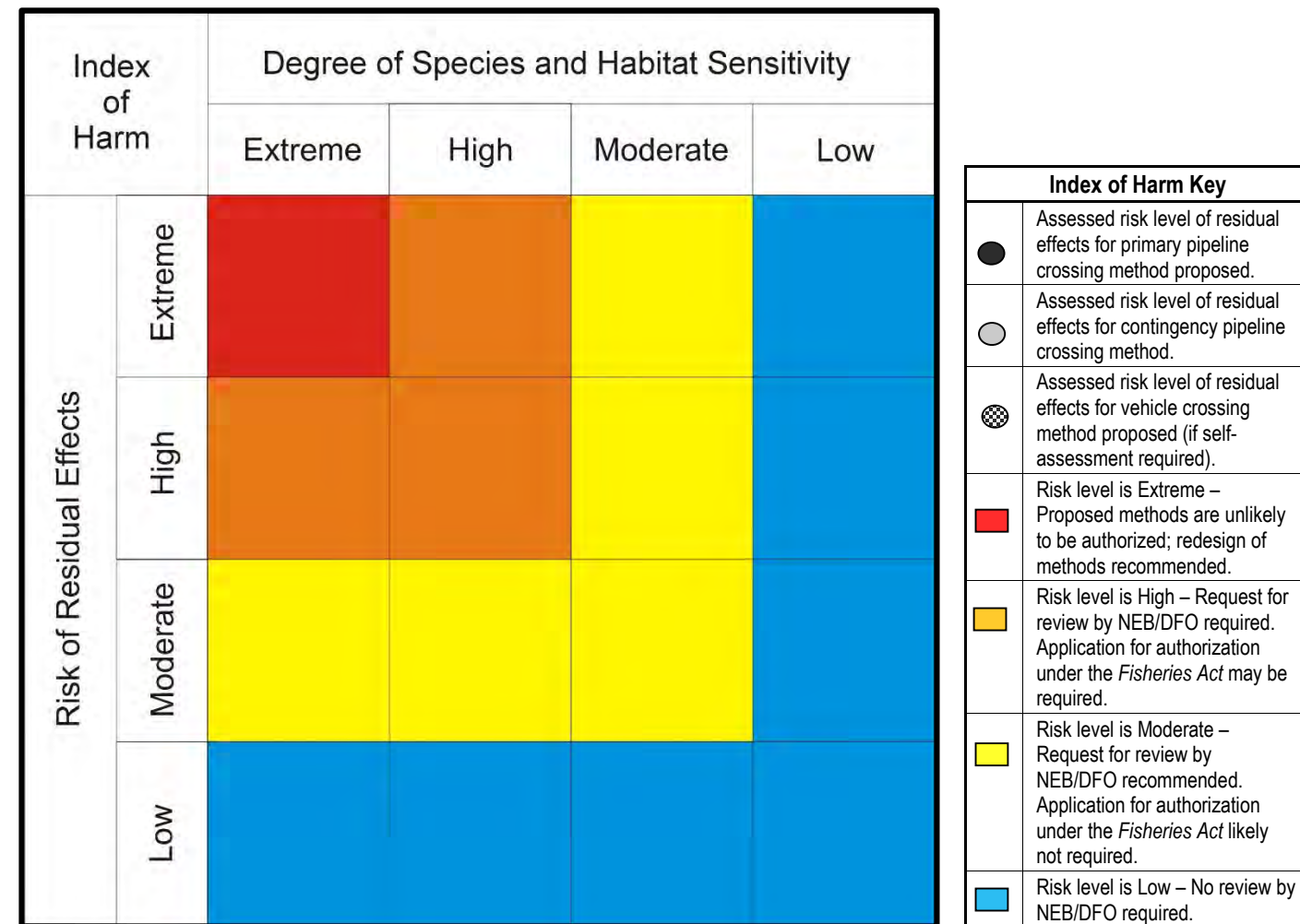
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> • Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect • Construction Timing vs. LRBW (Least Risk Biological Window) • Reversibility of Potential Residual Effect • Area of Residual Effect • Duration of Residual Effect • Intensity of Residual Effect • Frequency of Residual Effect • Probability of and Confidence in the Understanding of the Residual Effect • Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> • Fish Species Rarity • Presence of Species Belonging to or Supporting a CRA Fishery • Fish Species Sensitivity • Habitat Sensitivity, Rarity and Use • Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (07-05-13).



View downstream through centre of the proposed pipeline corridor (07-05-13).



View of left bank approach at centre of the proposed pipeline corridor (07-05-13).



View of right bank approach at centre of the proposed pipeline corridor (07-05-13).

Channel Morphology

Pattern: Tortuous meandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Vertical
 Habitat Unit at ROW: Run-Beaver Dam-Pool
 Habitat Unit through ZOI: Run-Beaver Dam-Pool
 Gradient (%): 1
 Main Stem: Lobstick River, FB, 12.4 km DS

Water Quality/Quantity

Water Temperature (°C): 11.8 D. Oxygen (mg/L): 8.5
 Conductivity (µS/cm): 112.1 Discharge (m³/s): 0.8
 pH: 7.7 Flow Regime: Perennial
 Turbidity: Stained/turbid

Substrate %

Organics: 0
 Fines: 93
 Sml Gravel: 7
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Depth
 Subdominant: Instream vegetation

Riparian

Type: Grasses, shrubs, and mixed C and D
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	6.4	4.0-8.0
Channel Width:	6.0	4.0-8.0
Bank Height:	1.2	0.6-2.0
Pool Depth:	1.2	0.7-1.5

Fish Presence and Life History Stage

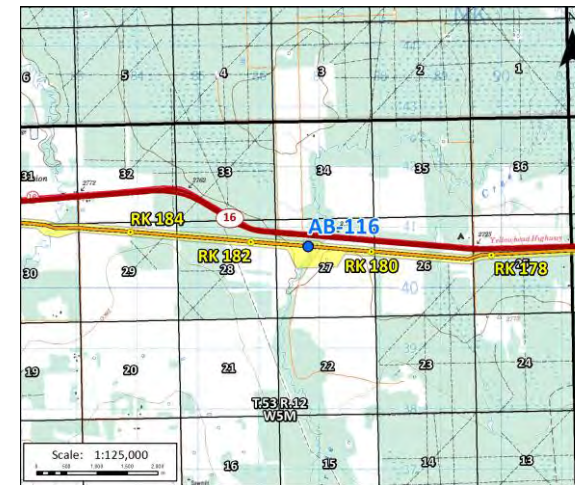
Species	YOY	Juv	Adult	Unknown
WHSC		1		1

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	M	M	M-H
NRDC	M-H	M-H	M	M-H
BNTR	L	L	L	M-H
ARGR	M	M	M	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	893 s	150 m	15-08-12
BPEF	508 s	200 m	07-05-13
MT	60 hrs	n/a	15-08-12



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to June 30

Least Risk Biological Window Proposed:

July 1 to August 31

Construction Timing:

To be determined

Stream Classification AB:

Class C

Navigability:

Potentially Navigable

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

Potential – beaver dam

Active Beaver Dams:

Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP with water quality monitoring.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snowfill/ice bridge.

Historical Fish Presence:

BRST, LNSC and WHSC previously documented (FWMIS 2014).

Comments:

Tortuous meanders cross existing TMPL right-of-way several times. Centre of the proposed pipeline corridor does not cross watercourse perpendicular, but occurs at a meander bend. Unstable banks downstream of centre of the proposed pipeline corridor, slumping in some areas. Substrate consists mostly of sandy fines with some small gravel. Some fish observed but not captured in August 2012 sampling, including suspected salmonid species. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Brule Creek		RK 181.1		
		Survey Date:	August 15, 2012; May 7, 2013	LSD	NW 27 – 53 – 12 W5M	TMEP site:	AB-116	Sensitivity
		Drawn By:	C. Tunks	Approved By:	G. Eisler	UTM Zone:	11 586742 E 5940913 N NAD 83	
Date Issued:	May 8, 2013							

SUMMARY OF AQUATIC ENVIRONMENT: AB-116, Brule Creek

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	1,000 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to August 31	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Outside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: construction timing is outside least risk biological window proposed (i.e., inside restricted activity period); proposed pipeline corridor occurs at a meander bend (i.e., does not approach the watercourse at a perpendicular angle); proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures to coincide with isolated trenched pipeline construction methods include water quality monitoring and QAES-led fish salvage. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of isolated trench to ensure fish migration, should isolation be in place for more than 3 days while outside the LRBW. Conditions and timing pending, spawning survey will also be completed in advance of, and during, isolated trenched construction.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	No
Pipeline construction method and timing may limit fish salvage effectiveness and may preclude spawning assessment.	

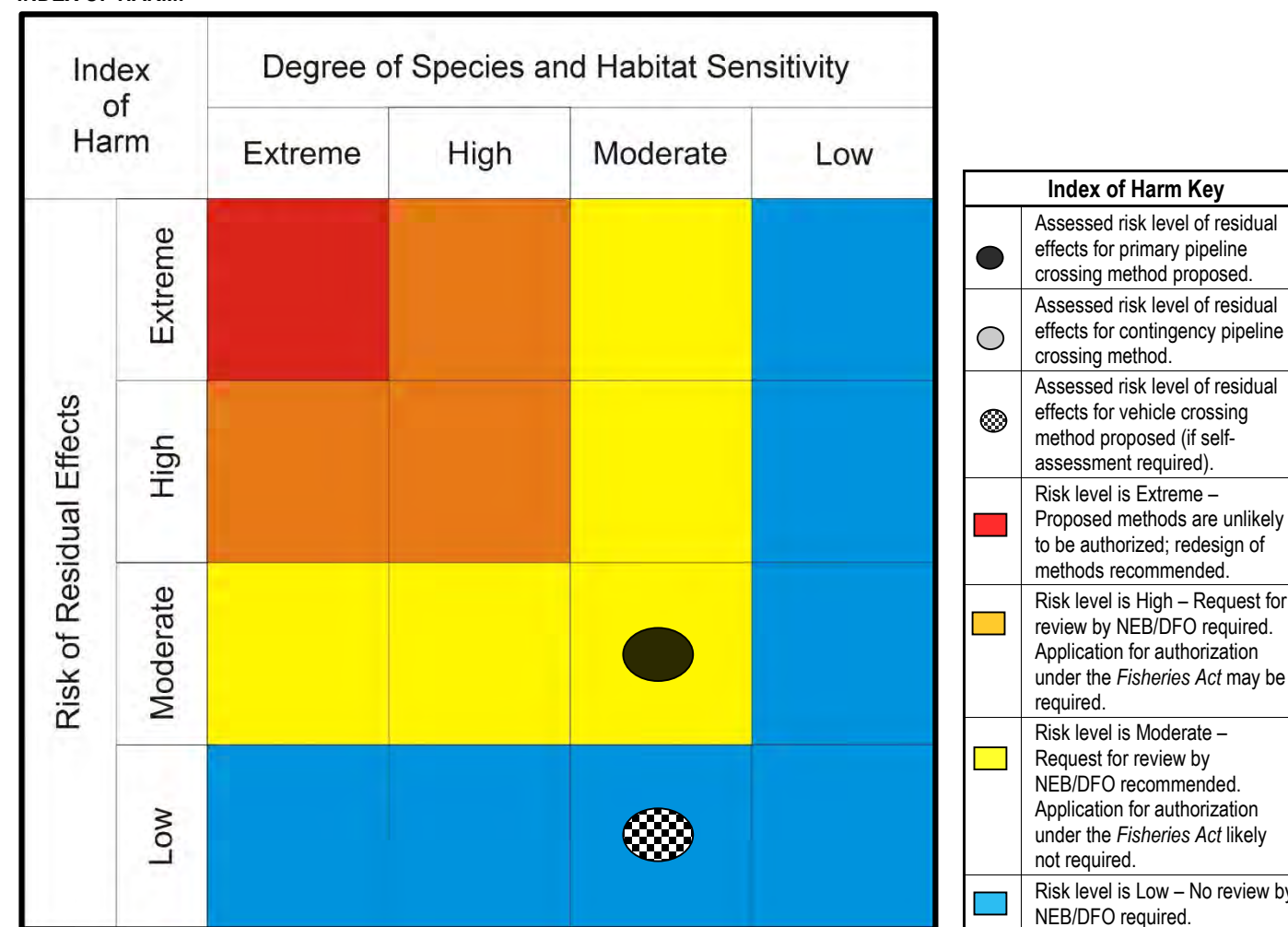
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	Moderate
The primary pipeline construction method would result in a moderate overall risk, while the proposed vehicle crossing methods would result in a low overall risk.	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through the centre of the proposed pipeline corridor (06-05-14).

View downstream through the centre of the proposed pipeline corridor (06-05-14).

View of left bank approach at centre of the proposed pipeline corridor (06-05-14).

View of right bank approach at centre of the proposed pipeline corridor (06-05-14).

Channel Morphology

Pattern: Tortuous meandering
 Confinement: Occasionally confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Run-Pool
 Gradient (%): 1-2
 Main Stem: n/a

Water Quality/Quantity

Water Temperature (°C): 6.9 D. Oxygen (mg/L): 9.6
 Conductivity (µS/cm): 82.2 Discharge (m³/s): 4.02
 pH: 7.4 Flow Regime: Perennial
 Turbidity: Stained

Substrate %

Organics: 1
 Fines: 64
 Sml Gravel: 25
 Lrg Gravel: 2
 Cobble: 6
 Boulder: 2
 Bedrock: 0

Cover

Dominant: Depth
 Subdominant: Woody debris
Riparian
 Type: Grasses
 Maturity: Not recorded
 Crown Closure: 0 %

	Mean (m)	Range (m)
Wetted Width:	8.4	5.9-11.0
Channel Width:	8.4	5.9-11.0
Bank Height:	3.7	3.0-5.0
Pool Depth:	n/a	n/a



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to June 30

Least Risk Biological Window Proposed:

July 1 to August 31

Construction Timing:

To be determined

Stream Classification AB:

Class C

Navigability:

Potentially Navigable

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

None

Active Beaver Dams:

No

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
TRPR				4
LKCH				10
WHSC				7
BRST				6

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	N	M-H
BURB	N	M	N	M-H
NRDC	M-H	M-H	L	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	409 s	4300 m	09-05-14
MT	n/a	n/a	n/a

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP if water is present with water quality monitoring or open cut if frozen to the bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snowfill/ice bridge.

Historical Fish Presence:

BURB, LKCH, LNSC, NRPK, TRPR and WHSC were previously documented (FWMIS 2014).

Comments: Study reach consists of tortuous meander bends and is surrounded by agricultural influences. Beyond the banks, the site is enclosed within 1-2 m approach slopes. Steep, sloughing banks are present throughout the proposed pipeline corridor. Existing armouring attempts (gabions) have not been successful. Wintering habitat potential ratings resulted from February 2014 site visit. During February 2014 site visit, sections of channel were observed frozen to bottom limiting migration potential during that period. Migration potential ratings provided are reflective of flowing conditions only. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Lobstick River		RK 185.3	
		Survey Date: February 12, 2014; May 9, 2014 Drawn By: B. Lunn Date Issued: May 14, 2014	Approved By: G. Eisler	LSD NE 30-53-12 W5M UTM Zone: 11 582524 E 5941148 N NAD 83	TMEP site: AB-117 Sensitivity		

SUMMARY OF AQUATIC ENVIRONMENT: AB-117, Lobstick River

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	1,100 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 1 to August 31	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Outside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the pipeline construction method: construction timing is outside least risk biological window proposed (i.e., inside restricted activity period); proposed pipeline corridor occurs at location containing unstable banks that may result in erosion and scouring.	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures to coincide with isolated trenched pipeline construction methods include water quality monitoring and QAES-led fish salvage. A site specific reclamation plan will be implemented if trenched pipeline construction method occurs at current proposed location. Alternatively, crossing realignment should be considered to avoid unstable and erodible banks. Fish trap to be installed on either side of isolated trench to ensure fish migration, should isolation be in place for more than 3 days while outside the LRBW. Conditions and timing pending, spawning survey will also be completed in advance of, and during, isolated trenched construction.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	No
Pipeline construction method and timing may limit fish salvage effectiveness and may preclude spawning assessment.	

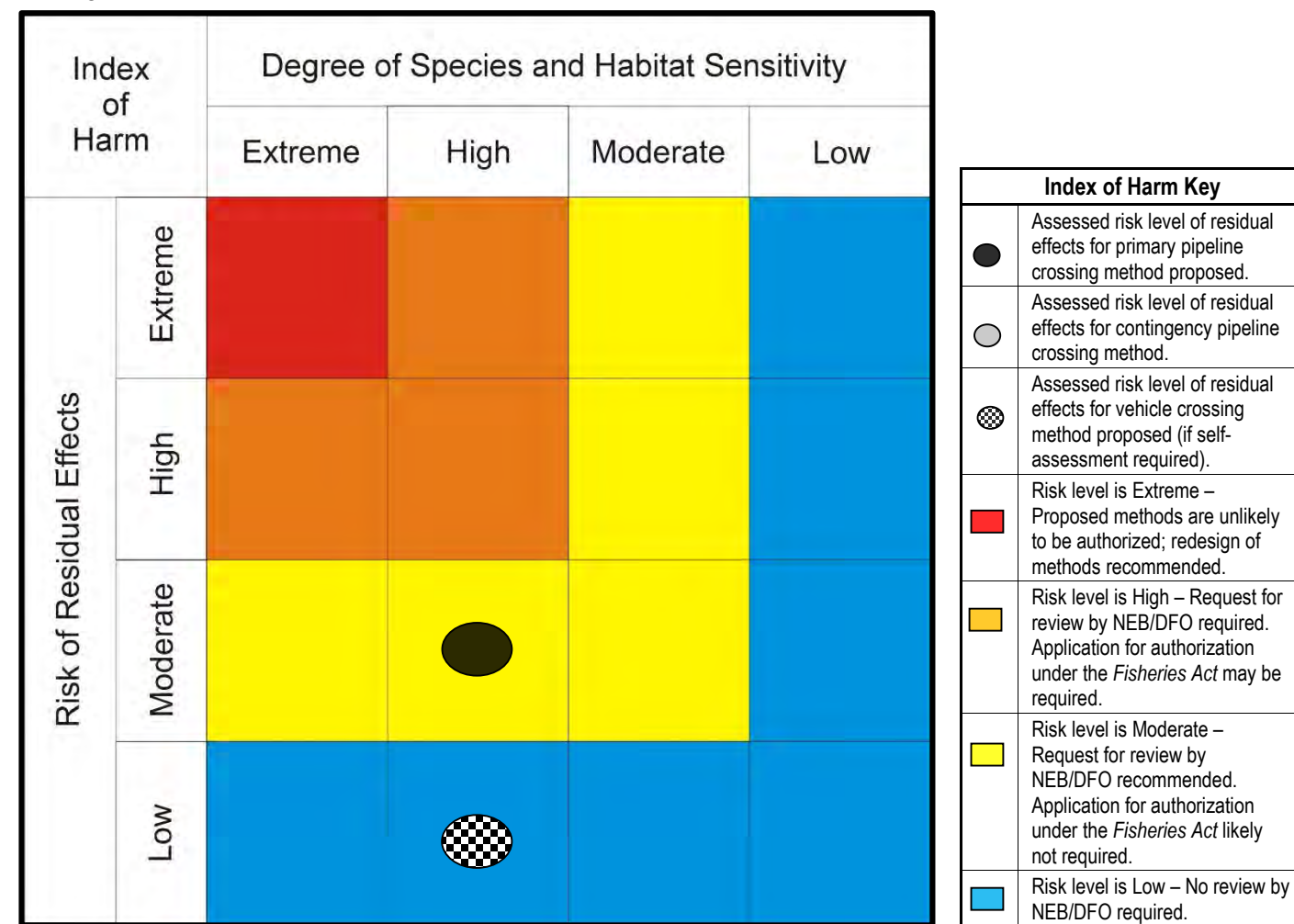
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	Moderate
The primary pipeline construction method would result in a moderate overall risk, while the proposed vehicle crossing methods would result in a low overall risk.	

Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (08-05-13).



View downstream through centre of the proposed pipeline corridor (08-05-13).



View of left bank approach at centre of the proposed pipeline corridor (08-05-13).



View of right bank approach at centre of the proposed pipeline corridor (08-05-13).

Channel Morphology

Pattern: Straight
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Flat
 Habitat Unit through ZOI: Flat-Beaver Dam
 Gradient (%): 0.5
 Main Stem: Lobstick River, FB, 6.0 km DS

	Mean (m)	Range (m)
Wetted Width:	6.9	4.9-8.6
Channel Width:	6.5	4.9-8.6
Bank Height:	1.7	0.9-2.9
Pool Depth:	n/a	n/a

Water Quality/Quantity

Water Temperature (°C): 7.7
 Conductivity (µS/cm): 190.2
 pH: 7.3
 D. Oxygen (mg/L): 1.2
 Discharge (m³/s): 0.02
 Flow Regime: Perennial
 Turbidity: Stained

Substrate %

Organics: 100
 Fines: 0
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Woody debris

Riparian

Type: Grasses and mixed C and D
 Maturity: Not recorded
 Crown Closure: 1-20 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to June 30

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Potentially Navigable

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

None

Active Beaver Dams:

Yes

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				1

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	L	M	L	M-H
NRDC	M	M	M	M-H
BURB	L	L	L	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	389 s	185 m	15-08-12
BPEF	688 s	250 m	08-05-13
MT	62 hrs	n/a	15-08-12

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snowfill/ice bridge.

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Upstream from centre of the proposed pipeline corridor, watercourse follows ditch line of Highway 16. Low dissolved oxygen levels observed. Watercourse with wetland features. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Trib. to Lobstick River		RK 189.0	
		Survey Date: August 15, 2012; May 8, 2013 Drawn By: C. Tunks Date Issued: May 9, 2013	Approved By: G. Eisler	LSD SE 35 – 53 – 13 W5M UTM Zone: 11 579009 E 5941517 N NAD 83	TMEP site: AB-118	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-118, Unnamed Tributary to Lobstick River at RK 189.0

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (10-05-13).



View downstream through centre of the proposed pipeline corridor (10-05-13).



View of left bank approach at centre of the proposed pipeline corridor (10-05-13).



View of right bank approach at centre of the proposed pipeline corridor (10-05-13).

Channel Morphology

Pattern: Sinuous
 Confinement: Occasionally confined
 Bank Shape LB: Vertical
 RB: Vertical
 Habitat Unit at ROW: Run
 Habitat Unit through ZOI: Riffle-Run
 Gradient (%): 1
 Main Stem: McLeod River, FB, 13.8 km DS

	Mean (m)	Range (m)
Wetted Width:	13.6	10.0-25.0
Channel Width:	13.6	10.0-25.0
Bank Height:	3.1	1.8-4.5
Pool Depth:	1.5	n/a

Water Quality/Quantity

Water Temperature (°C): 10.2
 Conductivity (µS/cm): 101.4
 pH: 7.8
 D. Oxygen (mg/L): 10.5
 Discharge (m³/s): 2.2
 Flow Regime: Perennial
 Turbidity: Moderately turbid

Substrate %

Organics: 0
 Fines: 38
 Sml Gravel: 8
 Lrg Gravel: 19
 Cobble: 16
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Depth
 Subdominant: Boulder

Riparian

Type: Grasses and shrubs
 Maturity: Not recorded
 Crown Closure: 0 %



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to July 15

Least Risk Biological Window Proposed:

July 16 to August 31

Construction Timing:

To be determined

Stream Classification AB:

Class C

Navigability:

Potentially Navigable

Reason for Decision:

Class cannot be established

Barriers to Fish Movement:

None

Active Beaver Dams:

No

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
WHSC		3		4
LKCH		1		1
SPSC				1
NRPK		1		1
TRPR				1
LNSC		1		

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
ARGR	M	M	M-H	H
MNWH	M	M	M-H	H
NRPK	M-H	M-H	M-H	H
SPSC	M-H	M	M-H	H

Sampling Effort

Method	Time	Distance	Date
FLEF	1,307 s	500 m	14-09-06
MT	255 hrs	n/a	14-09-06
FLEF	529 s	450 m	10-05-13

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP with water quality monitoring.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, snowfill/ice bridge or clear span bridge.

Historical Fish Presence:

ARGR, LKCH, LNSC, MNWH, NRPK, SPSC, SPSH, TRPR, FTMN, BRST and WHSC previously documented (FWMIS 2014).

Comments: Habitat dominated by riffle and run units with some pools. Surrounded by agricultural land on both sides from 300-600 m downstream. Cover limited to woody debris and instream vegetation with limited overhanging vegetation. Wintering habitat potential ratings resulted from February 2013 site visit. Corroborating habitat potential ratings, fish capture information and recommendations from AAR (2006) data. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Carrot Creek		RK 193.1	
		Survey Date: September 14, 2006; August 16, 2012; February 10, 2013; May 10, 2013 Drawn By: C. Tunks Date Issued: May 13, 2013	Approved By: G. Eisler	LSD SW 33 – 53 – 13 W5M UTM Zone: 11 574924 E 5941261 N NAD 83	TMEP site: AB-119	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-119, Carrot Creek

Federally/provincially-listed species present:	ARGR,SPSC		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	1,300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 16 to August 31	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a channel > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures to coincide with isolated trenched pipeline construction methods include water quality monitoring and QAES-led fish salvage. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW.	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

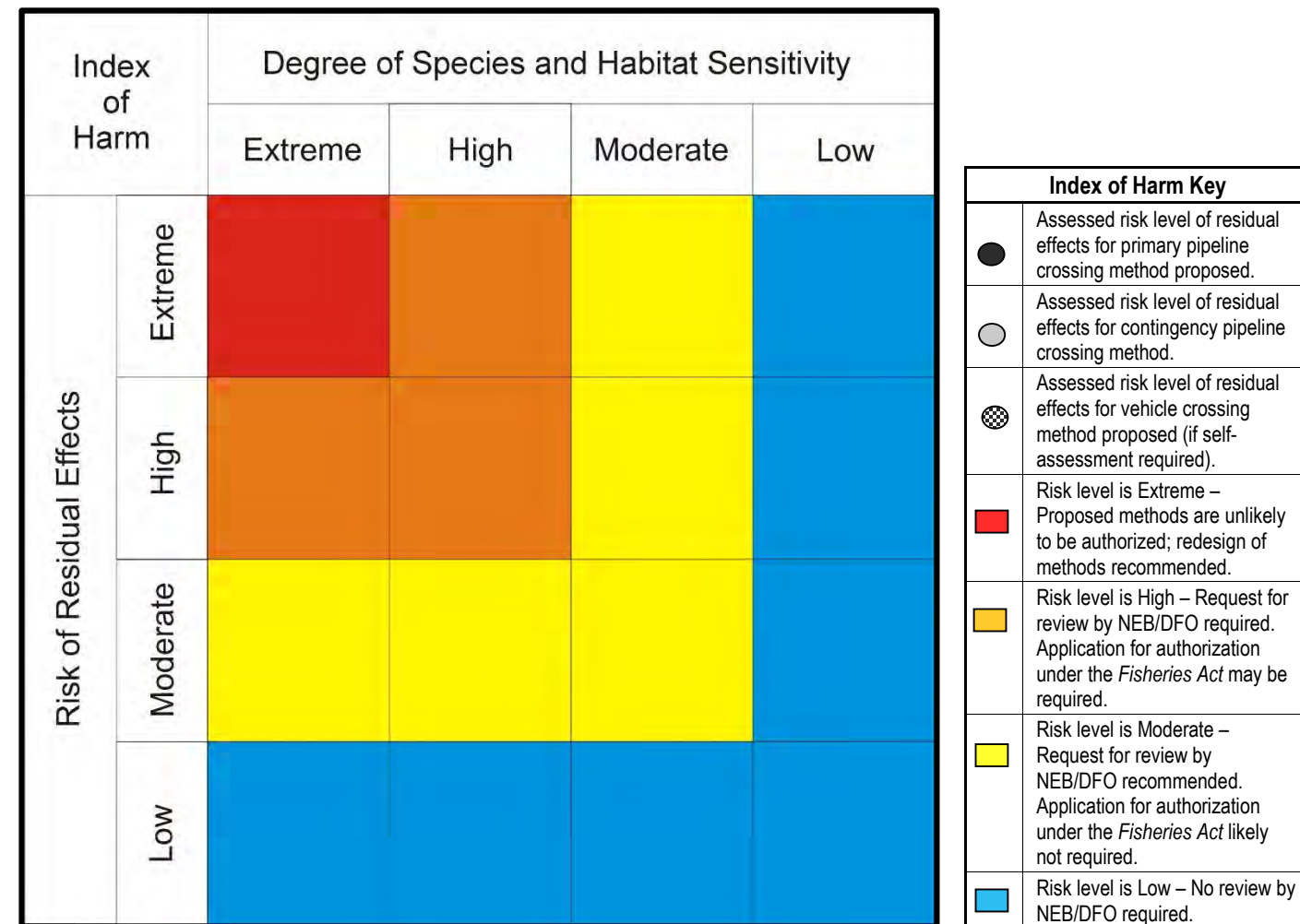
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (08-05-13).

View downstream through centre of the proposed pipeline corridor (08-05-13).

View of left bank approach at centre of the proposed pipeline corridor (08-05-13).

View of right bank approach at centre of the proposed pipeline corridor (08-05-13).

Channel Morphology

Pattern: Not recorded
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Impoundment-Beaver Dam
 Habitat Unit through ZOI: Impoundment-Beaver Dam
 Gradient (%): 0.5
 Main Stem: January Creek, FB, 600 m DS

	Mean (m)	Range (m)
Wetted Width:	63.9	15.0-111.0
Channel Width:	1.1	0.4-2.0
Bank Height:	n/a	n/a
Pool Depth:	n/a	n/a

Fish Presence and Life History Stage

Species	YOY	Juv	Adult	Unknown
BRST				6

Water Quality/Quantity

Water Temperature (°C): 9.9
 Conductivity (µS/cm): 195.3
 pH: 7.7
 D. Oxygen (mg/L): 5.4
 Discharge (m³/s): Negligible
 Flow Regime: Not recorded
 Turbidity: Stained

Substrate %

Organics: 100
 Fines: 0
 Sml Gravel: 0
 Lrg Gravel: 0
 Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Woody debris

Riparian

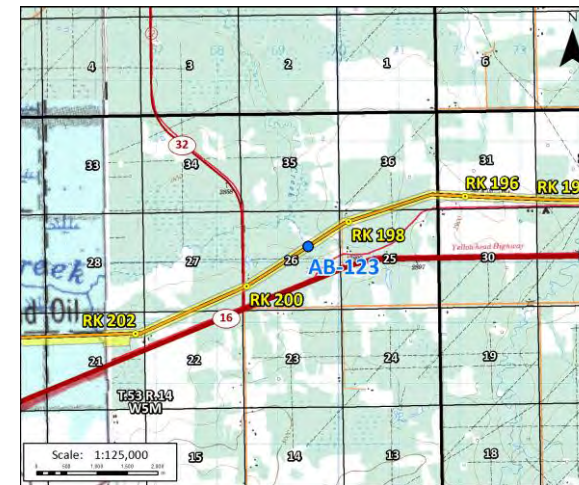
Type: Grasses/shrubs
 Maturity: Not recorded
 Crown Closure: 0 %

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M	L	M
NRDC	M	M	M	M
BKTR	L	L	L	M
ARGR	L	M	L	M

Sampling Effort

Method	Time	Distance	Date
BPEF	209 s	20 m	15-08-12
BPEF	676 s	200 m	08-05-13
MT	66 hrs	n/a	15-08-12
MT	104 hrs	n/a	08-05-13



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to July 15

Least Risk Biological Window Proposed:

Open

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Class 1 as per section 11 (2)

Reason for Decision:

CW < 1.2m

Barriers to Fish Movement:

Potential – beaver dam

Active Beaver Dams:

Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched at any time if water is present or open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snowfill/ice bridge.

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments:

Watercourse with wetland features. Wet throughout the entire crossing area, resulting from beaver impoundment downstream from the centre of the proposed pipeline corridor. Channel definition upstream from impoundment observed. Obvious definition observed beginning approximately 100 m downstream. Substrate is soft detritus throughout entire reach. Fish habitat is only suitable for cyprinid species. Corroborating fish habitat potential ratings and recommendations from AAR (2006) data. No fish were captured in previous investigation (AAR 2006). QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Trib. to January Creek		RK 198.8	
		Survey Date: September 24, 2006; August 15, 2012; May 8, 2013 Drawn By: C. Tunks Date Issued: May 9, 2013	Approved By: G. Eisler	LSD NE 26 – 53 – 14 W5M UTM Zone: 11 569435 E 5940488	TMEP site: AB-123 NAD 83	Sensitivity 	

SUMMARY OF AQUATIC ENVIRONMENT: AB-123, Unnamed Tributary to January Creek at RK 198.8

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	Low		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	Open	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Inside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	No
Isolated trenched pipeline construction at a wetted width > 5 m wide is not expected to meet DFO's Project Activities list.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	Yes

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures include QAES-led fish salvage during isolated trenched pipeline construction methods. Fish trap to be installed on either side of proposed pipeline corridor to ensure fish migration, should trenched pipeline construction occur for more than 14 days while inside the LRBW. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

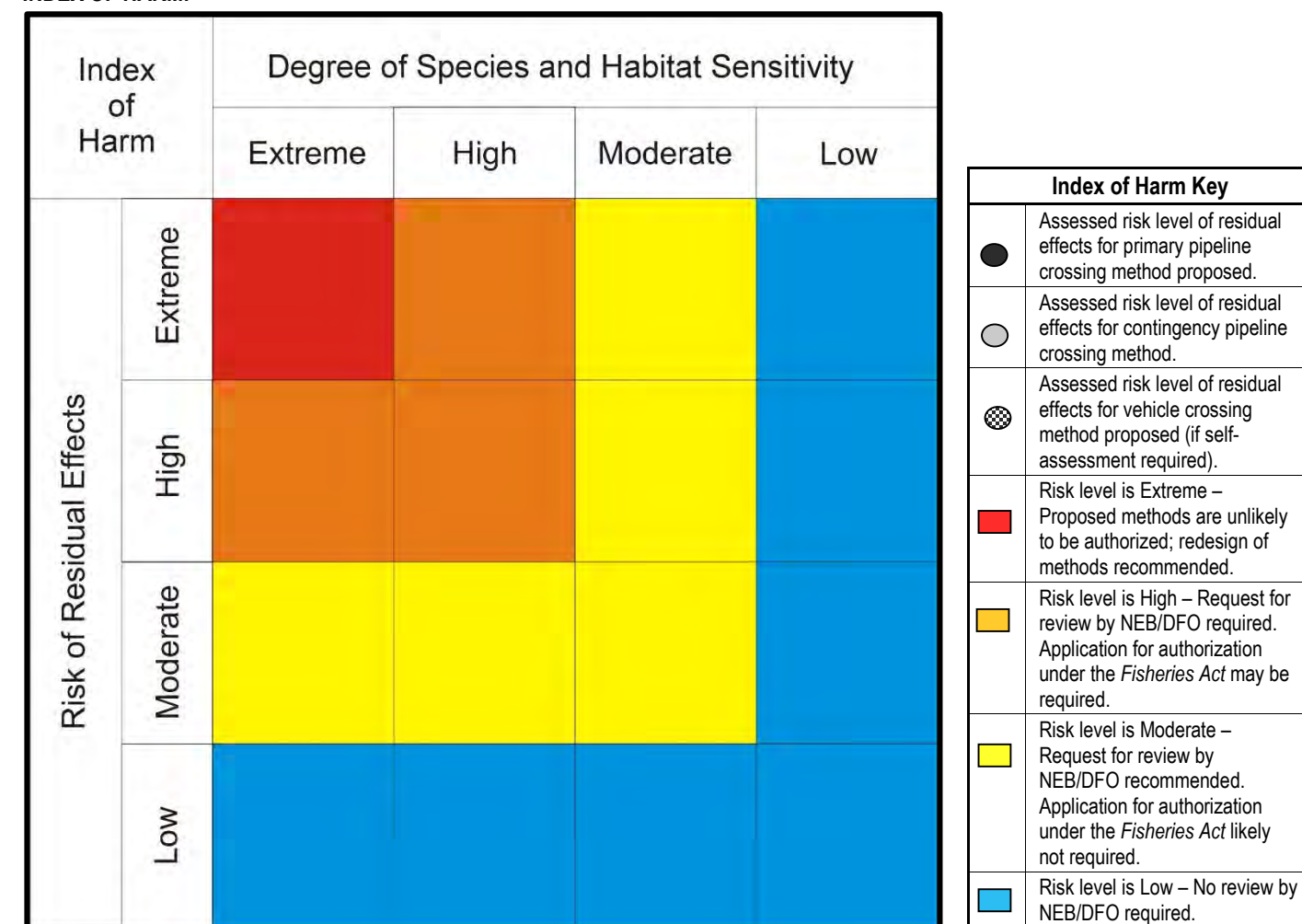
5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:



Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value



View upstream through centre of the proposed pipeline corridor (09-05-13).



View downstream through centre of the proposed pipeline corridor (09-05-13).



View of left bank approach at centre of the proposed pipeline corridor (09-05-13).



View of right bank approach at centre of the proposed pipeline corridor (09-05-13).

Channel Morphology

Pattern: Meandering
 Confinement: Unconfined
 Bank Shape LB: Sloping
 RB: Sloping
 Habitat Unit at ROW: Impoundment
 Habitat Unit through ZOI: Impoundment-Run-Pool
 Gradient (%): 0.5
 Main Stem: January Creek, FB, 850 m DS

Water Quality/Quantity

Water Temperature (°C): 4.6 D. Oxygen (mg/L): 3.3
 Conductivity (µS/cm): 314.5 Discharge (m³/s): 0.03
 pH: 7.4 Flow Regime: Perennial
 Turbidity: Clear

Substrate %

Organics: 91
 Fines: 7
 Sml Gravel: 1
 Lrg Gravel: 0
 Sml Cobble: 0
 Boulder: 0
 Bedrock: 0

Cover

Dominant: Instream vegetation
 Subdominant: Overhanging vegetation

Riparian

Type: Grasses, shrubs and mixed C and D
 Maturity: Not recorded
 Crown Closure: 1-20 %

	Mean (m)	Range (m)
Wetted Width:	27.7	0.9-65.0
Channel Width:	0.8	0.5-1.0
Bank Height:	0.9	0.1-2.0
Pool Depth:	0.8	0.7-0.8

Fish Presence and Life History Stage

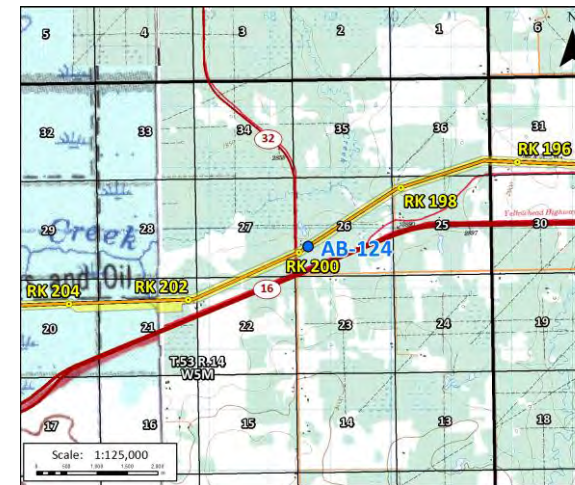
Species	YOY	Juv	Adult	Unknown
BRST				2

Fish Habitat Potential

Species	Spawning	Rearing	Wintering	Migration
NRPK	M	M-H	L	M-H
NRDC	M-H	M-H	L	M-H
BKTR	L	M	L	M-H
ARGR	L	M	L	M-H

Sampling Effort

Method	Time	Distance	Date
BPEF	415 s	250 m	09-05-13
MT	134 hrs	n/a	17-08-12
MT	4 hrs	n/a	09-05-13



Source: 1:125,000 NTS Map © 2013 Department of Natural Resources Canada.

Restricted Activity Period:

September 1 to July 15

Least Risk Biological Window Proposed:

July 16 to August 31

Construction Timing:

To be determined

Stream Classification AB:

Class C (unmapped)

Navigability:

Class 1 as per section 11 (2)

Reason for Decision:

CW < 1.2m

Barriers to Fish Movement:

Potential – beaver dam

Active Beaver Dams:

Yes

Recommended Primary Pipeline Crossing Method:

Isolated trenched outside RAP with water quality monitoring; open cut if frozen to bottom.

Recommended Contingency Pipeline Crossing Method:

n/a

Recommended Vehicle Crossing Method (Non-Frozen):

Existing crossing or clear span bridge.

Recommended Vehicle Crossing Method (Frozen):

Existing crossing, clear span bridge or snowfill/ice bridge.

Historical Fish Presence:

No fish previously documented (FWMIS 2014).

Comments: Watercourse with wetland features. Marginally defined drainage area/spruce and willow swamp upstream of the centre of the proposed pipeline corridor to approximately 50 m downstream, but channelization becomes more obvious 300 m downstream. Wintering ratings resulting from February 2013 site visit. QAES-led fish salvage required if isolated trenched construction occurs.

		Trans Mountain Expansion Project		Unnamed Trib. to January Creek		RK 199.8		
		Survey Date:	August 17, 2012; February 8, 2013; May 9, 2013	LSD	SW 26 – 53 – 14 W5M	TMEP site:	AB-124	Sensitivity
		Drawn By:	C. Tunks	Approved By:	G. Eisler	UTM Zone:	11 568569 E 5939926 N NAD 83	
Date Issued:	May 10, 2013							

SUMMARY OF AQUATIC ENVIRONMENT: AB-124, Unnamed Tributary to January Creek at RK 199.8

Federally/provincially-listed species present:	None		
Fishes present which comprise part of commercial, recreational or Aboriginal (CRA) fishery or which support a CRA fishery: (Yes/No)	Yes		
Habitat sensitivity (High/Low) within crossing's Local Study Area:	High		
Riparian buffer setback distance:	30 m		
Does riparian habitat provide functional support ¹ to fish and fish habitat within the footprint area of this crossing? (Yes/No)	Yes		
Zone-of-influence:	300 m		
Additional information provided in: Sections 4 through 7 and Appendices A and C of Fisheries (Alberta) Technical Report (Filing ID A3S1W6-A3S1X8); Section 4 through 7 and Appendices A and B of the Supplemental Fisheries (Alberta) Technical Report.			

PROPOSED CONSTRUCTION DETAILS:

Proposed construction timing:	To be determined		
Least Risk Biological Window (LRBW) proposed:	July 16 to August 31	Inside or outside LRBW	
Primary pipeline construction method/timing:	Isolated trenched/ To be determined	Outside	
Contingency pipeline construction method/timing:	None	N/A	
Vehicle crossing methods:	Existing crossing, clear span bridge or snowfill/ice bridge		
Number of construction days of instream work anticipated:	2-15 days		

POTENTIAL HARM EVALUATION:

QUALIFIED AQUATIC ENVIRONMENTAL SPECIALIST OR QUALIFIED ENVIRONMENTAL PROFESSIONAL	ANSWER
<i>If YES is answered to Questions 1 and 2 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing (and contingency methods). If NO is answered for one or more of Questions 1 and 2, proceed to Questions 3 and 4.</i>	
1. Can all of the criteria outlined in DFO's Project Activities for the above pipeline/vehicle methods be met?	Yes
Isolated trenched pipeline construction method will be used if flow occurs at time of construction. Beaver dam removal may be required.	
2. Can all applicable mitigation measures listed in DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat be implemented to address the Pathways of Effects?	No
Measures to avoid harm will not be met for the primary pipeline construction method (e.g., construction timing for primary pipeline construction method is outside the least risk biological window [i.e., inside restricted activity period]).	

<i>If YES is answered to Questions 3 and 4 below, NEB/DFO review is not required for the proposed activities at the proposed watercourse crossing. If NO is answered for Question 4, proceed to Questions 5.</i>	
3. Are additional mitigation measures to avoid serious harm to fish and fish habitat being implemented?	Yes
Specific watercourse crossing measures are included in Table 7.2.7-2 of Section 7.2.7 of Volume 5A (Filing ID A3S1Q9) and the Pipeline Environmental Protection Plan (Volume 6B) (Filing ID A3S2S3). Additional mitigation measures to coincide with isolated trenched pipeline construction methods include water quality monitoring and QAES-led fish salvage. Fish trap to be installed on either side of isolated trench to ensure fish migration, should isolation be in place for more than 3 days while outside the LRBW. Conditions and timing pending, spawning survey will also be completed in advance of, and during, isolated trenched construction. For additional mitigation for associated wetland features refer to the Wetland Evaluation Technical Report of Volume 5C (Filing ID A3S2H5).	
4. Is the implementation of all proposed mitigation measures expected to avoid all serious harm to fish and fish habitat?	Yes
Pending the successful implementation of all mitigation measures, serious harm can be avoided.	

5. Using the Index of Harm matrix, what risk level ranking did the proposed watercourse crossing receive?	
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Potential Serious Harm Considerations: (to be completed if resulting Risk Assessment Ranking Index of Harm is High or Extreme)

Estimated Maximum Footprint of Proposed Works:	Right-of-Way Width (m):		Est. Instream Footprint (m ²): X m (ROW) x X m (bankfull)	≤ X m ²
	Bankfull Channel Width (m):		Est. Functional Rip. Footprint (m ²): X m (ROW) x X m (riparian)	≤ X m ²
	Functional ¹ Rip. Width (m):	L: R:	Max Instream + Riparian Footprint (m ²): X m ² + X m ²	≤ X m ²

Note: 1 Functional riparian width is interpreted as the area/zone adjacent to a watercourse where vegetation present detectably influences the fish habitat potential (i.e., provides shade/cover, bank stability, feeding opportunities). Serious harm occurs when the loss of riparian habitat is considered 'limiting' to fishes.

INDEX OF HARM:

Index of Harm	Degree of Species and Habitat Sensitivity				
	Extreme	High	Moderate	Low	
Risk of Residual Effects	Extreme				
	High				
	Moderate				
	Low				

Index of Harm Key	
●	Assessed risk level of residual effects for primary pipeline crossing method proposed.
○	Assessed risk level of residual effects for contingency pipeline crossing method.
⊗	Assessed risk level of residual effects for vehicle crossing method proposed (if self-assessment required).
■ (Red)	Risk level is Extreme – Proposed methods are unlikely to be authorized; redesign of methods recommended.
■ (Orange)	Risk level is High – Request for review by NEB/DFO required. Application for authorization under the Fisheries Act may be required.
■ (Yellow)	Risk level is Moderate – Request for review by NEB/DFO recommended. Application for authorization under the Fisheries Act likely not required.
■ (Blue)	Risk level is Low – No review by NEB/DFO required.

Index of Harm Parameters	
Risk of Residual Effects	<ul style="list-style-type: none"> Pipeline/Vehicle Crossing Method/Potential Spatial Extent of Effect Construction Timing vs. LRBW (Least Risk Biological Window) Reversibility of Potential Residual Effect Area of Residual Effect Duration of Residual Effect Intensity of Residual Effect Frequency of Residual Effect Probability of and Confidence in the Understanding of the Residual Effect Potential for Multiple or Associated Residual Effects (e.g., beaver dam removals, blasting)
Degree of Species and Habitat Sensitivity	<ul style="list-style-type: none"> Fish Species Rarity Presence of Species Belonging to or Supporting a CRA Fishery Fish Species Sensitivity Habitat Sensitivity, Rarity and Use Riparian Habitat Value