ENVIRONMENTAL PROTECTION PLAN FOR THE NOVA GAS TRANSMISSION LTD. NORTHWEST MAINLINE EXPANSION

July 2012
7212

Prepared for:

TransCanada
In business to deliver

NOVA Gas Transmission Ltd.

A Wholly Owned Subsidiary of
TransCanada PipeLines Limited
Calgary, Alberta

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ACRONYMS AND ABBREVIATIONS

AC	Alberta Culture
ACIMS	Alberta Conservation Information Management System
AENV	Alberta Environment
ASERD	Alberta Environment and Sustainable Resource Development
ASRD	Alberta Sustainable Resource Development
ATV	all terrain vehicle
BC	British Columbia
COP	Code of Practice
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPP	Caribou Protection Plan
DFO	Fisheries and Oceans Canada
EAP	Enhanced Approval Process
EPP	Environmental Protection Plan
ESA	Environmental and Socio-economic Assessment
FRL	Fish Research License
GOA	Government of Alberta
GPS	Global Positioning System
HDD	horizontal directional drill
KPC	Kilometre Post (Cranberry Section)
KPK	Kilometre Post (Kyklo Creek Section)
KPT	Kilometre Post (Timberwolf Section)
MDZ	Minimal Disturbance Zone
MFLNRO	Ministry of Forests, Lands and Natural Resource Operations
MOE	Ministry of Environment
MPB	mountain pine beetle
MWLAP	Ministry of Water, Land and Air Protection
NEB	National Energy Board
NGTL	NOVA Gas Transmission Ltd.
OS	Operational Statements
PCM	post-construction monitoring
PCMP	Post-Construction Monitoring Program
PEP	Provincial Emergency Program
QAES	Qualified Aquatic Environment Specialist (Alberta)
RAP	restricted activity period
SARA	*Species at Risk Act*
the Project	NOVA Gas Transmission Ltd. Northwest Mainline Expansion
TLU	Traditional Land Use
TransCanada	TransCanada PipeLines Limited
TSS	total suspended solids
ZOI	zone of influence

1.0 INTRODUCTION

1.1 Project Description

This Environmental Protection Plan (EPP) outlines all the environmental protection measures to avoid or minimize potential effects during construction of the Northwest Mainline Expansion (the Project), by NOVA Gas Transmission Ltd. (NGTL), a wholly owned subsidiary of TransCanada PipeLines Limited (TransCanada). The Project includes the construction of three separate pipeline sections in order to expand portions of NGTL's Alberta System to provide adequate capacity to transport natural gas supply from the northeast British Columbia (BC) and northwest Alberta area, namely the Horn River Mainline (Kyklo Creek Section) [Kyklo Creek Section], Northwest Mainline (Timberwolf Section) [Timberwolf Section] and the Tanghe Creek Lateral Loop No. 2 (Cranberry Section) [Cranberry Section].

The three component pipelines will be constructed in separate locations in northeast BC and northwest Alberta (see Figure 1). In total, the Project is expected to include the construction of approximately 111.2 km of pipeline (82.1 km in Alberta and 29.1 km in BC).

Horn River Mainline (Kyklo Creek Section)

The Kyklo Creek Section will consist of approximately 29.1 km of 1,067 mm (NPS 42) O.D. pipe with a maximum operating pressure of 9,930 kPa. Located approximately 80 km southeast of Fort Nelson, BC, the pipeline loop will extend from a point adjacent to the existing Sierra Gas Plant in b-25-K/94-I-11) to a tie-in point in a-97-F/94-I-10. The Kyklo Creek Section will parallel existing disturbances (*e.g.,* pipelines, roads and seismic lines) for 27.8 km (96%) of the pipeline loop.

For ease of description, this pipeline loop is described using Kilometre Posts (Kyklo Creek Section) (KPKs), starting at the Sierra Gas Plant (KPK 0.0) and ending at MLV 1 (KPK 29.1).

Northwest Mainline (Timberwolf Section)

The Timberwolf Section will consist of 49.8 km of 1,219 mm (NPS 48) O.D. pipe with a maximum operating pressure of 8,450 kPa. Located within Alberta, approximately 30 km southwest of Rainbow Lake, Alberta, the pipeline loop will extend from the applied for NGTL Moody Creek Compressor Station in NW 3-109-12 W6M to a tie-in point immediately adjacent to the existing NGTL Snowfall Creek Meter Station in NW 6-104-12 W6M. The Timberwolf Section will parallel existing disturbance (*e.g.,* pipelines and roads) for 49.4 km (99%) of the loop.

This pipeline loop is described using Kilometre Posts (Timberwolf Section) (KPTs) starting at the Moody Creek Compressor Station (KPT 0.0) and ending at Mainline Valve adjacent to the existing Snowfall Creek Meter Station (KPT 49.7).

Tanghe Creek Lateral Loop No. 2 (Cranberry Section)

The Cranberry Section will consist of 32.3 km of 1,219 mm (NPS 48) O.D. pipe with a maximum operating pressure of 8,450 kPa. Located in Alberta approximately 76 km northwest of Manning, the pipeline loop will extend from SW 31-96-7 W6M to a tie-in point immediately adjacent to the existing NGTL Chinchaga Meter Station in NE 13-96-5 W6M. The Cranberry Section will parallel existing disturbances (*e.g.,* pipelines and roads) for 30.4 km (94%) of the loop.

This pipeline loop is described using Kilometre Posts (Cranberry Section) (KPCs) starting at SW 31-96-7 W6M (KPC 0) and ending at the Chinchaga Meter Station (KPC 32.4).

All Pipeline Loops

The construction right-of-way for the pipeline loops will generally be a minimum of 32 m wide with additional temporary workspace required at site-specific areas to account for considerations such as ownership, location and nature of existing paralleled disturbance. Temporary workspace will be necessary at select locations to accommodate construction activities (*e.g.,* road and watercourse crossings, sharp sidebends, steep sidehill, log decking sites, mud handling sites, etc.). NGTL will also require areas for material staging, stockpiling and equipment storage.

Pending regulatory approval, construction is anticipated to commence during October 2012 with an in-service date of April 2013.

1.2 Environmental Protection Plan Structure

The EPP is written in construction specification format and should be read in conjunction with the Environmental Alignment Sheets (Appendix M of this EPP). This EPP provides Project-related environmental mitigation measures and commitments to be addressed during the detailed engineering design, construction and post-construction reclamation phases.

Throughout this EPP, regulatory authorities refer to the appropriate federal (*i.e.,* National Energy Board [NEB], Fisheries and Oceans Canada [DFO], Transport Canada, etc.), Alberta provincial (*i.e.,* Alberta Environment and Sustainable Resource Development [AESRD], Alberta Culture [AC], etc.), BC provincial (*i.e.,* BC Ministry of the Environment [MOE], BC Ministry of Forests, Lands and Natural Resource Operations [MFLNRO], etc.) and municipal regulators, where applicable.

The EPP is based on:

- TransCanada's Health, Safety and Environment Commitment;
- NGTL's Environmental Management System;
- feedback obtained through consultation and engagement;
- results of the 2010 and 2011 biophysical field programs;
- commitments made in the Environmental and Socio-economic Assessment (ESA);
- commitments made during the regulatory review process including information requests;
- NEB Certificate Conditions; and
- professional experience.

Revisions to the EPP may occur as a result of:

- results of the 2012 biophysical field programs and supplemental studies (*i.e.*, hydrostatic test source and access surveys, bear den sweep); and
- engagement programs with Aboriginal communities and other stakeholders.

Pending regulatory approval, construction is scheduled to commence in October 2012 with a target completion date of April 2013. Clean-up and post-construction reclamation of disturbed portions of the right-of-way will be conducted immediately following construction or as soon as weather, ground and seasonal conditions allow.

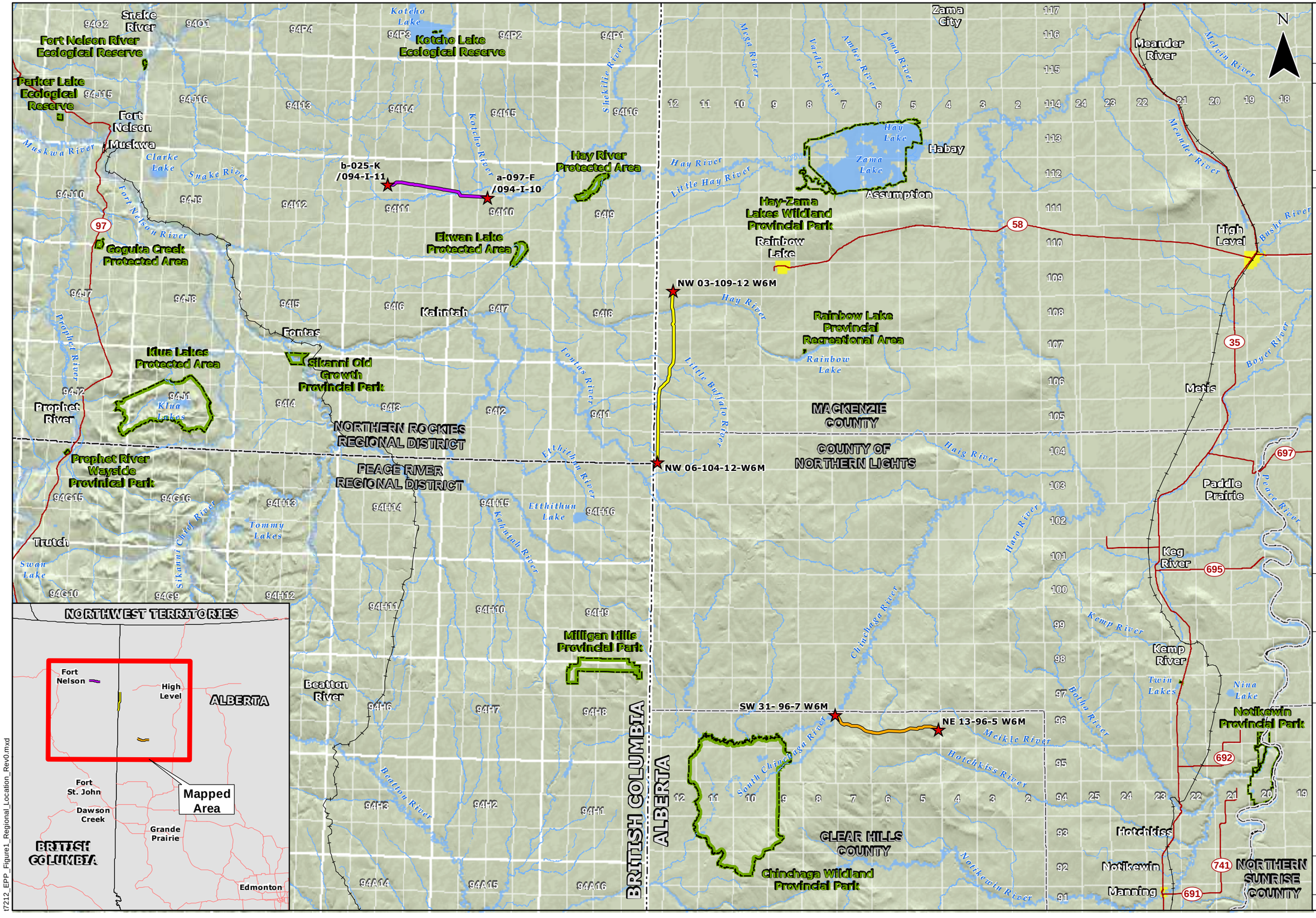

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FIGURE 1

REGIONAL LOCATION

ENVIRONMENTAL PROTECTION PLAN FOR THE NOVA GAS TRANSMISSION LTD. NORTHWEST MAINLINE EXPANSION PROJECT

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- Tie-In Location
- Horn River Mainline (Kyklo Creek Section)
- Northwest Mainline (Timberwolf Section)
- Tanghe Creek Lateral Loop No.2 (Cranberry Section)
- Railway
- Major Road
- Stream/River
- Lake
- Populated Area
- County/Regional District
- Park/Protected Area

SCALE: 1: 1,000,000

0 10 20 30 km

(All Locations Approximate)

tera ENVIRONMENTAL CONSULTANTS

Pipeline Routing: Midwest Survey 2011; Railway: Natural Resources Canada 2011; Road: IHS Inc. 2012; Hydrography: IHS Inc. 2004; Populated Area: AltaLIS 2012; County/Regional District: BC Forests, Lands and Natural Resource Operations 2007, AltaLIS 2012; Park/Protected Area: Alberta Tourism, Parks and Recreation 2011; BC Forests, Lands and Natural Resource Operations 2008.

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

Mapped By: PMS | Checked By: SB

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2.0 PURPOSE

The purpose of the EPP is to describe the environmental mitigation, reclamation and monitoring measures and commitments to be carried out by NGTL, their Contractor(s) and subcontractors during construction and post-construction phases of the Project to avoid or reduce potential effects. The EPP includes both general and site-specific environmental protection measures which have been developed based on past project experience, current industry best management practices and input from stakeholders and regulators during public consultation where they are applicable to the Project activities.

Specifically the EPP:

- outlines environmental protection measures related to Project activities;
- provides instructions for carrying out construction activities to minimize negative environmental effects; and
- serves as reference information to the environmental inspection staff to support decision-making and provide links to more detailed information.

Following completion of construction, this EPP will be used as a guide during Project operation.

3.0 ENVIRONMENTAL PROTECTION PLAN ORGANIZATION

This section provides an overview of the organization and scope of the EPP.

3.1 Organization

The EPP addresses the construction mitigation and reclamation of the Project.

The EPP applies to all Project areas including but not limited to the pipeline right-of-way, temporary workspace, temporary access roads, staging areas and valve sites, construction yards, pipe storage areas and potential hydrostatic test water sources and access routes.

Environmental protection measures are identified under the headings "General Measures", "Specific Measures" and "Activity" in accordance with the progression of construction activities, and are intended to be read in conjunction with the Environmental Alignment Sheets (Appendix M of this EPP). The Environmental Alignment Sheets identify specific locations where mitigation measures may be applied.

The EPP is intended to provide NGTL and their Contractor(s) and subcontractors personnel with an understanding of the general environmental setting of the Project, extent and limitations of the EPP, specific or unique mitigation measures of the Project, general mitigation measures or best management practices that are typically applied to a pipeline project, and generally reflect the sequences of construction of a pipeline project.

Sections 1-3 outline the purpose and organization of the EPP and place the EPP in context with respect to geographic location, and where information can be found in the EPP.

Section 4 "Environmental Compliance", provides information about the tools and processes to facilitate compliance with all the regulatory approvals, permits, commitments and the specific requirements of the EPP.

Section 5 "Notification of Concerned Parties" provides details on specific activities to be followed to ensure all relevant stakeholders are properly notified of Project activities before the commencement of construction.

Section 6 "Preconstruction Measures", outlines activities to clearly delineate the boundaries of approved work areas and to ensure environmentally sensitive features are properly identified before any ground disturbance occurs. Proper identification avoids potential effects to resource features and ensures that NGTL and its Contractors are aware of the limits of the approved work areas.

Section 7 "Resource-Specific Protection and Management Measures", outlines procedures to be undertaken to protect environmental and cultural features that were identified pursuant to the environmental assessment. Section 7 information is documented and displayed on the Environmental Alignment Sheets.

Section 8 "Pipeline Construction" outlines the environmental protection measures associated with general pipeline construction, strippings salvage and grading, water crossings, pipe installation activities, backfill and contingency pressure testing that will be executed during construction of the Project. Where appropriate, these measures are applicable to the construction of the pipeline, access roads and other Project-related facilities.

Section 9 "Clean-up and Reclamation" outlines procedures to be undertaken to ensure all disturbed areas are regraded and/or stabilized to allow for successful reclamation.

Section 10 "Post-Construction Monitoring" outlines activities to take place once construction and post-construction reclamation activities have been completed to evaluate the success of reclamation activities, compliance with commitments, and the stability of the disturbed lands.

Appendices to the EPP include drawings, Project contacts, contingency plans, management plans and environmental alignment sheets to support the specific mitigation measures identified in the EPP and provides guidance to decision-making processes should conditions arise that require implementation of contingency measures.

3.2 Environmental Setting

Horn River Mainline (Kyklo Creek Section)

The pipeline loop is located in a forested setting within the Northern Rockies Regional Municipality. Lands traversed are 100% (29.1 km) provincially-owned Crown land in BC, which is under the jurisdiction of the BC MFLNRO. Lands traversed along the pipeline loop are 100% forested (29.1 km). The nearest major centre to the pipeline loop is the City of Fort Nelson (approximately 80 km west). No residences lie within 1 km of the pipeline right-of-way.

The pipeline loop is located within the Fort Nelson Forest District and is subject to very short growing seasons. The most common tree species in this zone are white spruce, aspen, lodgepole pine, black spruce, balsam poplar, tamarack and paper birch *(*known as white birch in Alberta). Forests of variable successional stages are present in this area due to frequent forest fires (Meidinger and Pojar 1991).

The Kyklo Creek Section lies in the Fort Nelson Lowland Subregion of the Great Plains Physiographic Region (Valentine *et al.* 1978). The Great Plains Physiographic Region is characterized by structurally controlled topography with mesas and cuestas, developed on flat-lying or gently dipping sandstones and shales. The sandstones are relatively resistant to erosion and are found in upland or level areas along this pipeline loop. Terrain along the Kyklo Creek Section is generally level to undulating.

Rare plant surveys were conducted in the summer of 2009 and fall 2010. No previously recorded occurrences of rare plants are known from within 10 km of the Project footprint (BC Conservation Data Centre [CDC] 2009, 2010). No Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or *Species at Risk Act* (*SARA)*-listed species or species designated under the BC Identified Wildlife Program were found during the summer 2009 and fall 2010 surveys. Three BC CDC-listed rare plant species were observed during the summer 2009 rare plant survey, including slender manna grass, western Jacob's-ladder and white adder's-mouth orchid.

The Kyklo Creek Section does not traverse any provincially identified Ungulate Winter Range, Wildlife Habitat Area, caribou range or caribou core habitat (BC Ministry of Environment [MOE] 2008, 2011a,b). The Snake-Sahtaneh caribou range is located approximately 1.4 km west of KPK 0.0 (BC MOE 2008). The pipeline loop is located within a Wood Bison Management Zone that covers northeastern BC and extends into Alberta (Harper *et al.* 2000). This loop is not located within an identified wood bison range. Wood bison herds in the area include the Hay-Zama herd located within the Hay-Zama Wildlife Provincial Park in Alberta (approximately 87 km west of KP 29.1) and the Etthithun herd located near Etthithun Lake (approximately 90 km to the south). Provincial records indicate two adult trumpeter swans were identified on an unnamed watercourse located approximately 400 m south of the pipeline loop near KPK 1.0 (Breault and Shisko 2007, Ducks Unlimited and Canadian Wildlife Service 2005). Observations during the winter of 2011 indicated the presence of wolverine adjacent to the pipeline loop. The Kyklo Creek Section lies in the Kotcho Lake Watershed Group in northeast BC. The Kotcho Lake Watershed Group flows into the Hay River Basin.

The pipeline loop crosses Kyklo Creek (S2 stream class), an unnamed tributary to Kyklo Creek (S3 Stream Class), an unnamed drainage to Kyklo Creek (unclassified) and an unnamed drainage to Kotcho River (unclassified). In addition, numerous wetlands and undefined drainages are crossed by the pipeline loop. Additional detail regarding the environmental setting can be found in Section 5 of the ESA.

The nearest major centre to the pipeline loop is the City of Fort Nelson (approximately 80 km west). No residences lie within 1 km of the pipeline right-of-way

Northwest Mainline (Timberwolf Section)

The pipeline loop is located in a forested setting within Mackenzie County and the County of Northern Lights. Lands traversed are 100% (49.8 km) provincially-owned Crown land and the pipeline loop lies entirely within the Green Area of Alberta. Lands traversed along the pipeline loop are 100% forested (49.7 km).

The Timberwolf Section lies in the Lower Boreal Highlands Natural Subregion (Natural Regions Committee 2006). The Lower Boreal Highlands Natural Subregion is the third largest natural subregion in Alberta and has slightly colder winters and longer, warmer summers than the Upper Boreal Highlands Natural Subregion. It is also moister and cooler than the adjacent Central Mixedwood and Dry Mixedwood

natural subregions. Landscapes in the Lower Boreal Highlands are characterized by diverse mixedwood forests on moist lower slopes of northern hill systems and extensive wetlands at slope bases and on adjacent lowlands. Forests are a mix of aspen, balsam poplar, black spruce, white spruce and white birch (known as paper birch in BC), with hybrids of lodgepole pine and jack pine occurring on slopes. Treed, shrubby or graminoid fens occur in depressions, seepage zones or level areas.

The Timberwolf Section traverses the Clear Hills Uplands Division of the Northern Alberta Uplands Physiographic Region (Pettapiece 1986). This proposed pipeline loop is located in the Rainbow Lake Plain and Chinchaga Plain Districts. Terrain is generally level to undulating along the Timberwolf Section with moderate slopes encountered at selected watercourse crossings (*i.e.*, the Little Buffalo River and Chasm Creek).

A rare plant habitat assessment was conducted in fall 2010 and a vegetation survey conducted in the summer of 2011. There are no potential species listed for the Lower Boreal Highlands Natural Subregion that have a *SARA* or COSEWIC designation. No previously recorded occurrences of rare plants with a *SARA* or COSEWIC designation are known within 10 km of this proposed pipeline loop (Alberta Conservation Information Management System [ACIMS] 2011, BC CDC 2011a). There are no potential species listed for the Lower Boreal Highlands that are designated under the Alberta *Wildlife Act*. No previously recorded occurrences of rare plants or rare ecological communities are known within 10 km of the proposed pipeline loop (ACIMS 2011, BC CDC 2011).

The Timberwolf Section is located within the Chinchaga caribou range between KPT 22.7 and KPT 49.8 (Alberta Sustainable Resource Development [ASRD] 2007). The Chinchaga caribou range (approximately 17,517 km²) contains an estimated population of approximately 250 caribou (ASRD and Alberta Conservation Association 2010). The eastern edge of the Etthithun Core Area for caribou is located in BC approximately 950 m west of the proposed pipeline loop between approximately KPT 39.5 and KPT 49.8. The proposed pipeline loop traverses a Key Wildlife and Biodiversity Zone associated with the Hay River between KPT 3.5 and KPT 7.1 (ASRD 2010). Key Wildlife and Biodiversity Zones include ungulate winter ranges, river corridors and biodiversity areas where species tend to concentrate. A short segment of the south end of the proposed pipeline loop (KPT 43.8 and KPT 49.8) is located within a Grizzly Bear Secondary Zone (Government of Alberta [GOA] 2010a). The Timberwolf Section is located within a Bison Management Zone that extends from the Northwest Territories to south of High Level, Alberta. The government of Alberta created the Bison Management Zone (approximately 40,350 km^2) in the northwest corner of the province to manage the Hay-Zama wood bison herd (Mitchell and Gates 2002). The Bison Management Zone also extends into BC. The pipeline loop is not located within the mapped range of any known bison herds.

The Timberwolf Section lies in the Hay River Basin and Fontas River sub-basin in northwest Alberta. There are 14 crossings identified along this pipeline loop.The pipeline loop crosses the Hay River, two unnamed tributaries to the Hay River, Little Buffalo River, an unnamed tributary to the Little Buffalo River, Bivouac Creek, an unnamed tributary to Bivouac Creek, Chasm Creek, an unnamed tributary to Chasm Creek, Beaverskin Creek, three unnamed tributaries to Beaverskin Creek and Snowfall Creek. All watercourses are Class C watercourses. There were no fish species listed under *SARA* or having COSEWIC status identified as potentially occurring along the pipeline loop. In addition, numerous wetlands and undefined drainages are crossed by the pipeline loop. Additional detail regarding the environmental setting can be found in Section 5 of the ESA.

The nearest community to the pipeline loop is the Town of Rainbow Lake (approximately 30 km northeast). The nearest major centre to the pipeline loop is the City of High Level (approximately 160 km east). No residences lie within 1 km of the pipeline right-of-way.

Tanghe Creek Lateral Loop No. 2 (Cranberry Section)

The pipeline loop is located in a forested setting within Clear Hills County. Lands traversed are 100% (32.3 km) provincially-owned Crown land and the pipeline loop lies entirely within the Green Area of Alberta. Lands traversed along the pipeline loop are 100% forested (32.3 km).

This pipeline loop is located in the Lower Boreal Highlands (see Timberwolf Section above) and Upper Boreal Highlands natural subregions of the Boreal Forest Natural Region (Natural Regions Committee 2006). The Upper Boreal Highlands Natural Subregion consists of coniferous dominated

woodlands and extensive wetlands confined to upper slopes and plateaus of isolated hills in northern Alberta (Natural Regions Committee 2006). Local climate is typically characterized by cooler temperatures and higher annual precipitation than the surrounding Lower Boreal Highlands Natural Subregion. Coniferous forests dominated by lodgepole pine or lodgepole pine/jack pine hybrids characterize typical uplands with aspen dominated mixedwood forests less extensive than other natural subregions in the Boreal Forest Natural Region. Wetlands situated in depressions are frequently extensive and typically consist of nutrient-poor bogs and fens dominated by black spruce and peatmosses. Where nutrient-rich water occurs, tamarack, golden mosses and willows may develop.

The Cranberry Section is located in the Clear Hills Uplands Division of the Northern Alberta Uplands Physiographic Region (Pettapiece 1986). This pipeline loop lies in the Clear Hills Plain and Chinchaga Plain Districts. Terrain is generally level to gently rolling along the Cranberry Section with some moderate slopes encountered along segments from approximately KPC 0.4 to KPC 0.9 and from KPC 20.0 to KPC 23.0.

A rare plant habitat assessment was conducted in fall 2010 and a vegetation survey conducted in the summer of 2011. There are no potential species listed for the Lower Boreal Highlands or Upper Boreal Highlands natural subregions that have a *SARA* or Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designation. No previously recorded occurrences of rare plants with a *SARA* or COSEWIC designation are known within 10 km of this pipeline loop (ACIMS 2011). There are no potential species listed for the Lower Boreal Highlands and Upper Boreal Highlands natural subregions that are designated under the Alberta *Wildlife Act*. No previously recorded occurrences of rare plants or rare ecological communities are known within 10 km of the pipeline loop (ACIMS 2011, BC CDC 2011).

The portion of the Cranberry Section between KPC 26.4 and KPC 32.5 is located within the Chinchaga caribou range (ASRD 2007, 2010). The entire length of this loop is located within a Grizzly Bear Secondary Zone (ASRD 2010). The Cranberry Section is also located within a Bison Management Zone; however, it is not located within the mapped range of any known bison herds (see Timberwolf Section above for details).

The Cranberry Section is located in the Chinchaga River and Notikewin River sub-basins. The Cranberry Section crosses three watercourses and one fish-bearing drainage. The pipeline loop crosses an unnamed tributary to Midget Creek, Sloat Creek, an unnamed tributary to Chinchaga River and a fish-bearing headwater drainage. All watercourses are Class C watercourses. There were no fish species listed under *SARA* or having COSEWIC status identified as potentially occurring along the pipeline loop. In addition, numerous wetlands and undefined drainages are crossed by the pipeline loop. Additional detail regarding the environmental setting can be found in Section 5 of the ESA.

The nearest community to the pipeline loop is the Town of Manning (approximately 76 km southeast). The nearest major centre to the pipeline loop is the City of Grande Prairie (approximately 237 km south). No residences lie within 1 km of the pipeline right-of-way.

3.3 Nonroutine Mitigation

Nonroutine mitigation measures have been developed for areas which require special attention regarding the protection of environmental resources. All nonroutine measures are identified on the Environmental Alignment Sheets. Specifically nonroutine measures apply to riparian reclamation, caribou protection and permafrost, which may be present along portions of the right-of-way. Following confirmation studies, specific mitigation measures for permafrost may be proposed, as outlined in the Permafrost Contingency Plan (Appendix E).

3.4 Extent and Limits of the EPP

The EPP applies to pipeline construction under frozen and nonfrozen ground conditions. There may also be a need to revise specific measures as a result of on-going consultation and engagement or to address unforeseen site-specific conditions that may arise during construction. If this were to occur, NGTL will resolve the issue with the Project Manager, the Construction Manager, the Environmental Inspector(s) and the Environmental Advisor in consultation with the appropriate regulators. The resolution and/or revision will be documented and communicated to the appropriate parties.

4.0 ENVIRONMENTAL COMPLIANCE

Introduction

Environmental compliance is facilitated through sharing of information, providing orientations/training, hiring qualified staff and providing onsite inspection of activities through a pro-active and adaptive inspection program. Works will be conducted in accordance with applicable environmental regulations, codes and standards, and NGTL policies, procedures and specifications.

Objective

The objective of these mitigation measures is to ensure that:

- NGTL and its Contractor(s) and subcontractors are aware of relevant environmental regulatory requirements;
- processes are in place that allow NGTL and its Contractor(s) and subcontractors to access Project environmental information to aid in decision-making at the field level; and
- Environmental Inspectors and Resource Specialists hired for the Project are qualified and properly trained.

Specific Measures

Activity	Preparation Measures
Approvals and Licenses	1. Obtain necessary licenses and approvals before the commencement of construction. NGTL, its Contractor(s), and subcontractors, will comply with conditions as presented to NGTL on permits, approvals, licences, certificates and Project-specific management plans. Resolve any inconsistencies between permit conditions and contract documents before the commencement of construction.
Information Sharing	2. The Environmental Inspector(s) and NGTL Environmental Advisor will facilitate the transfer of environmental information and information updates to NGTL field staff and the Contractor(s) in a timely manner. 3. Keep a complete set of Environmental Alignment Sheets and documents at each NGTL construction field office.
EPP and Distribution	4. Make controlled copies of the EPP and associated environmental documents available to key Project construction and Contractor(s) staff members during construction. 5. The EPP serves as the construction guide for environmental issues and commitments and includes pertinent environmental information from the ESA and supplemental environmental surveys conducted for the Project.
Environmental Alignment Sheets	6. The Environmental Alignment Sheets provide information regarding environmental requirements and serve as detail to the Construction Alignment Sheets.
ESA Reports and Preconstruction Surveys	7. Provide Contractor(s) and Project inspection staff with relevant results of preconstruction surveys to identify known locations of environmentally sensitive features (*e.g.,* rare plants, nests, dens, mineral licks, archaeological sites). Indicate specific mitigation for these sites on the Environmental Alignment Sheets and/or corresponding tables, with reference to specific environmental information. Identify sites with suitable markers and record Global Positioning System (GPS) locations for any post-construction monitoring (PCM) requirements.

Activity	Preparation Measures
Listed or Sensitive Species	8. If listed or sensitive species are identified during construction of the Project, implement the Plant Species and Ecological Communities of Concern Discovery Contingency Plan or the Wildlife Species of Concern Discovery Contingency Plan (Appendix E). 9. Report sightings of sensitive or species at risk to the Environmental Inspector(s). Specific protection measures may be implemented and the sighting will be recorded in daily reports and located on the environmental issues tracking list.
Traditional Land Use (TLU) Sites	10. If TLU sites are identified during the construction of the Project, implement the Contingency Plan for TLU Sites Discovery during construction (Appendix E).
Industry Guidelines and Regulations	11. Industry Guidelines, Regulations and Codes of Practice (COPs) have been considered in the creation of the EPP. These include: • DFO Operational Statements (OSs) (DFO 2008a,b,c,d,e,f,g,h,i,j,k,l); • Pipeline Associated Watercourse Crossings, 3rd Edition (Canadian Association of Petroleum Producers [CAPP] 2005); • *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body* (Alberta Environment [AENV] 2000a); • *Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines* (AENV 1999a); • *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines* (AENV 1999b); • *Code of Practice for Watercourse Crossings* (AENV 2000b); • Upstream Oil and Gas Approval Standards for the Enhanced Approval Process (EAP) (GOA 2010b); • Upstream Oil and Gas Operating Conditions for the EAP (GOA 2010c); and • Upstream Oil and Gas for the EAP (GOA 2010d). • BC Oil and Gas Waste Regulation; • BC *Water Act*; • *Forest Practices Code of BC Act*. Timber Harvesting and Silviculture Practices Regulations; • *Forest Practices Act*; and • BC *Environmental Management Act*.
Environmental Inspector's Qualifications	12. The Environmental Inspector(s) hired for the Project will be required to have experience in pipeline planning, environmental inspection or both. The Environmental Inspector(s) will have an understanding of pipeline construction techniques and take a preventative approach. In addition, the Environmental Inspector(s) will be supported by appropriate Resource Specialists who have expertise in the particular issues associated with the Project and who will be available onsite or via consultation, as required.
Environmental Inspection Responsibilities	13. The Environmental Inspector(s) main responsibility is to ensure that environmental commitments, undertakings and conditions of authorizations are met and that work is completed in compliance with applicable environmental regulations and NGTL policies, procedures and specifications in the most efficient and effective way possible. Other responsibilities include: • providing expert advice and guidance on major decisions or courses of action to deal with major environmental conditions;

Activity	Preparation Measures
Environmental Inspection Responsibilities (cont'd)	• reporting any spills in accordance with federal and/or provincial regulations and advising NGTL management on the clean-up and disposal of the material and any affected soils or vegetation; • monitoring delivery of environmental orientation presentations to NGTL, regulatory and contractor staff, as directed by the NGTL Construction Manager and NGTL Environmental Advisor; • preparing daily reports; • preparing, collecting, organizing, and disseminating environmentally-related information and documentation that arises during construction; • liaising with appropriate government agencies in co-operation with the Construction Manager; • supervising of the environmental Resource Specialists that may be required to support the Project; • organizating onsite meetings as requested by the Construction Manager as the need arises, to address site-specific issues; • reviewing construction methodologies with the NGTL Construction Manager; and • collecting environmental information throughout construction for documentation and Project reporting.
Project Training and Orientation	14. Develop and implement an environmental orientation program to ensure that personnel working on the construction of the Project are informed of the environmental requirements and sensitivities. 15. Hire the Environmental Inspector(s) before the commencement of construction with sufficient lead time to enable training and participation in the orientation of other construction staff, as well as sufficient onsite time to facilitate review of environmentally sensitive aspects of the Project. 16. The Environmental Inspector(s) will be briefed by the NGTL Environmental Advisor and/or Environmental Inspection Co-ordinator, as well as previously involved environmental consultants, on the environmental processes and agreements that have taken place to date. 17. The Environmental Inspector(s) will review Project-related information. 18. The Environmental Inspector(s) will ensure an environmental orientation program is presented to NGTL Construction Activity Inspection Staff and Contractor(s) staff. 19. Regulatory representatives may attend the Contractor(s) environmental orientation presentations or, if necessary, be provided with separate presentations.
Non-Compliances and Resolution	20. The Environmental Inspector(s) will be notified by the responsible person onsite when non-compliance is identified and it will be his/her responsibility to contact the Construction Manager. If the Construction Manager is not available during a non-compliance situation, the Environmental Inspector(s) has the authority to initiate work stoppage. 21. The Construction Manager will make a determination to either modify the work practice or shut the activity down until corrective actions are determined and implemented. The Environmental Inspector(s) will assist in this decision making process.

Activity	Preparation Measures
Non-Compliances and Resolution (cont'd)	22. If the work is shut-down, it will resume only when corrective actions have been developed and approved by NGTL. Once approved by NGTL, the Contractor(s) will inform the work crew and work will proceed following the corrective action plan. 23. The Environmental Inspector(s) are responsible for documenting procedure modifications and environmental non-compliances.

Change Management

During the course of construction it may be necessary to modify or create new procedures to address site conditions not anticipated in the EPP. This procedure outlines the process to be followed.

Activity	Preparation Measures
Modifications	24. Contact the Environmental Inspector(s) if site conditions warrant a change in procedure that has environmental implications. 25. Develop the modification to the procedure in co-operation with the Construction Manager, Environmental Inspector(s), and NGTL's Project Management Team. 26. The modification to the procedure will include the following: • change to specific procedure (*e.g.,* culvert installation, etc.); • location (KPs, GPS co-ordinates and site description); • rationale for change; • environmental criteria reviewed as part of modification request; • consideration of environmental objectives; • equivalent or approved standard of mitigation; • additional environmental protection measures required; • site sketch or photo documentation; and • sign-off by the Construction Manager, Environmental Inspector(s) and NGTL representative. 27. Discuss changes to an existing procedure with the appropriate regulatory authorities, as necessary and seek the appropriate authorization should the revised procedures require further regulatory approval. If the modification meets the environmental objectives and there is no specific regulatory approval required for the change, no additional discussions with regulatory authorities are necessary. 28. Document the resolution and/or revision and communicate it to the appropriate parties.

5.0 NOTIFICATION OF CONCERNED PARTIES

Introduction

Notification of the construction schedule and timing of specific construction activities will facilitate awareness of upcoming activities and allow regulatory agencies and other stakeholders to plan as appropriate for construction activities in their area.

Objective

The objective of these mitigation measures is to ensure:

- interruptions to other land use activities are reduced during construction of the Project;
- affected stakeholders are aware of Project activities; and
- relevant regulatory agencies personnel are kept informed throughout construction.

Specific Measures

Contacts	Measures
Federal, Provincial and Municipal Agencies	1. Inform appropriate federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted. 2. In Alberta, the disposition holder will notify AESRD within 48 hours of site entry. 3. Contact AESRD if there are circumstances that lead to delays with the construction schedule.
Aboriginal Communities	4. Provide Aboriginal communities with proposed construction schedule and pipeline loop maps.
Trappers and Guide Outfitters	5. Contact trappers and guide outfitters at least two weeks prior to construction.
General Public	6. Post signage, where appropriate, notifying the public of construction activities.

6.0 PRECONSTRUCTION MEASURES

Introduction

The following measures will be implemented by NGTL's Contractor(s) and subcontractor(s) before the initiation of any ground disturbance activities.

Objective

The objectives of these mitigation measures are to ensure:

- all resources are properly identified and marked in the field before the initiation of ground disturbance to avoid or reduce potential Project effects;
- right-of-way is properly delineated to prevent inadvertent trespass; and
- all access to and from the work sites are properly marked.

Specific Measures

Activity/Concern	Mitigation Measures
Staking	1. To prevent inadvertent trespass, stake the right-of-way, staging areas and temporary workspace to clearly delineate boundaries. 2. Mark and locate foreign lines and cables using Alberta and/or BC One-Call services before the start of construction to ensure the safety of the workers and public.
Environmental Resource Delineation	3. Clearly mark sensitive resources identified on the Environmental Alignment Sheets and environmental tables (Tables 1 and 2A, B and C in Section 8.4 of this EPP) within the immediate vicinity before the start of clearing. Snow fencing will be installed to delineate sensitive resources along the right-of-way after clearing. 4. Supplement marking with signage after clearing. 5. The Environmental Inspector(s) will confirm the accuracy of environmentally sensitive resource locations and will ensure flagging is maintained during construction. 6. The Environmental Inspector(s) will identify and inform the contractor of appropriate locations for wildlife gaps.
Access Delineation	7. Clearly delineate areas that have access restrictions. .Restrict access to essential construction personnel. Direct all other personnel to the right-of-way via alternate access routes.
Grade Plan	8. The Contractor(s) shall provide a right-of-way grading plan a minimum of 14 days prior to the commencement of construction. 9. Before the start of construction, the Environmental Inspector(s) shall review the Contractor's grade plan to ensure environmental resources are not compromised as a result of grading. 10. Obtain approval for any additional temporary workspace required for storage of grade or ditch spoil during construction from the Environmental Inspector(s) and Construction Manager before disturbance.
Hot Line Exposure / Hydrovac	11. Strippings salvage is not required prior to exposing hot lines for holes less than 1 m in diameter, if soil will be removed using a hydrovac during frozen soil conditions or where the area to be exposed will be subsequently subject to strippings salvage as part of right-of-way preparation activities.

Activity/Concern	Mitigation Measures
Hot Line Exposure / Hydrovac (cont'd)	12. Empty the hydrovac truck onto subsoil at approved locations. Ensure that hydrovac material is contained within the designated release area (*i.e.,* will not migrate to a waterbody). Refer to the Hydrovac Cutting Handling Plan (Appendix F).
Aboriginal Monitors	13. Through discussion and on-going engagement with the potentially affected Aboriginal communities who have made recommendations for monitoring, NGTL will also arrange opportunities for Aboriginal community representatives to participate in monitoring activities in accordance with this EPP, during and after construction, at a frequency agreed upon by both parties.

7.0 RESOURCE-SPECIFIC PROTECTION AND MANAGEMENT MEASURES

Introduction

This section of the EPP describes the specific mitigation measures that will be used on the Project to protect sensitive environmental features as identified in the ESA and results of the supplemental biophysical field programs.

Objective

The objective of these mitigation measures is:

- to ensure the identification and protection of biophysical and cultural resources identified in the ESA; and
- where avoidance of wetlands is not technically or economically feasible, to implement construction and reclamation mitigation measures to minimize disturbance to wetlands and to allow affected wetlands to return to full functionality following temporary disturbances.

Specific Measures

Activity/Concern	Mitigation Measures
Environmental Resource Delineation	1. Specific resource protection measures have been marked on the Environmental Alignment Sheets and entered into the Resource-Specific Mitigation Table (Table 1 of this EPP).
Signage	2. Post signs in the vicinity of sensitive environmental features to alert workers of these items and ensure they are protected. See Table 1 for a listing of sensitive environmental features located along the pipeline right-of-way.
Watercourse Crossings	3. Watercourse crossing requirements are provided in Table 2A, B and C in Section 8.4 of this EPP, in Section 8.4 of the EPP, and are indicated on the Environmental Alignment Sheets.
Hydrology	4. If springs are encountered along the right-of-way, install trench breakers to force groundwater seepage along the pipeline trench to the surface. Install subdrains, if warranted, to divert shallow groundwater from the right-of-way. 5. Where shallow domestic water wells occur within 200 m of the Project, they will be sampled and analyzed for water quality prior to the start of pipeline construction. 6. In the event that construction activities result in a reduction of well water quality and quantity, provide well replacement and/or the replacement of equal or better quality and quantity of water. 7. Leave gaps in the windrows, at obvious drainages, on sidehill terrain and wherever seepage occurs to reduce interference with natural drainage patterns.
Wildlife	8. Discuss wildlife issues that are identified during construction will be discussed as necessary between the Environmental Inspector(s), Wildlife Resource Specialists and the appropriate regulatory representatives as directed in the Wildlife Discovery/Encounter Contingency Plan (Appendix E). 9. Do not harass or feed wildlife. Do not permit construction personnel to have dogs on the right-of-way. Firearms are not permitted in Project vehicles, on the right-of-way or at associated Project facilities. In addition, prohibit the recreational use of all-terrain vehicles (ATVs) or snowmobiles by construction personnel on the right-of-way. Report any incidents with nuisance wildlife or collisions with wildlife to AESRD and/or BC MFLNRO and the local police detachment, if applicable.

Activity/Concern	Mitigation Measures
Wildlife (cont'd)	10. Properly dispose of food and industrial waste. 11. If wildlife is discovered in the trench, or in association with any other activity or facility, report to the Environmental Inspector(s) who will contact the applicable regulatory authorities, as required. 12. Project personnel are not permitted to hunt or fish on the work site. 13. If listed or sensitive species are identified during construction of the Project, implement the Wildlife Species of Concern Discovery Contingency Plan (Appendix E). 14. Implement the Wildlife Encounter Contingency Plan (Appendix E) in the event of an encounter with wildlife occurring during construction, either at the site or on the commute to and from the construction site. 15. In the event of clearing or construction activities within the restricted activity period (RAP) for migratory birds (May 1 and July 31), conduct a nest sweep to identify any active nests. 16. Advise construction-related traffic to follow applicable traffic, road use and safety laws. 17. Place line-of-sight measures along the pipeline loops to reduce long sight lines and to lessen predator mobility. Recommended locations include transition zones between upland forest and muskeg/black spruce forest, areas with level terrain that have long sight lines and where the pipeline loop intersects an existing road or other pipeline right-of-way. These locations will be selected by the Environmental Inspector(s) with guidance from a wildlife biologist where necessary.
Key Wildlife and Biodiversity Zone (Timberwolf and Cranberry Sections)	18. Bi-weekly updates (*i.e.,* every second week) will be provided by NGTL to the appropriate AESRD representative(s) on construction progress within the Key Wildlife and Biodiversity Zone. NGTL will consult and inform AESRD of its construction schedule if activity continues after January 15. 19. Schedule pipeline construction to commence as soon as soil conditions allow. Complete construction within the Key Wildlife and Biodiversity Zone as early as practical within the winter construction season. 20. Conduct work expeditiously to maintain a tight construction spread (*i.e.*, interval between front-end work activities such as clearing, grading and back-end activities such as clean-up) to reduce the duration of activities within the Key Wildlife and Biodiversity Zone. 21. Obtain access to the right-of-way from existing access roads as indicated on maps provided to AESRD Public Lands and Forest. These maps will be posted at the construction camp and in construction offices.

Activity/Concern	Mitigation Measures
Caribou Protection (Timberwolf and Cranberry Sections)	22. Within Provincially identified caribou areas, implement the following measures. • Employ an "early in/ early out" approach by initiating activities as early as possible in the winter and working expeditiously to limit late winter activities. • Bi-weekly updates (*i.e.,* every second week) will be provided by NGTL to the appropriate AESRD representative(s). NGTL will consult and inform AESRD of its construction schedule if activity continues after mid-March. • NGTL will ensure pipeline construction will not be a barrier to caribou movement. For large diameter welded pipe, gaps are typically associated with terrain features (*i.e.*, slope changes), crossings (*i.e.*, watercourse, road, right-of-way) and bends. Efforts will be made to provide gaps at obvious, well used wildlife trails. Breaks in set-up and welded pipe shall be coincident with gaps in strippings, spoil, snow and rollback windrows.
Caribou Protection (Kyklo Creek Section)	23. The Kyklo Creek Section is located within 1.4 km of Snake-Sahtenah Caribou Range. The proposed measures identified in the Caribou Protection Plan (CPP) (Appendix K) will be implemented, where appropriate.
Caribou Protection (All Sections)	24. If caribou are encountered, stop vehicles/equipment and allow the caribou to move through the area undisturbed. Advise others working nearby of the presence of caribou in the area. 25. Follow additional mitigation measures within identified caribou areas in Alberta as described in the CPP (Appendix K). For the Kyklo Creek section, measures identified in the CPP will be implemented, where appropriate.
Grizzly Bear Protection	26. If an active grizzly bear den is discovered during supplemental surveys or Project construction activities, NGTL will consult with AESRD and BC MFLNRO to discuss what, if any, mitigation is required. Note that in Alberta, the recommended setback distance from an active grizzly bear den is 750 m from October 1 to April 30 (GOA 2011) and in BC, a 50 m setback is recommended (BC Oil and Gas Commission 2011).
Species with Special Conservation Status	27. In the event that a species with special conservation status is observed during construction, the appropriate regulatory agency (AESRD or BC MOE) will be contacted to determine if additional mitigation measures are warranted.
Rare Plants / Rare Ecological Communities	28. Clearly mark identified rare plant locations before the start of right-of-way preparation and construction. 29. Preconstruction flagging/staking will be reviewed by the Environmental Inspector(s) and survey team to ensure the locations requiring mitigation are clearly marked. 30. Review mitigation of rare plants / rare ecological communities with Contractor(s) personnel in advance of construction to ensure there is full understanding of the procedures involved. 31. Restrict the general application of herbicide near rare plants or rare ecological communities. Spot spraying, wicking, mowing or hand-picking are acceptable measures for weed control in these areas. 32. Follow mitigation identified in the Resource-Specific Mitigation Table (Table 1) and Environmental Alignment Sheets (Appendix M).

Activity/Concern	Mitigation Measures
Rare Plants / Rare Ecological Communities (cont'd)	33. If previously unidentified rare plants or rare ecological communities are found on the right-of-way prior to or during construction, implement the Plant Species and Ecological Communities of Concern Discovery Contingency Plan (Appendix E).
Mountain Pine Beetle (MPB) (All Sections)	34. All non-merchantable MPB infested pine encountered along the right-of-way during the clearing process will be burned or mulched to eliminate any spread of MPB. 35. Contact AESRD to determine site-specific MPB mitigation measures prior to clearing.
MPB (Kyklo Creek Section)	36. Post-harvest woody debris will be mulched and scattered or piled and burned
Weeds	37. Equipment must arrive at the Project site clean and free of soil or vegetative debris. Equipment will be inspected by the Environmental Inspector(s), or designate, and if deemed to be in appropriate condition will be identified with a suitable marker, such as a sticker. Any equipment which arrives in a dirty condition will not be allowed on the right-of-way until it has been cleaned. 38. Post signs at areas identified as having Noxious weed infestations prior to start of construction. 39. Conduct basic shovel and sweep cleaning before moving equipment from any locations identified as having a Noxious weed infestation. 40. Consider packing with snow or placing mats (*i.e.,* construction mats or swamp mats) over infested areas to reduce construction equipment transporting weed or plant material. Where mats are used, ensure they are free of soil, vegetation and debris prior to removing from the site. 41. Record any sites where equipment is cleaned due to concerns associated with weeds and monitor during the following growing season. Control weed growth, if warranted. 42. Additional mitigation to reduce weed growth and spread may be warranted if grade/strippings replacement is delayed due to the construction scheduling.
Wetlands	43. Do not dewater any permanent wetland. 44. Reduce grading within wetland boundaries. Do not use temporary workspace within the boundaries of wetlands, unless required for site-specific purposes. Temporary workspace within the boundary of a wetland must be approved by the Environmental Inspector(s). 45. Install berms and/or cross ditches at the base of approach slopes to wetlands, if warranted. 46. Restrict grading adjacent to wetlands to the extent practical. If grading within the vegetative buffer is necessary, install temporary sediment barriers to prevent sediment from entering the wetland. Direct grading away from wetlands. 47. Ramp with snow and ice, wherever possible, when constructing during frozen conditions. 48. Conduct ground level cutting/mowing/walking down of wetland vegetation instead of grubbing wherever possible. 49. Recontour the right-of-way and restore natural drainage patterns following construction.

Activity/Concern	Mitigation Measures
Wetlands (cont'd)	50. Natural recovery is the preferred method of reclamation (*i.e.,* do not seed wetland areas). 51. In Alberta, construct the shallow open water wetland crossings as per COP notifications submitted to AESRD. 52. In BC, pipeline wetland crossings on NEB-regulated projects require either approval from or notification to the BC MOE under Section 9 of the *Water Act* and Section 7 of the Water Regulations. Where delineated wetlands correspond to fish-bearing non-classified drainages, notification under Section 9 of the *Water Act* BC MOE for the pipeline crossing is required a minimum of 45 days prior to the start of construction and adherence to the applicable terms and conditions outlined in BC MOE (2010).
Historical and Palaeontological Resources	53. If historical or palaeontological features (*e.g.,* arrow heads, modified bone, pottery fragments, fossils) not previously identified are found on the right-of-way or facility site during construction follow conditions outlined in the Heritage Resource Discovery Contingency Plan (Appendix E). 54. Prohibit collection of Historical Resources by Project personnel.
TLU Sites	55. Previously identified TLU sites requiring mitigation are specified in the Resource-Specific Mitigation Table (Table 1). 56. If additional TLU sites are identified during the construction of the Project, implement the Contingency Plan for TLU Sites Discovery during construction (Appendix E).
Discontinuous Permafrost	57. If discontinuous permafrost is encountered during construction implement the Discontinuous Permafrost Contingency Plan (Appendix E). 58. Follow mitigation measures identified in the Resource-Specific Mitigation Table (Table 1) and Environmental Alignment Sheets (Appendix M).
Permafrost	59. Permafrost tends to be confined to poorly-drained organic bogs where the thick layers of peat provide insulating properties to protect the permafrost from thawing. In the unlikely event that isolated pockets of permafrost are identified throughout the Project during construction, the following mitigation measures will be implemented to the extent practical. • NGTL will inform the NEB Compliance Inspector with a report identifying and describing each permafrost location encountered. The report will include the depth, extent, terrain, vegetation and mitigation measures implemented. • Construction schedule will allow site preparation in frozen conditions only. • Snow and ice will be used to create a level surface to facilitate construction. Grubbing and grading over the area of permafrost will be avoided, if feasible. • Any strippings or subsoil will be placed on a snow layer in the permafrost area to prevent damage to the upper surface materials over the permafrost.

TABLE 1

RESOURCE-SPECIFIC MITIGATION TABLE

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
WILDLIFE - GENERAL				
KPK 0.0 to 0.1, 2.9 to 3.0 KPT 1.6 to 1.8, 4.8 to 4.9, 5.8 to 5.9 KPC 5.8 to 6.7, 26.8 to 26.9, 27.9 to 28.0	Visual Screening / Line-of-Sight	N/A	• Place line-of-sight measures along the pipeline loops to reduce long sight lines and to lessen predator mobility. Recommended locations include transition zones between upland forest and muskeg/black spruce forest, areas with level terrain that have long sight lines and where the pipeline loop intersects an existing road or other pipeline right-of-way.	• Preliminary candidate locations for site-specific visual screening and access control measures are identified on the Environmental Alignment Sheets.
Nesting Areas	Migratory birds	Avoid construction activities during the migratory bird restricted activity period of May 1 to July 31	• In the event that the schedule changes and clearing or construction activities are planned during the migratory bird RAP, a migratory bird nest sweep is recommended. • Stick nests were observed along the Cranberry pipeline route (KPC 24.7) during the 2011 field work. Clearing will be scheduled to occur in winter at a time when the nest will be inactive.	• In the event of a discovery of wildlife species of concern or migratory bird nest, implement the appropriate mitigative measures outlined in the Wildlife Species of Concern Discovery Contingency Plan (Appendix E).
Bear Dens	Grizzly Bear Zone	A timing restriction of October 1 to April 30, and 750 m setback distance applies to active grizzly bear dens, as outlined in the Upstream Oil and Gas Best Management Guidelines for the EAP (GOA 2010d)	• If an active grizzly bear den is discovered during supplemental surveys or Project construction activities, NGTL will discuss the setback with AESRD or BC MFLNRO. In Alberta, the setback distance is 750 m with a timing restriction of October 1 to April 30 (GOA 2010d) with AESRD. Alternative measures may be implemented only with the approval of AESRD. In BC, the setback distance is 50 m (BC OGC 2011).	• If required, additional mitigation measures will be implemented.
Trumpeter Swan Breeding Lakes	Trumpeter Swans	Clearing and construction are scheduled to commence outside of the timing restriction for trumpeter swans: Alberta: April 1 to September 30 (GOA 2010b); BC: April 1 to July 31 critical period and August 1 to August 31 cautionary period (BC MOE 2010b).	• No trumpeter swan breeding lakes were observed during the fall 2011 field surveys. • Avoid direct aerial overflights over identified trumpeter swan breeding lakes or waterbodies between April 1 to September 30 (GOA 2010b).	• In the event a trumpeter swan breeding lake is identified, consult with the Environmental Inspection(s) staff, Wildlife Resource Specialists and the appropriate regulatory representatives as directed in the Wildlife Discovery/Encounter Contingency Plan (Appendix E).

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
Key Wildlife and Biodiversity Zone	Wildlife Disturbance	A timing restriction of January 15 to April 30 applies to Key Wildlife and Biodiversity Zones.,	• Conduct work expeditiously to maintain a tight construction spread (*i.e.*, interval between front-end work activities such as clearing, grading and back-end activities such as clean-up) to reduce the duration of activities within the Key Wildlife and Biodiversity Zone. • Place line-of-sight measures along the pipeline loops to reduce long sight lines and to lessen predator mobility. Recommended locations include transition zones between upland forest and muskeg/black spruce forest, areas with level terrain that have long sight lines and where the pipeline loop intersects an existing road or other pipeline right-of-way. These locations will be selected by the Environmental Inspector(s) with guidance from a wildlife biologist where necessary. • Bi-weekly updates (*i.e.,* every second week) will be provided by NGTL to the appropriate AESRD representative(s) on construction progress within the Key Wildlife and Biodiversity Zone. NGTL will consult and inform AESRD of its construction schedule if activity continues after January 15. • Schedule pipeline construction to commence as soon as soil conditions allow. Complete construction within the Key Wildlife and Biodiversity Zone as early as practical within the winter construction season. • Obtain access to the right-of-way from existing access roads as indicated on maps provided to AESRD Public Lands and Forest. These maps will be posted at the construction camp and in construction offices.	• None
Caribou Area (Alberta)	Caribou Disturbance	An "early in/ early out" approach is recommended by AESRD. The Upstream Oil and Gas Approval Standards for the EAP (GOA 2010b) indicate new site preparation or construction should not be initiated between February 15 and July 15 unless approved by AESRD.	• Employ an "early in / early out" approach by initiating activities as early as possible in the winter and working expeditiously to limit late winter activities (GOA 2010b). • Bi-weekly updates (*i.e.*, every second week) will be provided by NGTL to the appropriate AESRD representative(s) • NGTL will consult and inform AESRD of its construction schedule if activity continues after mid-March. • NGTL will ensure pipeline construction will not be a barrier to caribou movement. For large diameter welded pipe, gaps are typically associated with terrain features (*i.e.*, slope changes), crossings (*i.e.*, watercourse, road, right-of-way) and bends. Efforts will be made to provide gaps at obvious, well used wildlife trails. Breaks in set-up and welded pipe shall be coincident with gaps in strippings, spoil, snow and rollback windrows. • If caribou are encountered, stop vehicles/equipment and allow the caribou to move through the area undisturbed. Advise others working nearby of the presence of caribou in the area.	• None.

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
Kyklo Section	Caribou Disturbance	An "early in/ early out" approach is recommended.	• The Kyklo Creek Section is located within 1.4 km of Snake-Sahtenah Caribou Range. The proposed measures identified in the Caribou Protection Plan (CPP) (Appendix K) will be implemented, where appropriate. • If caribou are encountered, stop vehicles/equipment and allow the caribou to move through the area undisturbed. Advise others working nearby of the presence of caribou in the area.	• None.
KPT 9.2, 9.4, 9.7 to 10.0, 12.9, 17.3, 24.9, 29.7, 30.6, 33.1, 34.9, 36.4 and 46.3 KPC 6.4 and 8.7	Beaver Dam/Lodge	N/A	• In the event that beaver dams or lodges will be disturbed, relevant permits for beaver dam removal will be obtained from the appropriate provincial regulatory agency. Comply with the DFO OS for Beaver Dam Removal, where applicable, as well as any Project approval conditions.	• Follow mitigation measures outlined in the Beaver Dam Removal Plans for Timberwolf and Cranberry sections. These Beaver Dam Removal Plans will be available prior to removal.
WILDLIFE – Site-Specific				
KPT 22.3	Mineral Lick	N/A	• Flag the mineral lick and ensure that all construction personnel are aware of its location. • Leave the mineral lick open for wildlife use. Do not cover the mineral lick with spoil, swamp mats, snow or other material. • To allow wildlife access to the mineral lick, ensure there is a gap in strung pipe within the area of the mineral lick. Welded pipe should not be on the ground for an extended period of time. Breaks in strung pipe shall be coincident with gaps in strippings, spoil, snow and rollback windrows. The locations of gaps in strung pipe will be determined in the field by the Environmental Inspector(s). • Conduct work expeditiously to maintain a tight construction spread (*i.e.*, interval between front-end work activities such as clearing, grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers to wildlife.	• None.
VEGETATION - General				
Hydrotest Sites and Access	Rare Plant Species and Rare Ecological Communities	Prior to Construction	• The locations of rare plant site-specific measures, if required, will be determined based on input from the supplemental rare plant species study for hydrotest sites and access and will be implemented in the field by the Environmental Inspector(s).	• If previously unidentified rare plants or rare ecological communities are found on the right-of-way prior to or during construction, implement the Plant Species and Ecological Communities of Concern Discovery Contingency Plan (Appendix E).
Hydrotest Sites and Access	Rare Plant Species and Rare Ecological Communities	Prior to construction	• Clearly mark identified rare plant locations before the start of right-of-way preparation and construction. • Preconstruction flagging/staking will be reviewed by the Environmental Inspector(s) and survey team to ensure the locations requiring mitigation are clearly marked.	
VEGETATION – Mountain Pine Beetle				
Kyklo Creek Section	Mountian Pine Beetle	N/A	• Post-harvest woody debris will be mulched and scattered or piled and burned	• None.

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
VEGETATION - White Adder's-Mouth Orchid				
KPK 4.7	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the three rare plant sub-populations prior to commencement of construction activities. • Leave a gap in the spoil pile within 10 m of the population to protect the portion of the population located on the existing right-of-way. • Ramp or mat over the travel lane within 10 m of the population to protect the portion of the population located on the proposed construction right-of-way. • If any of the flagged sub-populations is determined to be on the trench line, hand transplant to a suitable receiving location off construction right-of-way during the growing season (*i.e.,* summer) prior to construction. A biologically suitable receiving location for this species was identified by the on-site biologist at the time of survey. UTM co-ordinates for the potential recipient site are provided at right. • Monitor the effectiveness of mitigation measures during Post-construction Monitoring (PCM).	• None.
KPK 5.0	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the rare plants prior to commencement of construction activities. • Ramp or mat over the travel lane within 10 m of the population to protect any plants located on the proposed construction right-of-way. • If any of the flagged plants is determined to be on the trench line, hand transplant to a biologically suitable receiving location off construction right-of-way during the growing season (*i.e.,* summer) prior to construction. • Monitor the effectiveness of mitigation measures during PCM.	• None.
KPK 5.2	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the eastern and western extent of the rare plant population located on the proposed construction right-of-way prior to commencement of construction activities. • Ramp or mat over the travel lane for the extent of the population to protect the portion of the population located on the proposed construction right-of-way. • If any of the flagged sub-populations is determined to be on the trench line, hand transplant a portion of the population to a suitable receiving location off construction right-of-way during the growing season (*i.e.,* summer) prior to construction. • Monitor the effectiveness of mitigation measures during PCM.	• None.
KPK 5.6	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the rare plant population prior to commencement of construction activities. • Leave a gap in the spoil pile within 10 m of the population. • Monitor the effectiveness of mitigation measures during PCM.	• None.

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
VEGETATION – Purple Stemmed Aster				
KPK 5.5	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the rare plant population prior to commencement of construction activities. • Store spoil on top of frozen ground or snow layer within 10 m of the population. • Ramp or mat over the travel lane within 10 m of the population. • If stripping and/or grading are required in the vicinity of the population, salvage strippings from within 10 m of the population and store separately. • Maintain sufficient separation between strippings and spoil piles to ensure that piles do not mix, thereby preventing dilution of propagules. Identify strippings in this area by labeled stakes or flags. Redistribute salvaged strippings over the construction right-of-way at the location from which they were stripped. • Monitor the effectiveness of mitigation measures during PCM.	• None.
VEGETATION – Slender Mannagrass				
KPK 5.5, 23.0	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the rare plant population prior to commencement of construction activities. • Ramp or mat over the travel lane within 10 m of the population. • If stripping and/or grading are required in the vicinity of the population, salvage strippings from within 10 m of the population and store separately. • Maintain sufficient separation between strippings and spoil piles to ensure that piles do not mix, thereby preventing dilution of propagules. Identify strippings in this area by labeled stakes or flags. Redistribute salvaged strippings over the construction right-of-way at the location from which they were stripped. • Monitor the effectiveness of mitigation measures during PCM.	• None.
KPK 23 to 23.05	Site-Specific Mitigation for 2009 Rare Plant Locations	N/A	• If grading is not warranted, it is recommended that disturbance of the root zone and soil seed bank be reduced by using a stump mulcher or alternate equipment that reduces disturbance of root zone and soil seed bank rather than grubbing except along the trench line. • For any plants that are determined to be located on spoil side, store spoil on top of frozen ground or snow layer. • For any plants that are determined to be on the work side, ramp over the travel lane with snow. • If grading is warranted, salvage the organic layer (*i.e.*, the leaf litter layer) and the upper strippings to an approximate depth of 15 cm. Identify strippings in this area by labeled stakes or flags. Redistribute salvaged strippings over the construction right-of-way at the location from which it was stripped.	• None.

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
VEGETATION – Bog Adder's Mouth Orchid				
KPK 17.1, 25.3	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Flag the rare plants prior to commencement of construction activities. • Leave a gap in the spoil pile within 10 m of the population to protect any plants located on the existing right-of-way. • Ramp or mat over the travel lane within 10 m of the population to protect any plants located on the proposed construction right-of-way. • If any of the flagged plants is determined to be on the trench line, hand transplant to a biologically suitable receiving location off construction right-of-way during the growing season (*i.e.,* summer) prior to construction. • Monitor the effectiveness of mitigation measures during PCM.	• None.
VEGETATION – Saxifrage species				
KPK 25.1, 25.2, 28.1, 28.9	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• In areas where stripping and/or grading are required, restore site to preconstruction contours following construction.	• None.
VEGETATION – Orange Touch-Me-Not				
KPK 28.2	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Ensure vehicle and equipment traffic related to construction is restricted to the proposed construction right-of-way in the vicinity of the population.	• None.
VEGETATION – White Birch/ Scouler's Willow Community				
KPT 12.0, 30.9, 41.5	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	Grubbing will be restricted to the trench unless grading is required. • In areas where stripping and/or grading are required, restore site to preconstruction contours following construction.	• None.
VEGETATION – Scalloped Moonwort				
KPC 1.5	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Use construction matting or an appropriate alternative (at the discretion of the Environmental Inspector(s)) within an approximately 5 m^2 area of the rare plant population in order to prevent disturbance of the soil during construction and clean-up. • Stake or flag the location of the construction matting to facilitate safe and appropriate clean-up and reclamation. • Monitor the effectiveness of mitigation measures during PCM.	• None.
KPC 8.5	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Fence off south boundary of the proposed construction right-of-way within an approximately 10 m^2 area of the rare plant population. • Leave a gap in the spoil pile around the 10 m^2 fenced area to protect the population. • Monitor the effectiveness of mitigation measures during PCM.	None.

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
VEGETATION – Lance-Leaved Grape Fern, Leather Grape Fern, Northwestern Grape Fern				
KPC 8.5	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Fence off south boundary of the proposed construction right-of-way within an approximately 10 m^2 area of the rare plant population. • Leave a gap in the spoil pile around the 10 m^2 fenced area to protect the population. • Monitor the effectiveness of mitigation measures during PCM.	None.
VEGETATION – Golden Saxifrage				
KPC 20.5	Site-Specific Mitigation for 2011 Rare Plant Locations	N/A	• Restore site to preconstruction contours following construction.	None.
WATER CROSSINGS– See Table 2A, B and C for specific water crossing mitigation measures				
WETLANDS - General				
Class and distribution of wetlands crossed by the pipeline sections are identified in the 2011 Wetland Assessment (Tables 2 – 4) TERA 2011a).	Wetlands traversed by pipeline route	N/A	• Refer to Table 11 of the 2011Wetland Assessment for general mitigation measures (TERA 2011a).	• None.
TRADITIONAL LAND USE				
Approximately 1 km west of the pipeline crossing at Kyklo Creek	A trail corridor that runs roughly parallel and within 1 km of the right-of-way	N/A	• Leave sufficiently sized gaps in snow piles, spoil piles, and strung pipe to allow for movement across the right-of-way. • Ensure that during trenching activities, locations are maintained that allow for the safe crossing of the right-of-way. • Post adequate signage indicating crossing locations.	• If additional TLU sites are identified during the construction of the Project, implement the Contingency Plan for TLU Sites Discovery during construction (Appendix E).
All Three Sections of Pipeline	Traplines	N/A	• contact trappers prior to construction activities, including right-of-way clearing, general construction, and clean-up activities; • provide construction activity schedules to trappers to enable them to select alternate areas of activity; and • compensate trappers for trapping-related losses in accordance with NGTL's Trapper Compensation and Engagement Program.	• In accordance with NGTL's Trapper Compensation and Engagement Program.

TABLE 1 Cont'd

Location	Issues	Timing Windows and / or Regulatory Guidelines	Mitigation	Comments
KPT 22.3	Mineral Lick	N/A	• Flag the mineral lick and ensure that all construction personnel are aware of its location. • Leave the mineral lick open for wildlife use. Do not cover the mineral lick with spoil, swamp mats, snow or other material. • To allow wildlife access to the mineral lick, ensure there is a gap in strung pipe within the area of the mineral lick. Welded pipe should not be on the ground for an extended period of time. Breaks in strung pipe shall be coincident with gaps in strippings, spoil, snow and rollback windrows. The locations of gaps in strung pipe will be determined in the field by the Environmental Inspector(s). • Conduct work expeditiously to maintain a tight construction spread (*i.e.*, interval between front-end work activities such as clearing, grading and back-end activities such as clean-up) to reduce the duration of the open trench and to reduce potential barriers to wildlife.	• If additional mineral lick sites are identified during the construction of the Project, implement the Contingency Plan for TLU Sites Discovery during construction (Appendix E).
KPC 22.2	Abandoned Cabin and Campsite	N/A	• Current alignment of the Cranberry Section will avoid this habitation site and, in addition, signs will be posted to notify site users of construction activities in the vicinity and alert workers of these features to ensure the habitation site will not be affected by the pipeline loop.	• If additional TLU sites are identified during the construction of the Project, implement the Contingency Plan for TLU Sites Discovery during construction (Appendix E).
DISCONTINUOUS PERMAFROST				
KPK 10.575 to KPK 10.675 KPK 17.600 to KPK 17.675 KPK 26.7 to KPK 26.875	Site-specific mitigation for discontinuous permafrost locations	N/A	• If discontinuous permafrost is encountered during construction implement the Discontinuous Permafrost Contingency Plan (Appendix E).	• If additional permafrost areas occur, NGTL will determine whether specific design measures are required and if so, will ensure that the appropriate measures are implemented.

Note: All locations are approximate. See Environmental Alignment sheets for additional details.

8.0 PIPELINE CONSTRUCTION

8.1 General Environmental Protection Measures

Introduction

The general environmental protection measures provided below are applicable to all work areas throughout the construction phase. These general measures are followed by detailed specifications for each phase of new pipeline construction.

Objective

The objective of these mitigation measures is to avoid and minimize the potential environmental effects associated with general pipeline construction activities.

Specific Measures

Activity/Concern	Mitigation Measures
Regulatory Contact	1. Document field regulatory contacts and forward to the Construction Manager and the NGTL Environmental Advisor. 2. Communication with environmental regulatory representatives will be the responsibility of the NGTL Environmental Inspector(s).
Waste Disposal	3. The Contractor(s) will continuously collect all construction debris and other waste and dispose by the end of each working day, at an approved facility and in accordance with the Waste Management Plan (Appendix F) and the Spill Contingency Plan (Appendix E). Ensure wastes are recycled, where practical.
Contaminated Soils	4. In the event Contaminated Soils are encountered during construction, implement the NGTL Waste and Hazardous Materials Management Manual. This TransCanada Operating Procedure will be available at the construction office of the Project.
Fire Prevention	5. Ensure that personnel are made aware of the proper disposal methods for welding rods, cigarette butts and other hot or burning material. 6. Smoke only on designated areas. 7. Obtain applicable permits prior to burning slash. Follow guidance in the Forest and Prairie Protection Regulations (Alberta Reg. 310/72) and *Open Burning Smoke Control Regulation* (BC Reg. 145/93). 8. Maintain a water truck on the right-of-way when fire hazard is high and air temperatures allow. 9. Ensure that slash burning crews have fire-fighting equipment on hand that is capable of controlling any fire that may occur as a result of their activities. 10. Do not burn slash if the fire hazard is high. If burning is delayed, store slash along the right-of-way, in natural clearings or approved push-outs. Resume burning once the fire hazard is low. Slash may only be burned if conditions permit. 11. In the event of high fire hazard conditions, follow the suppression measures of the Fire Contingency Plan (Appendix E). 12. In BC, Fire Danger Class Ratings must be obtained daily from a representative weather station and work must be conducted within restrictions and durations set out in Schedule 3 of the BC Wildfire Regulations (http://bcwildfire.ca/Industry_Stakeholders/industry/).

Activity/Concern	Mitigation Measures
Fire Prevention (cont'd)	13. In BC, if required, develop a Wildfire Hazard Mitigation Plan and implement additional measures as required to address the BC *Wildfire Act*/Regulations and the Forest Fire Prevention and Suppression Regulation (under the *Forest Practices Code of BC Act*).
Use of Workspace	14. Restrict construction activities to the approved, surveyed right-of-way and approved temporary workspace, existing roads and approved temporary access. Construction traffic will adhere to safety and road closure regulations.
Equipment Refuelling and Servicing	15. Place an impervious tarp underneath equipment/vehicles when servicing equipment/vehicles with the potential for accidental spills (*e.g.,* oil changes, servicing of hydraulic systems, etc.). Refer to the Spill Contingency Plan (Appendix E). 16. The Contractor(s) will ensure equipment is well-maintained and free of fluid leaks. 17. Bulk fuel trucks, service vehicles and pick-up trucks equipped with box-mounted fuel tanks shall carry spill prevention, containment and clean-up materials that are suitable for the volume of fuels or oils carried. Spill contingency material carried on bulk fuel and service vehicles shall be suitable for use on land and water (*i.e.,* sorbent pads, sorbent boom and rope). 18. No fuel, oil or hazardous material storage will be allowed within 100 m of a watercourse or waterbody except where secondary containment is provided. 19. Operators or onsite construction foremen must be made aware of the Spill Contingency Plan (Appendix E). 20. Conduct refuelling at least 100 m away from any watercourse or waterbody except where secondary containment is provided. 21. Employ the following measures to reduce the risk of fuel spills in water. Where equipment is required to operate within 100 m of a watercourse, ensure that: • all containers, hoses, nozzles are free of leaks; • all fuel nozzles are equipped with automatic shut-offs; and • operators are stationed at both ends of the hose during fuelling. 22. Equipment or machinery shall not be washed in watercourses or waterbodies. 23. Inspect hydraulic, fuel and lubrication systems of equipment used in water crossing construction to ensure that the systems are in good condition and free of leaks. Equipment to be used in or adjacent to a watercourse or waterbody or wetland will be clean or otherwise free of external grease, oil or other fluids, mud, soil and vegetation, both prior to entering the waterbody and upon completion of instream activity. 24. Report spills immediately to the Environmental Inspector(s) and, if warranted, appropriate government agencies in accordance with the Spill Contingency Plan (Appendix E).
Spill Prevention	25. Follow provincial regulations as outlined in the Chemical Management Plan (Appendix D) for dealing with procurement, storing and handling of hazardous materials required for the Project infrastructure.
Air Quality / Emissions	26. Reduce unnecessary idling of Project equipment, to the extent practical. 27. The Contractor(s) will ensure equipment is well-maintained.

Activity/Concern	Mitigation Measures
Air Quality / Emissions (cont'd)	28. Utilize multi-passenger vehicles for the transport of crews to and from the job sites, to the extent practical, to reduce emissions during construction. Advise Project-related vehicles to follow applicable traffic, road use and safety laws. 29. Comply with local government bylaws, the the *Forest and Prairie Protection Regulations* (Alberta Reg. 310/72) and BC *Open Burning Smoke Control Regulation* and the *Forest Fire Prevention and Suppression Regulation* when burning land clearing debris.
Noise	30. The contractor will ensure noise abatement equipment (*e.g.,* mufflers) on machinery is in good working order.
Firearms/Pets	31. Project personnel will not be permitted to have firearms or pets in any Project vehicles, on the right-of-way or at associated Project facilities.
Bar Ditch Ramps	32. Construct bar ditch ramps with subsoil or snow/ice.
Foreign Pipelines	33. Construct ramps on the work side of the right-of-way over existing foreign pipelines as per Crossing Agreements.
Public Access	34. Discourage unauthorized public vehicle access along the right-of-way through use of signs or gates to ensure public safety during construction.

8.2 Clearing and Disposal

Introduction

The following measures will be implemented by NGTL's Contractor(s) and subcontractor(s) during the clearing phase of pipeline construction.

Objective

The objective of these mitigation measures is to:

- restrict the Project footprint to approved workspace;
- limit the disturbance to vegetation (*i.e.,* merchantable timber and native vegetation) to the extent practical;
- reduce surface disturbance to the extent practical; and
- promote the natural regeneration of vegetation.

Specific Measures

Activity/Concern	Mitigation Measures
Clearing	1. Do not clear timber, stumps, brush and other vegetation beyond the marked construction right-of-way and temporary boundaries. 2. Remove off right-of-way trees that are a safety hazard during construction activity following notification to the Environmental Inspector(s). Fell all trees damaged during clearing and construction immediately. A damaged tree is defined as one that has fractures or has bark loss for 50% of its circumference. 3. Conduct clearing near watercourses or wetlands as described in Section 7.0 and Section 8.4 of this EPP. 4. During clearing, trees will be felled towards the existing or proposed right-of-way, wherever possible. Buck leaners or felled trees that inadvertently fall into adjacent undisturbed vegetation into manageable lengths. 5. Avoid disturbance to environmentally sensitive features as identified by flagging tape or fencing will be avoided during clearing. The Environmental Inspector(s) and appropriate Resource Specialist will determine the size of avoidance buffer surrounding these features, if appropriate. 6. Where practical, stumps shall be left in place, particularly on slopes and streambanks, to provide surface stability. Dispose of stumps removed from the required work areas by burning or chipping.
Rollback	7. Where segments of the right-of-way require rollback for access management, line-of-sight or erosion control, ensure sufficient timber of appropriate size is available. NGTL in consultation with AESRD or BC MFLNRO will determine potential rollback locations, and material to be used after construction 8. Place rollback in a manner that does not create or enhance a fire hazard along the right-of-way. 9. Leave periodic gaps in rollback windrow to allow wildlife passage. Locate gaps at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s).

Activity/Concern	Mitigation Measures
Wet Terrain / Muskeg	10. In the event that nonfrozen soils are encountered during construction, refer to the Wet Soils Contingency Plan (Appendix E). Install corduroy, subject to AESRD or BC MFLNRO approval, or wooden mats or equivalent in areas of thawed soils to reduce terrain disturbance and soil structure damage. These materials will be removed during clean-up.
Merchantable / Salvageable Timber	11. Salvage and deck timber as denoted in the Timber Salvage Plan. 12. Do not bulldoze salvageable timber. 13. Suspend timber skidding operations or implement alternative measures, if the potential exists for merchantable timber to be damaged through contact with wet or muddy soils.
Decking Sites	14. Locate deck sites in previously-disturbed areas, wherever practical. Avoid grading at deck sites. Refer to Appendix D, Dwg. STDS-03-ML-05-302.
Grubbing	15. Grub tree roots, where required with a hoe and thumb or alternate equipment to preserve surface organic material. 16. Use a stump mulcher rather than grubbing on areas where stripping and grubbing are not necessary. 17. Restrict grubbing within 2 m of the undisturbed edge of the right-of-way to prevent damaging adjacent trees. 18. Restrict root grubbing on steep erosion prone slopes in order to reduce soil disturbance and erosion. 19. Reduce grubbing near watercourses, muskeg and through other wet areas to facilitate the restoration of shrub communities and to avoid creation of bog holes.
Nonmerchantable Timber	20. Use suitable equipment which will result in minimal terrain disturbance to clear nonmerchantable timber to assist in maintaining an intact ground surface in areas where grading is not warranted.
Disposal	21. Dispose of all timber material not salvaged for merchantability through burning or mechanical chipping, unless otherwise directed by the NGTL Environmental Inspector(s)/Construction Manager. 22. Timber and brush disposal options will be subject to agreements with the AESRD and the BC Crown Agency. 23. Do not bury stumps and debris. 24. Obtain applicable permits prior to burning slash. Follow guidance in the applicable regulations (*i.e., Forest and Prairie Protection Regulations* [Alberta Regulation 310/72], *Open Burning Smoke Control Regulations* [BC Regulation 145/93]). 25. Do not undertake burning within 100 m of waterbodies, unless otherwise authorized by the Environmental Inspector(s) in consultation with the appropriate regulatory authority. . 26. Implement techniques to limit smoke production including limiting pile size, minimizing moisture content and maintaining loose burning piles free of soil. 27. Avoid locating burn piles on peat rich areas where residual fires could persist after construction. 28. If timber and brush are disposed of by mechanical means (*i.e.,* mulching), the maximum depth of mulch will be 5 cm or in accordance with AENV Industry Directive Number: ID 2009-01 (Management of Wood Chips on Public Land), whichever depth is less.

8.3 Strippings Salvage and Grading

Introduction

Construction on lands crossed by the Project is planned for frozen and non-frozen conditions.

Objective

The objectives of these mitigation measures are to:

- conserve surface material to facilitate reclamation of disturbed lands;
- reduce effects to soil productivity, surface drainage patterns, land use and wildlife habitat;
- comply with regulatory direction; and
- employ environmentally and economically responsible construction practices at all times and in accordance with applicable industry standards.

Specific Measures

Activity/Concern	Mitigation Measures
Snow Management	1. Leave periodic gaps in windrowed snow, if snow windrows are of sufficient height to interfere with wildlife movement. Locate gaps at obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s). 2. Windrow snow over the trench to prevent deep frost penetration along the trench line, if required. 3. Remove or pack snow on work side to increase frost penetration into the soil in the early winter. In mid to late winter, pack snow on the work side to avoid premature thawing of the upper soils. 4. Limit snow removal from the spoil side area. Excess snow that could interfere with backfilling operations is to be removed while an 8-10 cm buffer layer of snow is to be left in place to avoid surface organic material/subsoil mixing during backfilling. 5. In the event of excessive snow depths discuss snow management with AESRD or BC MFLNRO.
Strippings Salvage	6. Do not conduct strippings salvage except where grading is required (Appendix D, Dwg. STDS-03-ML-05-444A and STDS-03-ML-05-444B). The area stripped is to correspond to the area to be graded. 7. Salvage the organic layer (*i.e.*, leaf litter layer) where strippings salvage is required. 8. Stabilize exposed strippings and subsoil where potential for erosion exists. Refer to the Soil Erosion Contingency Plan (Appendix E) for additional information. 9. Ensure strippings storage areas are in approved right-of-way and temporary workspace. Strippings storage areas will be approved by the Environmental Inspector(s). Windrow stockpiled strippings in low berms. 10. If wet/thawed soil conditions occur, implement the Wet/Thawed Soils Contingency Plan (Appendix E).
Grade Plan	11. Undertake all grading with the understanding that original contours and drainage patterns will be re-established during clean-up unless otherwise authorized by the NGTL authorized representative.

8.4 Water Crossings

Introduction

Horn River Mainline (Kyklo Creek Section)

The pipeline loop crosses Kyklo Creek (S2 stream class), an unnamed tributary to Kyklo Creek (S3 Stream Class), an unnamed drainage to Kyklo Creek (unclassified) and an unnamed drainage to Kotcho River (unclassified). In addition, numerous wetlands and undefined drainages are crossed by the route.

Northwest Mainline (Timberwolf Section)

The pipeline loop crosses the Hay River, two unnamed tributaries to the Hay River, Little Buffalo River, an unnamed tributary to the Little Buffalo River, Bivouac Creek, an unnamed tributary to Bivouac Creek, Chasm Creek, an unnamed tributary to Chasm Creek, Beaverskin Creek, three unnamed tributaries to Beaverskin Creek, and Snowfall Creek. All watercourses are Class C watercourses. In addition, numerous wetlands and undefined drainages are crossed by the pipeline route.

Tanghe Creek Lateral Loop No. 2 (Cranberry Section)

The pipeline loop crosses an unnamed tributary to Midget Creek, Sloat Creek, an unnamed tributary to Chinchaga River and a fish-bearing drainage. All watercourses are Class C watercourses. In addition, numerous wetlands and undefined drainages are crossed by the pipeline route.

The method of vehicular and pipeline crossing has taken into consideration engineering and constructability requirements, fish and fish habitat, and protection of riparian habitats. The mitigation measures outlined in this section apply to all watercourses and wetlands. Details on specific water crossing information are provided in Tables 2A, 2B and 2C.

Objective

The objectives of these mitigation measures are to:

- avoid or reduce adverse effects;
- comply with the habitat protection provisions of the *Fisheries Act* and the principle of 'no net loss' of productive fish habitat of DFO's Policy for the Management of Fish Habitat;
- comply with all provincial regulatory requirements including the applicable AENV *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body* (AENV 2000a), AESRD EAP Upstream Oil and Gas Approval Standards (GOA 2010b,e), Upstream Oil and Gas Operating Conditions (GOA 2010c), and Upstream Oil and Gas Best Management Guidelines (GOA 2010d), and the BC *Water Act* and *Water Regulations;*
- comply with DFO OSs;
- comply with all regulatory, permit, and approval conditions;
- employ environmentally and economically responsible construction practices at all times, and in accordance with applicable industry standards;
- protect riparian areas in proximity to watercourse crossings; and
- maintain the ecosystem function of riparian areas.

Activity/Concern	Mitigation Measures
Grade Plan (cont'd)	12. Where grading is not required, cut/mow/walk down shrubs and small diameter deciduous trees in muskeg at ground level. 13. Salvage strippings from areas to be graded. Avoid overstripping. The area stripped is to correspond to the area to be graded. 14. Minimize grading throughout the right-of-way, especially at watercourses, wetlands, and rare plant sites and on moderately steep slopes. Minimize the width of grading in order to limit the potential for erosion and subsoil compaction. 15. Ensure graded material does not spread off right-of-way.
Watercourses	16. Grade away from watercourses to reduce introduction of soil and organic debris. No windrowed or fill material shall be placed in the watercourses during grading.
Known Archaeological Sites	17. No grading will be permitted in proximity to known archaeological sites unless otherwise approved by AC or BC MFLNRO.
Temporary Berms	18. Install sediment control structures such as temporary berms on approach slopes to watercourses following grading, as required (Dwgs. STDS-03-ML-05-001 and STDS-03-ML-05-132). Inspect the temporary sediment control structures on a daily basis and repair, if warranted, before the end of each working day.

TABLE 2A

SUMMARY OF PLANNED PIPELINE AND VEHICLE/EQUIPMENT CROSSING METHODS FOR WATERCOURSES CROSSED BY THE HORN RIVER MAINLINE LOOP (KYKLO CREEK SECTION)

Site No.	Name, Legal Location and KPK[1]	UTM Co-ordinates (Zone 10)	Stream Class[2]	Instream Work Window of Least Risk[3]	Riparian Management Area (m)[2]	Functional Riparian Area Width (m)	Mean Bankfull Width (m)	Fish Species Captured or Observed During Open Water Assessment (Previously Documented)[4]	Location of Nearest Known Fish Habitat[5]	Beaver Activity Present	Winter 2009 Habitat Investigation Results	Planned Pipeline Crossing Method[6]	Contingency Pipeline Crossing Method	Planned Vehicle/ Equipment Crossing Method (Frozen)	Planned Vehicle/ Equipment Crossing Method (Open Water)	Riparian and Bank Restoration Mitigation
WATERCOURSES																
H(K)-WC1	Unnamed Tributary to Kyklo Creek c-013-K/094-I-11 KPK 1.7	E: 599490 N: 6505942	S3	July 15 to March 31	40	Left: <5 Right: <5	1.8	finescale dace (brook stickleback and finescale dace captured at confluence of Metlahdoa Creek and Kyklo Creek approximately 4 km upstream on Kyklo Creek)	Within the crossing right-of-way and/or zone of influence (ZOI)	Yes, upstream of proposed crossing. Not influencing proposed crossing at time of assessment.	Dry	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snowfill/ice bridge	Clear span bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.
H(K)-WC2	Kyklo Creek a-008-L/094-I-10 KPK 20.9	E: 618160 N: 6504849	S2	July 15 to March 31	50	Left: 40-50 Right: >50	16.6	trout-perch, longnose sucker, finescale dace, flathead chub (finescale dace and brook stickleback captured approximately 22 km upstream at confluence of Metlahdoa Creek)	Within the crossing right-of-way and/or ZOI	Yes, upstream and downstream of proposed crossing. Not influencing proposed crossing at time of assessment.	Ice: 0.6 m Water: 1.0 m DO: 3.6 mg/L Flow: Negligible	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snowfill/ice bridge	Clear span bridge	• Follow site-specific reclamation plan.
FISH-BEARING NON-CLASSIFIED DRAINAGES																
H(K)-FD1	Unnamed Drainage to Kyklo Creek a-026-J/094-I-11 KPK 7.4	E: 604909 N: 6506505	n/a	July 15 to March 31	n/a	Left: >50 Right: >50	n/a	finescale dace, brook stickleback (none)	Within the crossing right-of-way and/or ZOI	Yes, upstream of proposed crossing. Not influencing proposed crossing at time of assessment.	Ice: 0.4 m Water: 0.3 m DO: 2.2 mg/L Flow: Negligible	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snowfill/ice bridge	n/a	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.
H(K)-FD2	Unnamed Drainage to Kotcho River b-100-F/094-I-10 KPK 26.5	E: 623430 N: 6504264	n/a	July 15 to March 31	n/a	Not recorded	n/a	brook stickleback (none)	Within the crossing right-of-way and/or ZOI	No	Dry/frozen to bottom	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snowfill/ice bridge	n/a	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.

Notes: n/a not applicable

1 KPKs may be subject to change and are based on surveys from January 2011.

2 BC MOE 1995

3 BC MWLAP 2004

4 BC MOE 2011a and BC MFLNRO 2011

5 Approximate distance to nearest watercourse, or location in the sampled watercourse, known to contain fish.

6 Based on the results of the open water aquatic assessment and winter aquatic habitat investigations, these crossings are considered to have low sensitivity during winter construction if the mitigation and reclamation measures outlined in Section 5.0 of this report are implemented. Therefore, trenched pipeline crossings are acceptable.

TABLE 2B

SUMMARY OF PLANNED PIPELINE AND VEHICLE/EQUIPMENT CROSSING METHODS FOR WATERCOURSES CROSSED BY THE NORTHWEST MAINLINE (TIMBERWOLF SECTION)

Site No.	Name, Legal Location (W6M), KPT [1]	UTM Co-ordinates (NAD 83, Zone 11)	AESRD Class and RAP [2]	Mean Channel Morphology (m)	Fish Species Captured or Observed During Open Water Assessment (Previously Documented) [3]	Beaver Activity Present	Winter 2011 Habitat Investigation Results	Planned Pipeline Crossing Method	Contingency Pipeline Crossing Method [4]	Planned Vehicle/ Equipment Crossing Method (Open Water)	Planned Vehicle/Equipment Crossing Method (Frozen)	Riparian and Bank Restoration Mitigation	Comments
WATERCOURSES													
N(T)-WC1	Hay River 5-22-108-12 KPT 5.4	E: 329382 N: 6475671 (HDD crossing) E: 329372 N: 6475657 (vehicle and contingency crossing)	Mapped Class C April 16 to July 15	Bankfull: 39.0 Wetted: 45.0 Depth: 2.8	white sucker, lake chub and trout-perch (walleye, emerald shiner, finescale dace, brook stickleback, trout-perch, white sucker at crossing)	No	Ice: 0.5 m Water: 0.3 m DO: 12.1 mg/L Flow: 0.5 m^3/s	Trenchless (HDD)	Partial isolation	Site-specific design	Site-specific design	• Replace salvaged strippings to facilitate revegetation at HDD entry and exit sites. • Seed with a native grass mixture at HDD entry and exit sites. • Follow site-specific reclamation plan if contingency pipeline method used	Vehicle and contingency crossing approximately 200 m upstream from HDD crossing.
N(T)-WC2	Little Buffalo River 6-33-106-12 KPT 21.5	E: 328472 N: 6459768	Mapped Class C April 16 to July 15	Bankfull: 11.4 Wetted: 11.4 Depth: 1.4	No fish captured or observed (longnose sucker, lake chub at crossing)	No	Ice: 0.4 m Water: 1.0 m DO: 10.8 mg/L Flow: 0.09 m^3/s	Isolate if water present/open cut if dry or frozen to bottom	n/a	Clear span bridge	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	
N(T)-WC3	Unnamed tributary to Bivouac Creek 10-17-106-12 KPT 26.8	E: 326867 N: 6455015	Unmapped Class C April 16 to July 15	Bankfull: 1.4 Wetted: 1.1 Depth: 0.2	Brook stickleback (none at crossing)	No	Frozen to bottom	Isolate if water present/open cut if dry or frozen to bottom	n/a	Clear span bridge	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	
N(T)-WC4	Chasm Creek 3-7-106-12 KPT 29.7	E: 324909 N: 6452979	Mapped Class C April 16 to July 15	Bankfull: 3.6 Wetted: 3.5 Depth: 0.6	No fish captured or observed (brook stickleback, lake chub, longnose sucker at crossing)	Yes, 50 m upstream. Not influencing proposed crossing	Ice: 0.03 m Water: 0.4 m DO: 8.3 mg/L Flow: Negligible	Isolate if water present/open cut if dry or frozen to bottom	n/a	Clear span bridge	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Defined channel with boulder substrate at right-of-way.
N(T)-WC5	Unnamed tributary to Beaverskin Creek 3-7-105-12 KPT 39.6	E: 324260 N: 6443057	Unmapped Class C April 16 to July 15	Bankfull: 0.9 Wetted: 0.7 Depth: 0.3	No fish captured or observed (none at crossing)	Yes, 250 m downstream. Not influencing proposed crossing.	Frozen to bottom	Isolate if water present/open cut if dry or frozen to bottom	n/a	Clear span bridge	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Small headwater channel with step barriers.
BEAVER DAM COMPLEXES													
N(T)-BP1	Unnamed tributary to Hay River 11-3-108-12 KPT 10.0	E: 329330 N: 6471103	n/a - no defined channel April 16 to July 15	Bankfull: see comments Wetted: see comments Depth: n/r	Finescale dace (none at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Frozen to bottom	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.	No defined channel Approximately 800 m wet area.
N(T)-BP2	Unnamed tributary to Hay River 11-27-107-12 KPT 12.9	E: 329336 N: 6468218	Unmapped Class C April 16 to July 15	Bankfull: see comments Wetted: 40 Depth: n/r	Finescale dace (none at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Ice: 0.4 m Water: 0.5 m DO: 1.1 mg/L Flow: Negligible	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Unable to determine native channel.
N(T)-BP3	Unnamed tributary to Little Buffalo River 3-15-107-12 KPT 17.3	E: 329240 N: 6463854	Mapped Class C April 16 to July 15	Bankfull: see comments Wetted: 143 Depth: n/r	Finescale dace, brook stickleback (finescale dace, brook stickleback at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Frozen to bottom	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Native channel is 10 m.

TABLE 2B Cont'd

Site No.	Name, Legal Location (W6M), KPT [1]	UTM Co-ordinates (NAD 83, Zone 11)	AESRD Class and RAP [2]	Mean Channel Morphology (m)	Fish Species Captured or Observed During Open Water Assessment (Previously Documented) [3]	Beaver Activity Present	Winter 2011 Habitat Investigation Results	Planned Pipeline Crossing Method	Contingency Pipeline Crossing Method [4]	Planned Vehicle/ Equipment Crossing Method (Open Water)	Planned Vehicle/Equipment Crossing Method (Frozen)	Riparian and Bank Restoration Mitigation	Comments
N(T)-BP4	Bivouac Creek 12-21-106-12 KPT 24.9	E: 327678 N: 6456662	n/a - no defined channel April 16 to July 15	Bankfull: see comments Wetted: 187 Depth: n/r	Brook stickleback, finescale dace (none at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Ice: 0.4 m Water: 0.3 m DO: 1.5 mg/L Flow: Negligible	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.	No defined channel
N(T)-BP5	Unnamed tributary to Chasm Creek 11-6-106-12 KPT 30.6	E: 324737 N: 6452029	Unmapped Class C April 16 to July 15	Bankfull: see comments Wetted: 35 Depth: n/r	Finescale dace, brook stickleback (none at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Ice: 0.5 m Water: 0.4 m DO: 0.5 mg/L Flow: Negligible	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Unable to determine native channel.
N(T)-BP6	Unnamed tributary to Beaverskin Creek 4-31-105-12 KPT 33.1	E: 324528 N: 6449627	n/a - no defined channel April 16 to July 15	Bankfull: see comments Wetted: see comments Depth: 0.5	Finescale dace (none at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Frozen to bottom	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.	No defined channel. Multiple wet areas.
N(T)-BP7	Beaverskin Creek 3-30-105-12 KPT 34.9	E: 324467 N: 6447821	Mapped Class C April 16 to July 15	Bankfull: 9.1 Wetted: 8.6 Depth: 0.4	No fish captured or observed (white sucker, finescale dace at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Ice: 0.3 m Water: 0.5 m DO: 10.1 mg/L Flow: Negligible	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Native channel is 7 to 12 m. Multiple wet areas
N(T)-BP8	Unnamed tributary to Beaverskin Creek 3-19-105-12 KPT 36.4	E: 324391 N: 6446278	Unmapped Class C April 16 to July 15	Bankfull: 1.2 Wetted: 1.2 Depth: 0.7	Brook stickleback (none at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Dry	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Native channel is 1.2 m. Beaver run between dams.
N(T)-BP9	Snowfall Creek 14-18-104-12 KPT 46.0	E: 323945 N: 6436371	n/a - no defined channel April 16 to July 15	Bankfull: see comments Wetted: 22 Depth: n/r	Brook stickleback, finescale dace (white sucker, finescale dace at crossing)	Yes, upstream and downstream. Influencing proposed crossing.	Ice: 0.5 m Water: 0.9 m DO: 0.7 mg/L Flow: 0.1 m^3/s	Isolate and/or partial isolation if water present/open cut if dry or frozen to bottom	n/a	n/a	Snowfill/ice bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.	No defined channel

Notes: n/a (not applicable), n/r (not recorded)

1 KPTs may be subject to change and are based on surveys from January 2011.

2 Determined from the AESRD Code of Practice Management Area Map for Peace River (AENV 2006).

3 Results from Fisheries and Wildlife Management Information System (FWMIS) (2011).

4 Trenchless pipeline crossing method was recommended to reduce the potential to negatively impact the productive capacity of the aquatic environment at Hay River. Trenched pipeline crossing methods were recommended for the remaining crossings based on the results of the open water aquatic assessment and winter aquatic habitat investigations. These crossings were considered to have low sensitivity during winter construction if the mitigation and reclamation measures outlined in Section 5.0 of this report are implemented. Therefore, trenched pipeline crossings are acceptable.

TABLE 2C

SUMMARY OF PLANNED PIPELINE AND VEHICLE/EQUIPMENT CROSSING METHODS FOR WATERCOURSE AND FISH-BEARING DRAINAGE CROSSINGS ALONG THE TANGHE CREEK LATERAL LOOP NO. 2 (CRANBERRY SECTION)

Site No.	Name, Legal Location (W6M) and KPC [1]	UTM Co-ordinates (NAD 83, Zone 11)	Class and RAP [2]	Mean Channel Morphology (m)	Fish Captured or Observed During Open Water Assessment (Previously Documented)[3]	Beaver Activity Present	Winter 2011 Habitat Investigation Results	Planned Pipeline Crossing Method[4]	Contingency Pipeline Crossing Method	Planned Vehicle/ Equipment Crossing Method (Frozen)	Planned Vehicle/ Equipment Crossing Method (Open Water)	Riparian and Bank Restoration Mitigation	Comments
WATERCOURSES													
T(C)-WC1	Unnamed Tributary to Midget Creek 7-23-96-5 KPC 2.4	E: 398473 N: 6356710	Unmapped Class C April 16 to July 15	Bankfull: 1.1 Wetted: 0.9 Depth: 0.2	No fish captured or observed (none at proposed crossing)	No	Dry	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snow fill/ice bridge	Clear span bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Small channel with abundant overhanging and in stream vegetation and debris, limited flow and depth, poor fish potential, likely no passage upstream.
T(C)-WC2	Sloat Creek 6-17-96-6 KPC 17.9	E: 383412 N: 6355410	Mapped Class C April 16 to July 15	Bankfull: 1.2 Wetted: 1.2 Depth: 0.1	No fish captured or observed (none at proposed crossing)	No	Frozen to bottom	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snow fill/ice bridge	Clear span bridge	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture. • Use bank stabilization measures if appropriate.	Small perennial channel, headwater watercourse, shallow water depth throughout
T(C)-WC3	Unnamed tributary to Chinchaga River 10-21-96-7 KPC 26.4	E: 375584 N: 6357956	Mapped Class C April 16 to July 15	Bankfull: 7.9 Wetted: 3.8 Depth: 0.3	Arctic grayling, brook stickleback (Arctic grayling, longnose sucker at proposed crossing)	No	Frozen to bottom	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snow fill/ice bridge/ Clear span bridge (protect meander and unstable banks at crossing)	Clear span bridge	• Follow site-specific reclamation plan.	Right bank vertical and steep within existing right of way, previous crossing used crib wall as right bank stabilization.
FISH-BEARING DRAINAGE													
T(C)-FD1	Unnamed drainage 3-21-96-5 KPC 6.4	E: 394666 N: 6356496	n/a April 16 to July 15	Bankfull: n/a Wetted: see comments Depth: not recorded	No fish captured or observed (none at proposed crossing)	Yes, beaver pond 50 m to 100 m downstream. Not influencing proposed crossing.	Frozen to bottom at crossing. Dissolved oxygen in beaver pond was 5.0 mg/L.	Isolate if water present/open cut if dry or frozen to bottom	n/a	Snow fill/ice bridge	n/a	• Replace salvaged strippings to facilitate revegetation. • Seed with a native grass mixture.	Several small drainages/wet areas at proposed right of way that feed into a beaver dam complex 50 m to 100 m downstream. Large beaver pond with lodge, approximately 87m across at existing right of way.

Notes: n/a (not applicable)

1 KPCs may be subject to change and are based on surveys from January 2011.

2 Determined from the AESRD Code of Practice Management Area Map for Peace River (AENV 2006).

3 Results from FWMIS (2011).

4 Based on the results of the open water aquatic assessment and winter aquatic habitat investigations, these crossings are considered to have low sensitivity during winter construction if the mitigation and reclamation measures outlined in Section 5.0 of this report are implemented. Therefore, trenched pipeline crossings are acceptable.

Table 3 outlines the Minimal Disturbance Zone (MDZ) setback criteria for watercourses traversed by the pipeline.

TABLE 3

WATERCOURSE MINIMAL DISTURBANCE ZONE SETBACK CRITERIA

Standard: Maintain the MDZ setback (10 m or more) established during clearing until just prior to access installation (work side) and pipeline installation (spoil or trench side).
Change in MDZ Size: MDZ may be shortened during grubbing or grading activities as approved by NGTL provided the criteria listed below are present and the Additional Mitigation Measures are implemented.
Rationale: 1. Grade cut required inside the MDZ to facilitate the installation of access (bridge, culvert). 2. Alternative protection measures provide the same or better level of protection of the watercourse from sedimentation.
Criteria: NGTL must approve any changes in the MDZ size on a site-specific basis, prior to implementation. The change to the MDZ may be implemented provided the following criteria are present at the specific watercourse: 1. Steep slope approach extends into the MDZ; however, the final grade results in a negative slope of a height differential between the MDZ and the approach slope; or 2. No potential for sediment to enter watercourse due to negative or flat grade; or 3. There are no erodible soils adjacent to the watercourse (*i.e.,* material on approaches is gravel, cobbles, boulders, bedrock, or other material deemed stable by NGTL).
Additional Mitigative Measures: The following mitigative measures will be implemented for resource protection both during and after construction to accommodate variance. The Contractor(s) responsible for implementing and maintaining all mitigative measures unless otherwise specified. 1. Maintain minimum set back of 3 m from the water's edge. 2. Berm barrier implemented, plus additional erosion and sediment control measures as specified by NGTL.

Specific Measures

Activity/Concern	Mitigation Measures
Watercourse Crossing Methods	1. Refer to Tables 2A, 2B and 2C for the method of vehicle and pipeline crossings on all watercourses.
Permits and Approvals	2. NGTL will obtain applicable permits and/or authorizations prior to the commencement of the crossings (Appendix C). Follow DFO Letter of Advice or *Fisheries Act* s35(2) authorization conditions and Transport Canada Approval conditions.
Notification	3. Ensure notification of DFO 14 days prior to commencement of work in waterbody in accordance with the applicable DFO OSs (Appendices 8G and 8H). OSs that could apply to the Project includes Clear Span Bridges, High Pressure Directional Drilling (should a horizontal directional drill [HDD] be required), Isolated or Dry Open-cut Stream Crossings (if construction occurs outside the RAP at watercourses that are less 5 m wide at the crossing) and Ice Bridges and Snowfills. Refer to Appendices 8G and 8H for copies of the OSs that are applicable to the Project. 4. In Alberta, ensure notifications are completed in accordance with the AENV *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body and Watercourse Crossings* (AENV 2000a,b). 5. In BC, ensure notifications are completed in accordance with the BC *Water Act* and *Water Regulations*.
Signage	6. Post signs before clearing (including name, number and KP) for watercourses. Signs will be posted 100 m from the watercourse or at the top of the valley slope, whichever is greater, to alert the Contractor(s) of the upcoming watercourse.
	7. As directed by the Transport Canada Navigable Waters approval, instream temporary works shall be marked with yellow flashing lights from dusk until dawn and during period of restricted visibility. 8. As directed by under the Transport Canada Navigable Waters approval, warning signs shall: • be placed and maintained during all periods of construction and instream activity; • be legible at a minimum distance of 50 m; • be placed 50 m upstream and downstream of the crossings that are navigable (*i.e.*, Kyklo Creek, Hay River, Little Buffalo River and the unnamed tributary to the Chinchaga River) until completion of the project; and display black letters on a yellow background
RAPs – Windows of Least Risk	9. Refer to Tables 2A, 2B and 2C for the RAPs and instream work windows of least risk associated with the watercourse crossings traversed by the Project. 10. No construction activity will occur within the RAP or outside the instream work window of least risk for any watercourse crossing unless • it is dry or frozen to the bottom at the time of construction; • if trenchless techniques are employed; or • work during the RAP or inside the window of least risk requires approval from the appropriate regulatory authorities.
Riparian Buffers	11. Limit clearing at watercourse crossings to the removal of trees and shrubs to the ditch line and work side areas required for vehicle crossings.

Activity/Concern	Mitigation Measures
Riparian Buffers (cont'd)	12. In BC, fell trees away from watercourses. When altering a tree that is located on the bank of a waterbody, where practical, ensure that the root structure and stability are maintained to help bind the soil and encourage rapid colonization of low-growing plant species. In addition, ensure no debris remains within the high watermark or is placed into a stream (BC Ministry of Forests [MOF] 1995). 13. Alter riparian vegetation in the right-of-way by hand, where practical. Avoid grubbing and use vegetative maintenance and removal techniques such as pruning, mowing, girdling, topping and select tree removals that allow the root system to remain. If machinery must be used, operate machinery on land (above the high watermark) and in a manner that minimizes disturbance to the banks of the watercourse. In addition, minimize disturbance to all low-growing shrubs or grass species. 14. If the working surface is unstable, do not permit machine clearing equipment within the 10 m riparian buffer, unless approved by the NGTL representative. Following clearing, the 10 m vegetation buffer will remain intact (*i.e.,* consisting of low-lying understory vegetation). 15. Limit the physical disturbance to the stream bank during construction activities (*e.g.,* limit infilling [filling scour pools, rock armouring placement], excavation of the channel within or upstream or downstream of the right-of-way, etc.). Follow the site-specific typical watercourse crossing construction plan drawings (Appendix D) and riparian reclamation plans developed for Kyklo Creek, the Hay River contingency and the unnamed tributary to the Chinchaga River.
Grading	16. Where practical, delay grading on approach slopes to watercourses or wetlands until immediately before construction of the crossing. If required, appropriate temporary erosion and sediment control structures shall be installed, at the discretion of the Environmental Inspector(s) upon initial disturbance of the vegetative mat and strippings. 17. Direct grading away from waterbodies. Do not place fill material in a waterbody or floodplain during grading. 18. Ensure that grubbing, stripping and grading of approach slopes to watercourses is restricted to an amount required to allow the safe passage of equipment, excavation of the trench and installation of the pipeline. 19. Where practical, avoid grading in riparian areasuntil installation of the vehicle crossing. 20. Ramp construction for bridges may require hauling in of fill material and placing geotextile fabric between the fill material and the surface layer. Ensure the approaches to watercourses and/or waterbodies have erosion and sediment control measures installed where thaw runoff may occur.
Vehicle Crossings	21. No fording of watercourses is permitted.

Activity/Concern	Mitigation Measures
Vehicle Crossings (cont'd)	22. Ensure equipment is clean prior to entering the Project site (*i.e.,* pipeline sections)and displays an equipment inspection sticker. It should also be cleaned after construction to ensure it does not transfer mud, debris, invasive plants or aquatic pests (*e.g., Myxobolus cerebralis* - the parasite that causes whirling disease in fish). 23. Implement appropriate precautions to prevent deleterious substances (*e.g.,* gasoline, sediment, oil, wet concrete, etc.) from entering watercourses. Cleaning, fuelling and servicing of equipment should be conducted in an area where spills or wash water will not contaminate surface water or groundwater resources. An appropriate emergency spill kit is to be available at all times. 24. Construct, install and remove all vehicle crossings across waterbodies, shorelines, riverbanks and wetlands: • as outlined in Tables 2A, 2B and 2C; • in a manner that protect the banks from erosion, maintain the flows in the waterway; • following the COP for Alberta (AENV 2000b); • following BC *Water Act* and Water Regulations; • following applicable DFO OSs (DFO 2008b,d,g,h,k); • according to typical drawings (Appendix D, Dwgs. STDS-03-ML-05-104, STDS-03-ML-05-101 and STDS-03-ML-05-102); and • according to designed drawings (Appendix D, Dwg. 1 (Kyklo typical), 4634-03-ML-SK-001A (Kyklo Clear span option), 4619-03-ML-SK-001C (Hay River Vehicle), Dwg. 1 (unnamed tributary to Chinchaga River typical). 25. Construct all bridges, with the exception of Hay River, (ice and snowfill bridges or single-span bridges) beyond the ends of the banks. Do not place fill within primary banks for bridge abutment construction, unless approved by the appropriate regulatory authority. 26. Where conditions permit, employ ice and snowfill bridgesas temporary crossing structures. Install ice and snowfill bridges using water drawn from the watercourse, a local source within the same watershed and/or clean snow plowed-in from surrounding areas or made. 27. If conditions will not support the construction of snowfill/ice bridges (*e.g.*, warm temperatures, low snow accumulations, wide watercourse spans), then employ other temporary crossing structures approved by regulatory authorities (*e.g.*, portable bridge spans, swamp mats, rig mats). Bridges will be lined with impervious geotextile with a minimum of 30 cm high plywood side boards. 28. If water withdrawal is necessary for the construction of a temporary crossing, ensure that necessary AENV approvals and/or BC *Water Act* and Water Regulations are in place and follow DFO conditions. Do not withdraw more than 10% of the instantaneous stream flow at any given time. Pump intakes should not disturb the streambed. Pumps should be screened with a maximum mesh size of 2.54 mm and should have a maximum screen approach velocity of less than 0.038 m/s where fish habitat is present. 29. Use only clean ice/snow for construction of an ice/snowfill or ice bridge. Construct approaches to the bridge with compacted snow and ice of sufficient thickness to protect the stream channel and banks. Do not use sand, gravel and soils for ice bridge approaches.

Activity/Concern	Mitigation Measures
Vehicle Crossings (cont'd)	30. Ensure that ice bridges or snowfills do not interfere with or impede winter flows. 31. Consider alternate methods of vehicle crossings on a site-specific basis. The decision making process will include the Contractor, Construction Manager and the Environmental Inspector(s). Decision criteria will include protection of the riparian vegetation and fisheries values associated with the crossing location, and applicable legislation. 32. Where conditions permit, employ ice and snowfill bridges as temporary crossing structures. Install ice and snowfill bridges using water drawn from the watercourse, a local source within the same watershed and/or clean snow plowed-in from surrounding areas or made. If ice is insufficient to support an ice bridge during frozen conditions use clear span bridges. These temporary structures should be installed perpendicular to the watercourse, where site conditions allow, and should be designed to meet provincial requirements related to flood frequency levels unless recommended otherwise by a river engineer. 33. Follow the site-specific typical watercourse crossing construction plan drawing for the vehicle crossing to ensure any meanders and unstable banks are protected (*i.e.*, such as on the site-specific typical watercourse crossing construction plan drawing for the vehicle crossing on the unnamed tributary to the Chinchaga River (Appendix D)).
Beaver Dams	34. In Alberta, in the event that beaver dams or lodges will be disturbed or removed, obtain an AESRD Wildlife Damage Control Licence and contact registered trapper(s) for permission to remove beaver dams where required. Abide by DFO's Alberta OS for Beaver Dam Removal (DFO 2008a). Provide 14 days notification to the DFO office prior to removal of beaver dam(s). Beaver dams to be removed under frozen conditions will require that DFO complete a case-specific review. Follow mitigation measures outlined in the Beaver Dam Removal Plans for Timberwolf and Cranberry sections. These Beaver Dam Removal Plans will be available to the contractor prior to removal. 35. In BC, in the event that beaver dams or lodges will be disturbed or removed, obtain Section 9 approval under the BC *Water Act*; Section 3(1)(a) and Section 2(c)(3) under the BC *Wildlife Act,* prior to commencing activities. NGTL will engage the registered trapper (or a licensed/registered nuisance trapper) and file a notification to BC MFLNRO. Follow the requirements of the Standards and Best Practices for Instream Works (BC Ministry of Water, Land and Air Protection [MWLAP] 2004) and mitigation measures outlined in the Beaver Dam Removal Plans developed for the Kyklo Creek. These Beaver Dam Removal Plans will be available to the contractor prior to removal. 36. Breach the beaver dam slowly to avoid the rapid release of water that could cause fish entrapment and/or erosion of the bed and banks resulting in subsequent siltation of downstream waters.
Watercourse Crossing Plans	37. At least 72 hours prior to the start of crossing work, the contractor will provide NGTL with site-specific detailed watercourse crossing construction plans including isolation structure, pumps (sizes and quantity), discharge locations, bypass location, spoil containment areas, grey water management, trenching equipment and a plan describing the excavation procedure .
Pipeline Installation	38. Before the installation of the water crossing and the commencement of instream activity, the Contractor(s) will ensure that all necessary equipment and materials are available and onsite.

Activity/Concern	Mitigation Measures
Pipeline Installation (cont'd)	39. Pipeline crossings should by constructed/installed as outlined in Tables 2A, 2B and 2C and according to typical drawings (Appendix D)
	40. Develop water quality monitoring plans to monitor for sediment events during instream construction activities as required by the applicable regulatory approvals (*i.e.*, the DFO Letter of Advice). If monitoring reveals sediment values are approaching threshold values, the water quality monitors will alert the Environmental Inspector(s) and work with them to develop corrective actions. If corrective actions are not successful, construction activities will be temporarily suspended until effective solutions are identified.
	41. The Contractor(s) shall weld, coat, and apply weighting to the water crossing portion of pipe prior to starting instream ditching activities. To reduce the duration of instream activity, the Contractor(s) shall make every effort to ditch, lower-in, and backfill water crossings during the same working day.
	42. When implementing a trenched (*i.e.*, open cut or isolated) pipeline installation method, and where practical, salvage the the upper 0.5 m (minimum) of clean granular material, if present. Stockpile separately from the remainder of the trench spoil so that the salvaged, clean, native granular material can be used to cap the upper portion of the trench.
	43. If spoil is likely to be highly saturated, excavate a pit or construct berms of packed earth, or swamp weights, if warranted, to prevent spoil from flowing back into the watercourse. Locate containment berms outside the riparian area (Dwg. STDS-03-ML-05-131).
	44. Ensure no vehicles or equipment, which contain petroleum, oil or lubricants are parked or stationed in a watercourse at anytime except for equipment that is required for that immediate phase of construction.
Open Cut Crossings	45. In Alberta, conduct typical open cut of seasonally dry or frozen to the bottom watercourses in accordance with the Alberta OS for Isolated or Dry Open-cut Stream Crossings (DFO 2008e). This is also described in Appendix D, Dwg. STDS-03-ML-03-101.
	46. In BC, conduct typical open cut of seasonally dry or frozen to the bottom watercourses in accordance with the Pacific Region OS for Dry Open-cut Stream Crossings (DFO 2008j). This is also described in Appendix D, Dwg. STDS-03-ML-03-101.
	47. Store excavation material outside the ordinary high watermark of the watercourse during the open cut.
Isolated Open Cut Crossings	48. Refer to Tables 2A, 2B and 2C, for locations where an isolated crossing method is proposed. Refer to Appendix D, Dwgs. STDS-03-ML-05-111 and STDS-03-ML-05-112.
	49. In Alberta, conduct isolated crossings of watercourses in accordance with the Alberta OS for Isolated or Dry Open-cut Stream Crossings (DFO 2008e), and/or additional conditions and measures provided by DFO resulting from their case-specific review.
	50. In BC, isolated pipeline crossings are not included under the Pacific Region DFO OSs. A Letter of Advice from DFO is required prior to pipeline installation using an isolated method.
	51. Ensure all water intakes are screened in accordance with the *End-of-Pipe Fish Screen Guideline* (DFO 1995) published by DFO. Ensure the Contractor(s) maintains the screens free of debris.
	52. Do not use earthen berms to isolate the crossing construction area.

Activity/Concern	Mitigation Measures
Isolated Open Cut Crossings (cont'd)	53. Ensure maintenance of downstream flow (in terms of quantity and quality) at all times when constructing an isolated crossing. 54. Ensure water from flumes, dam and pumps, diversion or other methods do not cause erosion or introduce sediment into the channel. 55. Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils, sedimentation of watercourse. 56. Ensure pumps, generators and light towers used for isolated watercourse crossings and/or trench dewatering has secondary containment that can hold a capacity of 125% of the fuel tank when stationed, operated or refuelled within 100 m of a watercourse. 57. Ensure pump intakes minimize or avoid disturbance of the streambed and are screened with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s. To accomplish this, where pumps larger than 15 cm diameter are used, place intakes in a mesh cage (2.54 mm) to reduce the approach velocity that fish are exposed to and prevent them form being impinged on the intakes. If a deeper sump is required for success of the isolated crossing refer to Environmental Inspector(s).
Fish Salvage	58. Ensure those conducting fish salvages abide by recommended protocols (*e.g.,* recommended by BC MFLNRO in BC) for disinfecting waders and gear to avoid transporting aquatic invasive species. 59. In Alberta, a Fish Research License (FRL) from AESRD will be required for fish salvage activities. If an FRL is required, it should be applied for at least 10 working days in advance so it is received prior to isolation of the watercourse. 60. In BC, a Scientific Fish Collection Permit from BC MFLNRO will be required for fish salvage activities and should be applied for at least 15 working days in advance so it is received prior to isolation of the watercourse. 61. The Contractor(s) shall notify NGTL 72 hours before construction of any watercourse crossing or diversions to ensure fish salvage operations are conducted, where required. 62. If an isolated method is employed, conduct a fish salvage led by a Qualified Aquatic Environment Specialist (QAES) at the watercourse crossings where fish were captured or previously documented. 63. Ensure fish are salvaged from any temporarily or permanently abandoned reach of channel. 64. Conduct fish salvage in accordance with permit conditions, using appropriate methods and equipment to effectively capture fish with minimal potential for stress and injury to fish. Release captured fish to areas downstream of the crossing that provide suitable rearing habitat. 65. Implement applicable measures from Fish Species of Concern Discovery Contingency Plan (Appendix E) should fish species of concern be discovered during construction.
Hay River Trenchless Crossing	66. Forthe Hay River crossing, follow the DFO OSs for High-pressure Directional Drilling (DFO 2008c,i). 67. Excavate entry and exit sites back from the ordinary high watermark and far enough from the watercourse to provide for containment of sediments and other deleterious substances above the high watermark. Vegetation removal for the entry and exit sites is only to occur within the approved construction right-of-way and temporary workspace.

Activity/Concern	Mitigation Measures
Hay River Trenchless Crossing (cont'd)	68. Ensure that water from dewatering entry and exit sites with a high sediment load is not discharged or allowed to flow into any waterbody. Remove the sediment load (*e.g.*, filtered or discharged into a vegetated area) before discharge water is allowed to enter any watercourse. 69. Develop an emergency response plan that will be implemented in the event of sediment releases or spills of deleterious substances during the construction of the trenchless crossings. 70. Where warranted, develop a monitoring plan with input from a QAES/Qualified Environmental Professional that combines water quality monitoring with other monitoring methods (*e.g.,* frac-walks, monitoring for loss of drilling fluids and/or annular pressure monitoring, total suspended solids and/or turbidity if trenchless methods are used) to help ensure if a drilling loss does occur that it is detected as quickly as possible so that the Emergency Frac-Out Response Plan can also be implemented as quickly as possible. 71. Cease work immediately and refer to the Directional Drilling Procedures and Instream Drilling Mud Release Contingency Plan (Appendix E) in the event that sediment-laden water or other deleterious substances enter a watercourse. 72. The Environmental Inspector(s) will notify the emergency contacts including the appropriate regulatory authorities (*e.g.,* AESRD, BC MOE, Environment Canada and DFO) if sediment-laden water or other deleterious substances enter the watercourse.
Contingency Plans	73. Follow the Construction and Sediment Control Plan developed for the contingency crossing method on the Hay River if implemented. This is included in the DFO Supplemental Filing (TERA 2012), available at the construction office. 74. Postpone watercourse crossing construction if excessive flows or flood conditions exist or are anticipated, and construction methods cannot be modified to cope with the increased flow, follow the Flood and Excessive Flow Contingency Plan (Appendix E).
Backfill Trench	75. Place only clean coarse material (gravel or rock) or native material removed from the trench in the trenched area as the final 0.5 m of backfill. Where there is not sufficient native material or where salvage of the native granular material is not practical to complete backfilling, clean course non-native granular material (gravel or rock) can be used to cap the trench. Any imported material must be obtained from above the average high water level of any watercourse.
Reclamation	76. Upon completion of the crossing, stabilize disturbed areas until such time that permanent reclamation activities are complete. Implement permanent reclamation measures to re-establish riparian vegetation and fish habitat should be implemented immediately following completion of construction at the crossing location (Refer to Appendix D, Dwgs. STDS-03-ML-05-604, STDS-03-ML-05-606 and STDS-03-ML-05-608). 77. The bed and banks of each watercourse should be returned as close as possible to their original preconstruction contours. 78. Follow the site-specific reclamation plans developed for Kyklo Creek, the Hay River contingency crossing and the unnamed tributary to Chinchaga River. These reclamation plans will be available at the construction office of the Project.

Activity/Concern	Mitigation Measures
Reclamation (cont'd)	79. Replace salvaged strippings to revegetate at watercourse crossings where no site-specific riparian reclamation plans have been developed, and where banks are disturbed by construction activities. 80. Ice bridges and snowfills should be mechanically breached to the natural ice level prior to spring break-up. 81. Seed disturbed banks and riparian areas with an approved native seed mixture. The Environmental Inspector(s) will determine onsite whether other restoration methods need to be applied to stabilize banks (e.g., soil wraps, brush layers, willow plantings and matting) in a manner that approximates natural conditions.

8.5 Pipe Activities (Trenching, Stringing, Welding, Coating, Lowering-In)

Objective

The objectives of these mitigation measures are to:

- prevent impacts to watercourses and waterbodies;
- reduce interference with other land uses; and
- prevent harming wildlife.

Stringing and Trenching

Activity/Concern	Mitigation Measures
Wet/Thawed Soils	1. Implement the Wet/Thawed Soils Contingency Plan (Appendix E) as required.
Compaction and Rutting	2. Limit heavy equipment travel to machinery and vehicles equipped with low-ground-pressure tires or wide tracks to reduce compaction and rutting if wet/thawed soil conditions are present. Where rutting of wet/thawed soils occurs, the Wet/Thawed Soils Contingency Plan (Appendix E) may be implemented.
Wildlife Trail Gaps	3. Leave periodic gaps in snow and soil windrows to allow wildlife to cross the right-of-way. Locate gaps at watercourses, obvious drainages and wildlife trails. Locations where wildlife gaps are appropriate will be determined in the field by the Environmental Inspector(s). 4. Ensure the open trench does not impede wildlife movements. Provide a break in the open trench at regular intervals to allow wildlife to cross the trench.
Trenching	5. To facilitate the free movement of wildlife, trenching operations will be followed as closely as possible by lowering-in and backfill operations, unless for construction purposes there is a need to have the trench open for an extended period of time. 6. Windrow surplus snow and any snow over the trench to the closest side of the right-of-way immediately prior to trenching. 7. Reduce trench width during trenching in order to limit spoil storage requirements. 8. The Contractor(s) will monitor the open trench daily for trapped wildlife. Should any wildlife be identified, the Contractor(s) will contact the Environmental Inspector(s) and Construction Manager. The Environmental Inspector(s) will contact AESRD or BC MFLNRO, or a Wildlife Specialist, where required, for direction.
Amount of Open Trench	9. Minimize the amount of open trench at any one time. The amount of open trench permitted at any one time shall be determined by the Environmental Inspector(s) or Construction Manager taking into consideration the stability of the trench, the prevailing weather conditions (*i.e.*, snow fall), safety and environmental concerns.
Spoil Handling	10. Place spoil in a manner that allows the spoil to be replaced separately from the organic material. Ensure spoil material does not spread off right-of-way.
Water Management	11. Monitor water levels in open trenches. 12. Where practical, grade the right-of-way to divert surface water away from the open trench.

Activity/Concern	Mitigation Measures
Water Management (cont'd)	13. If water levels or flow rates in the trench could overwhelm existing trench water control measures (berms, take offs, etc.), allowing sediment laden water to affect wetlands or watercourses (*e.g.,* if heavy rains are forecast), the trench shall be dewatered and backfilled to create a soft plug, or an existing hard plug will be maintained. 14. The location of discharge areas shall be approved by the Environmental Inspector(s). 15. Pumped trench water is not permitted to directly enter any watercourse or wetland. 16. Where the open trench could dewater a wetland or flood other areas, temporary hard or soft plugs will be left at identified locations to prevent the flow of water along the trench. 17. Ensure temporary trench plugs and breakers consist of material with low permeability that will effectively block water flowing along the trench. 18. If the trench requires dewatering, pump water onto stable, well-vegetated areas, tarpaulins, sheeting, rocks, sand bags or into settling ponds, filter bags or other appropriate sediment filtering devices. Ensure dewatering is completed in a manner that does not cause erosion or allow sediment to re-enter a watercourse or wetland. 19. The Contractor(s) will ensure the pump intake is elevated from the bottom of the trench to reduce the pumping of sediment. 20. The Contractor(s) will ensure hoses and pumps are of sufficient length and capacity to transfer trench water to the desired location. 21. The Contractor(s) will ensure hoses are in good working condition, and hoses with tears or ruptures will be repaired or replaced. 22. Pumps, generators, and light towers will have secondary containment to prevent fuel leak contamination, if located within 100 m of a watercourse. 23. Monitor the discharge area and change discharge location if conditions become saturated to the point that adequate natural filtration is no longer possible.

Stringing/Welding/Bending/Coating

Activity/Concern	**Mitigation Measures**
Turn Around Points	24. Based on access restrictions to and from the right-of-way, it may be necessary to develop turn-around points for stringing trucks. These areas will be approved by the Environmental Inspector(s).
Welding Waste	25. Use magnets to collect the bevel shavings on a daily basis. Collect welding refuse as generated by each welding rig and dispose of at an approved waste facility.
Welding Rods and Debris	26. Welding refuse will be collected as generated by each welding rig and disposed of at an approved waste facility.
Coating	27. Where spray or paint-on coatings are applied, use a tarp or alternative devices of sufficient size to block over spray from contacting the ground.

Lowering-in

Activity/Concern	Mitigation Measures
Trench Preparation	28. See Water Management (above) for measures relating to water in the trench.

8.6 Backfill

Objective

The objectives of these mitigation measures are to:

- protect the pipeline and prevent subsidence of the trench;
- ensure excavated materials from the trench are properly replaced;
- properly re-establish subsurface drainage; and
- facilitate cross right-of-way drainage.

Specific Measures

Activity/Concern	Mitigation Measures
Trench Breakers and Subdrains	1. Install trench breakers (*e.g.,* sack, foam or bentonite), and/or subdrains on slopes to control subsurface flow, where warranted. Mark location of each breaker prior to backfilling to facilitate correct placement of diversion berm immediately downslope of the breaker (Dwgs. STDS-03-ML-12-202 and STDS-03-ML-12-203). Similarly, subdrains will be installed to work in concert with surface drainage structures to control the persistent subsurface flow of water (Dwgs. STDS-03-ML-12-211 and STDS-03-ML-12-212). 2. The exact locations of trench breakers and subdrains will be determined in the field in consultation with the Construction Manager or Environmental Inspector(s) and where warranted the appropriate resource specialists. 3. Install stub berms, as required by NGTL, in high groundwater areas to prevent ditch line surface water flows. 4. The exact locations of trench breakers and sub-surface drains will be finalized in the field in consultation with the Construction Manager or the Environmental Inspector(s) and, where warranted, with the appropriate resource specialists. General locations where breakers may be required are identified on the Environmental Alignment Sheets.
Backfill Trench	5. Backfill the trench as soon as practical following lowering-in to minimize hazards to wildlife. 6. Do not mix snow with spoil material during backfill. 7. To reduce the potential for trench line subsidence, roach available spoil over the ditch line to allow for settlement. If necessary, spoil material will be reworked to break-up frozen clumps prior to trench backfill. 8. Ensure that backfill is complete prior to spring break-up.
Drainage Patterns	9. Leave openings in the crown at appropriate locations to allow for temporary and permanent cross right-of-way drainage.

8.7 Pressure Testing

Introduction

Hydrostatic testing uses a considerable amount of water for long sections of pipeline. Water is typically withdrawn from nearby lakes, watercourses, or municipal sources in accordance with applicable permits for withdrawal of water.

Objective

The objectives of these mitigation measures are to:

- ensure contingency pressure testing activities are conducted in accordance with all approval conditions, and permits; and
- reduce effects to watercourses and wetlands.

Specific Measures

Activity/Concern	Contingency Mitigation Measures
Permits and Approvals	1. Conduct hydrostatic testing activities in accordance with the NEB Onshore Pipeline Regulations, provincial regulations, as well as the latest version of CSA Z662 and BC Oil and Gas Waste Regulation Section 7(2)(e). 2. In Alberta, submit notification to AENV under both the *Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines* and the *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines*. If withdrawal amounts exceed 30,000 m^3, obtain a separate water diversion license. 3. In Alberta, if the volume of water to be released is greater than 1,000 m^3, obtain a registration number from AENV for the release of the hydrostatic test water under the *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines.* 4. In BC, obtain *Water Act* Section 8 Approval from the BC MOE Water Stewardship Division for the short-term use of water. 5. NGTL must authorize the Contractor's preferred water withdrawal sources for testing purposes (*i.e.,* must have sufficient quantity and quality of water) as well as the Contractor's test plan, including discharge locations. 6. Abide by applicable provincial or federal approval conditions.
Scheduling	7. Abide by instream RAPs, instream work windows and applicable provincial or federal approved conditions.
Traffic	8. Implement the Traffic Control Management Plan (Appendix F of the EPP) for specific mitigation measures.
Air Quality	9. Minimize unnecessary idling of Project equipment, to the extent practical. 10. Use well-maintained equipment during hydrostatic test activities to minimize emissions. 11. Utilize multi-passenger vehicles for the transport of crews to and from the job sites, to the extent practical, to minimize emissions and potential for wildlife/vehicle collisions.
Noise	12. The contractor will ensure noise abatement equipment (*e.g.,* mufflers) on machinery is in good working order.
Clearing	13. Conduct clearing and disposal activities along the access options as described in Sections 8.2 and 8.4.

Activity/Concern	Contingency Mitigation Measures
Grading	14. Salvage strippings from areas to be graded and windrow to the closest edge of the hydrostatic test access right-of-way.
Vehicle Crossings Along Access Routes	15. Construct, install and remove all watercourse vehicle crossings across waterbodies, shorelines, riverbanks and wetlands: • in a manner that protect the banks from erosion, maintain the flows in the waterway; • following the Alberta *Code of Practice for Watercourse Crossings* (AENV 2000a,b); • following BC *Water Act* and Water Regulations; • following applicable DFO OSs (DFO 2008a,b,c,d,e); and • according to typical drawings (Appendix D of the EPP, Dwgs. STDS-03-ML-05-104, STDS-03-ML-05-101 and STDS-03-ML-0-102). 16. Use only clean ice/snow for construction of an ice/snowfill or ice bridge. Approaches to the bridge should be constructed with compacted snow and ice of sufficient thickness to protect the stream channel and banks. Sand, gravel and soils are not to be used for ice bridge approaches. 17. Ensure that ice bridges or snowfills do not interfere with or impede winter flows.
Access (Kyklo Creek Section)	18. If the eastern access route option is used for hydrostatic testing activities, implement reduction of line-of-sight measures and access control measures along the seismic line.
Withdrawal	19. In BC, do not exceed 10% of the total volume of the lake or in accordance with alternative direction provided under the water license from BC MFLNRO. A copy of the water license will be retained onsite and reviewed by the Environmental Inspector(s) prior to the commencement of withdrawal activities. 20. In Alberta, the withdrawal rate and volume will not exceed 10% of the flow rate of the watercourse or of the volume of the body of water unless otherwise approved by the appropriate authority. Do not disturb the streambed when installing pump intakes. Pumps should be screened with a maximum mesh size of 2.54 mm and should have a maximum screen approach velocity of less than 0.038 m/s where fish habitat is present.
Water Trucks	21. Ensure water hauling trucks for test water, if used, are clean, inspected and tested prior to use.
Sump Excavation	22. Obtain any federal approvals required for instream work and abide by both approval and provincial conditions. Level or hollow out substrate of the water source as necessary for the water pump basket. Employ sediment reduction methods (*e.g.,* sediment mats, sand bag, coffer dam, etc.), if warranted, to protect downstream fish, fish habitat and water users from increased sedimentation or reduced water quality.
Isolate Pumps	23. Ensure pumps, generators and light towers used for water intake have secondary containment that can hold 125% of the fuel tank within 100 m of a waterbody. 24. Ensure any leaks in the fill and discharge lines are controlled to prevent erosion.
Screen Intake	25. Screen water intakes in accordance with the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995), and screens shall be maintained clear of debris.

Activity/Concern	Contingency Mitigation Measures
Dewatering	26. Shunt test water ahead from test section to test section to the extent possible to reduce water hauling, water usage and number of dewatering points. 27. In Alberta, prior to discharge of hydrostatic test water, ensure that the appropriate testing and treatment measures are implemented in accordance with provincial, Schedule 1, Requirements for Release to Land of the Alberta *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines* (Alberta Environmental Protection 1999). 28. In BC, prior to discharge of hydrostatic test water to land, ensure that the appropriate testing and treatment measures are implemented in accordance with Section 7(2)(a) and 7(3) of the BC Oil and Gas Waste Regulation. 29. Discharge hydrostatic test water into the same drainage basin from which it was withdrawn, unless otherwise approved by the appropriate authority. 30. Discharge water into a well-vegetated area. Provide scour protection (*i.e.,* use of rock aprons, plastic sheeting, plywood, etc.) and/or an energy diffuser (*e.g.,* cone with baffles, frog's foot) at the discharge site as directed by NGTL. 31. Preserve water quality including preventing the introduction of foreign material (debris, sediment, etc.) into the receiving waterbody / watercourse. 32. The location of areas which are to receive discharged water shall be approved by NGTL in accordance with applicable regulatory guidelines. 33. In Alberta, monitor the discharge area to ensure compliance with the COP for Hydrostatic Testing Registration under the *Environmental Protection and Enchancement Act*/Notification under the *Water Act* submission.
Temporary Overland Pipeline	34. Remove any temporary overland pipelines if used.
Chemical Recovery	35. If additives (*e.g.,* methanol, glycol, etc.) are used in the test water, applicable regulations will be complied with prior to disposal. The method and location of disposal must be authorized by NGTL in accordance with applicable regulations and regulatory direction. 36. Ensure that if test water contains chemical additives, the test water is sampled and treated, and discharged in accordance with applicable provincial requirements.

9.0 CLEAN-UP AND RECLAMATION

Introduction

Clean-up and reclamation are important steps in returning construction sites to a condition similar to preconstruction. For winter construction, clean-up is a two-phase process, with machine clean-up being completed following construction and final clean-up occurring the following winter.

Objective

The objectives of these mitigation measures are to:

- effectively use reclamation techniques that prevent surface material loss due to water erosion;
- establish a vegetative cover compatible with surrounding vegetation and land uses;
- comply with approval conditions, including all permits;
- re-establish the right-of-way or Project site in a stable condition acceptable for operational requirements; and
- maintain equivalent land capability, ensuring the ability of the land to support various land uses similar to the uses that existed before construction, but not necessarily identical.

Specific Measures

Activity/Concern	Mitigation Measures
Scheduling	1. Complete machine clean-up following construction, prior to spring break-up, if possible. Final clean-up will occur during the following winter. 2. Employ an "early in/ early out" approach by initiating activities as early as possible in the winter and working expeditiously to limit late winter activities. 3. NGTL will consult and inform AESRD of its construction schedule if activity continues after mid-March.
Staking	4. Remove flagging from the Project area and dispose of it at an approved facility following the completion of final clean-up.
Corduroy	5. Remove clay cap, if used, overlying corduroy and return to preconstruction location unless otherwise requested by the applicable government agency. 6. Dispose of corduroy, slash and any remaining leaning trees or incorporate into rollback, where required.
Swamp Mats/Matting	7. Remove swamp mats and matting from all locations on the right-of-way.
Grade Replacement	8. Replace grade material to preconstruction contours, unless otherwise authorized by an assistant construction manager or designate. 9. Re-establish surface drainage patterns; install drainage and erosion control measures such as berms, silt fence, and cross ditches, and complete bank stabilization measures, as required at all watercourse crossings.
Diversion Berms and Cross Ditches	10. Install cross ditches and berms on moderate to steep slopes in order to prevent runoff along the right-of-way and subsequent erosion. Exact locations of berms will be determined in the field. General locations where berms will be installed are shown on the Environmental Alignment Sheets. Install berms immediately downslope of all breakers on moderate to steep slopes (Dwg. STDS-03-ML-12-221).
Strippings Replacement	11. Replace strippings evenly over all portions of the right-of-way that have been stripped.

Activity/Concern	Mitigation Measures
Strippings Replacement (cont'd)	12. Postpone replacement of strippings during wet conditions to prevent erosion and/or compaction and rutting.
Access Removal	13. Remove temporary vehicle crossing structures in accordance with regulatory approvals. Remove or breach snow or ice bridge to ensure they do not impede flow. Ensure that removal of access does not disturb the bed or banks of the crossing. 14. Remove bar ditch ramps and reclaim temporary access to stable conditions.
Erosion Control	15. Install permanent erosion control measures, where required, in accordance with Dwgs. STDS-03-ML-05-604, STDS-03-ML-05-606 and STDS-03-ML-05-608 in Appendix D, unless otherwise approved by NGTL to adjust for site conditions and suitability. 16. Remove unnecessary sediment fence or other temporary measures not required, as specified by NGTL. 17. Install cross ditches and berms on moderate to steep slopes in order to prevent runoff along the right-of-way and subsequent erosion. NGTL will determine the exact locations of berms and erosion control measures in the field. Install berms immediately downslope of all trench breakers (Dwg. STDS-03-ML-12-221).
Water Crossings	18. Recontour the right-of-way and stabilize approach slopes at watercourse crossings. 19. Seed riparian areas with an approved cover crop and seed mix as soon as feasible after construction. 20. Armour streambanks, where warranted, to provide adequate erosion control.
Natural Recovery	21. Natural recovery will be the preferred method of reclamation on level terrain (*e.g.,* peatland and non-peatland) where erosion is not expected. 22. Use cover crops where required, to prevent erosion of disturbed areas prior to clean-up and reclamation.
Seeding	23. Seed riparian and erosion prone areas with an AESRD or BC MFLNRO approved native seed mix and cover crop. Seeding will follow as close as possible to machine and final clean-up and surface material replacement pending seasonal or weather conditions. 24. NGTL will review and acquire the Certificate of Analysis of each seed mix species for seed germination, weeds and other crop seeds of concern to determine the selection of reclamation seed mix species to be used (*i.e.*, native species) and ensure that no species considered to be noxious under the BC *Weed Control Act* and Alberta *Weed Designation Regulation* are included in the reclamation seed mix. 25. Seeding will follow as close as possible to final clean-up and surface material replacement pending seasonal or weather conditions. 26. The primary method of seed application in forested lands is broadcast seeding with an application rate of 15 kg/ha, unless otherwise specified by NGTL. 27. Restrict vehicle access over newly seeded areas.
Rollback	28. Install rollback as specified by NGTL and approved by the AESRD or BC MFLNRO. Leave gaps in rollback at obvious wildlife trails (Refer to Appendix D, Dwg. STDS-03-ML-05-313).

Activity/Concern	Mitigation Measures
Rollback (cont'd)	29. Rollback slash and timber at locations indicated to prevent access along the right-of-way. Spread evenly over right-of-way. Do not walk over rollback (Refer to Appendix D, Dwg. STDS-03-ML-05-312).
Burn Piles	30. Confirm burn piles are properly extinguished. Conduct infrared scanning of burn pile locations to locate any hot spots.
Weed Control	31. PCM and treatment of weed infestation on the right-of-way and facility sites as needed.
Caribou Protection	32. Implement measures to control access and line-of-sight (*e.g.*, rollback, revegetation) as determined by NGTL in consultation with AESRD or BC MLFNRO. 33. Schedule final clean-up and reclamation activities outside the period of mid-March to late July unless otherwise approved by AESRD or BC MFLNRO

10.0 POST-CONSTRUCTION MONITORING

Objective

The objectives of post-construction monitoring are to:

- assess the success of mitigation measures implemented during construction;
- document opportunities for procedural learnings and improvement;
- reviewing the success of re-establishing equivalent land capability; and
- compare the predicted effects (including cumulative effects) and mitigation measures with actual documented effects.

Activity/Concern	Mitigation Measures
PCM Assessment	1. Monitor areas of potential terrain instability for five years following construction PCM will commence following the first full growing season after construction cleanup (*i.e.*, mid-summer to early fall of 2014) and continue every following summer until outstanding environmental issues have been resolved. 2. Inspect slope stability on a routine basis during operations. Undertake remedial work, where warranted, to protect pipeline integrity. 3. Inspect right-of-way during operations with regular aerial patrols after heavy snow melt or heavy, persistent rainfall to identify areas of erosion. Undertake remedial work, where warranted, to protect pipeline integrity in a timely manner.
Remediation	4. Implement remedial actions as soon as practical during the most appropriate season, preferably summer, but may be outside this timing window due to environmental timing restrictions (reproductive periods, migration periods), field and weather conditions or social and public concerns. A final assessment would then be scheduled for the fall or as deemed appropriate to ensure the remedial actions are stable and successful. 5. Identify areas that are susceptible to erosion or difficult to revegetate and maintain records of remedial measures implemented and the success of these measures. Ensure this information is available to construction contractors and supervisors prior to and during operation and maintenance activities to allow implementation of adaptive mitigation strategies to reduce effects on soil and soil productivity.
Information Sharing	6. NGTL will record locations of concerns identified during construction related to weeds, vegetation establishment, general right-of-way conditions, water crossing stability and reclamation success. This issues list will be used to measure success of mitigation measures used during construction of the Project and to ensure outstanding issues are investigated, resolved and reported during the operation of the Project.
Reporting	7. Reporting of PCM observations, progress and recommendations for the following year to the NEB will be before January 31 after each of the first, third and fifth complete growing seasons following final clean-up of the Project.

10.1 Post-Construction Monitoring Program

The Post-Construction Monitoring Program (PCMP) will include an assessment of reclamation, revegetation, erosion control and any weed problem areas along the construction rights-of-way. Methods for monitoring the status of environmental effects of the Project will be based on the principle that success of land reclamation is measured against adjacent representative site conditions while taking into consideration the status of reclamation at the time of the assessment.

Re-vegetation monitoring involves an assessment of the re-establishment of vegetation and success of revegetation, as well as the identification of any weed infestations along the construction rights-of-way. Erosion monitoring involves an assessment of the effect of wind and water along the construction rights-of-way, as well as the assessment of effectiveness of any erosion control measures implemented during construction. The PCMP will also take into consideration recommendations made and any unresolved issues identified in the initial post-construction report.

NGTL will provide PCMP reports during for the first, third and fifth complete growing seasons following construction and the implementation of post-construction reclamation measures. By initiating the program in year one, issues identified and remedial actions taken during the first year following construction can be assessed and any residual outstanding issues can be managed during the subsequent years. The PCMP will commence after the first full growing season following the completion of construction final clean-up (*i.e.*, mid to late summer 2014). Preliminary work will entail a review of relevant planning, construction and environmental reports and any other documentation of potential issues encountered during construction to create an Environmental Issues List. The Environmental Issues List will form the basis for monitoring issues identified during the construction and reclamation phases of the Project.

The criteria used to determine the effectiveness of the proposed mitigation measures will consist of an assessment of the topographic condition of the pipeline rights-of-way, to ensure that the surface drainage, profile and stability of the reclaimed rights-of-way are similar to preconstruction patterns, directions and capacity of the surrounding landscape. Experience from previous PCMPs has demonstrated that most environmental issues are resolved within two full seasons after construction. Any outstanding right-of-way issues arising after the first two years of construction will have been identified through NGTL's continuous monitoring of all aspects of right-of-way integrity and addressed, if warranted.

If warranted, detailed assessments will be conducted at sites where reclamation problems have been identified during the previous years of monitoring to design site-specific mitigation. It is anticipated that the inspection sites will be more frequent in complex landscapes and less frequent in homogeneous landscapes. Follow-up monitoring at specific sites will be completed and further mitigative action will be taken, if warranted.

NGTL is committed to avoiding or reducing environmental effects and ensuring reclamation objectives have been achieved through the mitigation measures and post-construction monitoring outlined in this plan. The results of reclamation and the monitoring program will indicate that a high standard of environmental protection was achieved throughout the construction program. Environmental issues will be immediately resolved when feasible.

Any outstanding issues identified in the Environmental Issues List will continue to be monitored and the necessary actions taken until all issues are resolved. The entire length of the rights-of-way will be inspected during the five full growing seasons and will primarily assess the outstanding issues of weeds and erosion along the rights-of-way.

10.1.1 Landscape Monitoring

Preliminary work would be followed by an aerial and/or reconnaissance during the first year after construction to note any areas where erosion, slope/bank instability, disruption of natural drainage or excessive trench subsidence is evident. A ground reconnaissance would be completed to inspect any locations where problems were noted during the aerial reconnaissance. During ground reconnaissance, NGTL will inspect the conditions of the rights-of-way to assess the effects of pipeline construction and the effectiveness of mitigation, reclamation and revegetation measures. The riparian area, banks and approach slopes at all watercourse crossings will be observed for stability, erosion, vegetation establishment and presence of invasive species. The rights-of-way will also be monitored to determine if

there are any significant adverse effects to disturbance of natural drainage patterns. The trench and areas of potential terrain instability will be monitored during regular aerial pipeline patrol during spring break-up after construction and for at least two years following construction. Mitigative measures will be implemented as soon as feasible after an issue is identified during the aerial pipeline patrol and the Environmental Issues List will be used to monitor the success of mitigation measures taken to address the issues identified.

10.1.2 Vegetation Monitoring

The pipeline rights-of-way will be visually inspected by personnel with experience completing PCM during the first growing season following construction and the implementation of post-construction reclamation measures for vegetation issues, such as weed infestations or poor vegetation establishment. The timing of vegetation monitoring will be in the late summer/early fall when vegetation is mature enough for accurate identification and evaluation. Particular attention will be given to areas of terrain instability that may be prone to erosion. If warranted, detailed vegetation assessments will be completed at sites where reclamation problems are identified. The above process will be continued during the second growing season after construction.

The second year of monitoring will focus on ensuring vegetation on the reclaimed rights-of-way is comparable to that of conditions off right-of-way. The rights-of-way will be visually inspected for vegetation issues such as weed infestations and poor vegetation establishment. Where the natural regeneration of vegetation along the rights-of-way is the preferred option for revegetation, the establishment of a vegetative cover compatible with the surrounding vegetation and land use will be evaluated.

10.1.3 Wetland Post-Construction Monitoring

NGTL has a PCMP in place to document the return of wetland function following temporary disturbance and, if warranted, provide recommendations for additional remedial measures to assist in the return of full functionality to wetland habitat. This plan provides a general description of the data collection requirements (both baseline and PCM) in order to gather sufficient information to identify alterations to and recovery of wetland function and for measuring the effectiveness of NGTL's wetland management.

The general PCM study design is to revisit disturbed wetlands in the years following construction in order to document the progress of functionality returning to the wetland system. Wetland function conditions documented during baseline (*i.e.*, preconstruction) assessments and wetland function conditions that are observed either adjacent to or in close proximity to the right-of-way, will be directly compared to wetland function conditions observed along the reclaimed (*i.e.*, post-construction) right-of-way. The results of this comparison will be used to measure the effectiveness and efficiency of mitigation and remedial measures and provide support to the determination of loss or "no net loss" of wetland function.

Based on the findings during the PCM, additional recommendations for remedial measures will be provided, if warranted, to promote the successful return of wetland function within the lifetime of the PCMP. The duration of the PCMP will be for five years following construction. Wetland assessments will be completed once per year and will ideally take place at or near the height of the growing season during the first and second complete growing seasons following construction and the implementation of post-construction reclamation measures. If a wetland is determined not to have full functionality before the completion of the five year PCMP, NGTL will continue to monitor those specific wetlands once per year up to year five and if at the end of five years of monitoring the wetland has still not reached full functionality, NGTL will consult with Environment Canada regarding the appropriate next steps.

Wetlands will be generally and specifically assessed along the rights-of-way. Generally, where alterations to the site are documented, they will be supported with remedial measure recommendations (*e.g.*, ponding is observed on work side and spoil side of right-of-way indicating that an elevated trench crown exists; recommend that breaks in the trench crown be created to ensure proper throughflow of surface waters). Specifically, random plots will be documented both on and off right-of-way and at various zones within the right-of-way (*i.e.*, work, trench, spoil sides) in order provide enough detail to the data to successfully see changes over the life of the PCMP.

During a PCM assessment, the following information will be collected.

General Site Information

- Wetlands will be geo-referenced using GPS (UTM), identified by KP, legal location and a site sketch will be prepared.
- Wetlands will be photo documented and any alterations (existing or newly occurring) either on or adjacent to the site will be noted.

Substrate Function

- Comments regarding the re-establishment of the preconstruction profile, presence of ponding or standing waters, erosion rills or channelized flows, sediment movement, slumping, rutting, compaction and the presence/absence of a trench crown.
- Substrate composition regarding level of humification, moisture levels, mottling, gleying and peat depth are recorded and results for both on and off right-of-way are compared.

Hydrological Function

- Comments will be made regarding the primary source of water, water signs (*i.e.,* signs of a higher moisture regime that can be observed when surface water is not present), water depth and inlets/outlets.

Water Quality Function

- Observations made regarding water quality parameters (*i.e.*, pH, temperature, conductivity), nutrient removal, retention, transformation and water quality protection capabilities will be documented.

Vegetation Function

- Random samples documenting vegetation densities will be recorded for 1 m x 1 m plots located off right-of-way and on right-of-way at various zones (*i.e.*, work side, trench line, spoil side).
- Dominant vegetation will be recorded (*e.g.*, tree, shrub, herbaceous, emergent, moss and/or weed species).

Habitat Function

- Habitat features will be identified (*e.g.*, snags present, browsing evident, sufficient cover and access to open water) and any wildlife or wildlife sign observations will be documented.

Overall Wetland Function

- Direct indicators of function and loss of function specific to the wetland will be documented for both on and off right-of-way.
- Observed function on the specific sampling date will be classified as having proper functional conditions, being functional-at-risk, or non-functional.

Issues and Recommendations

- A summary of wetland issues related to the pipeline construction and recommendations for best remedial measures will be provided.

10.1.4 Remediation

In the event that a location is identified where the mitigative measures were unsuccessful in avoiding or reducing impacts (*e.g.*, excessive weed growth, poor vegetation growth), remedial measure(s) chosen will be influenced by the severity of the issue, aerial extent and location of the effect. Based on the likely causes that may have resulted or contributed to the ineffective mitigation, a determination will be made whether to continue monitoring rather than implement remedial measures (*e.g.*, at locations where poor revegetation is evident but droughty conditions have occurred) or to implement remedial measures to

potentially contaminated soils. Additional expertise will be sought to assess other issues that may arise, if necessary. The appropriate specialists will recommend and oversee the implementation of any remedial measures and conduct follow-up site inspections.

At locations where issues are obvious, such as excessive settlement of the trench crown or water erosion on a slope, the extent of the problem area will be delineated and the problem area will be scheduled for repair. Soil and/or vegetation sampling will be conducted at locations where poor revegetation is evident in order to determine the cause (*e.g.,* upper surface material/subsoil mixing, weeds and/or compaction) and magnitude of the problem and assist in the identification of appropriate remedial measures or continue to monitor rather than implement remedial measures.

Where appropriate, mitigative or contingency measures found in this EPP will be used to remediate a site. In the unlikely event that issues arise that are not addressed in the EPP or existing available regulatory guidelines/standards, then remedial measures will be discussed with the appropriate regulatory agencies. All consultation with regulatory authorities will be detailed in the PCMP reports. NGTL and/or its consultants will initiate a post-construction dialogue with government agency representatives for Crown land (*e.g.*, BC MFLNRO, AESRD) along the three proposed pipeline loops after construction clean-up to discuss reclamation progress to date, and address and/or resolve any issues. NGTL has an on-going Public Awareness Program with stakeholders.

10.1.5 PCMP Reporting

PCMP reports will be provided following for the first, third, and fifth year of monitoring on or before January 31, following final clean-up of the Project. The PCMP reports must describe the methodology used for monitoring and the criteria established of evaluating the success of the results found. The PCMP reports will document all environmental issues identified during the inspections; including locations and any follow-up assessments, monitoring, and mitigation plans required to resolve the issue. Issues that have been successfully mitigated will be listed as resolved. The effectiveness of mitigation measures applied against the criteria for success will be assessed.

Following Year 5, NGTL will continue to monitor the rights-of-way as needed during operations to ensure any issues related to weeds, trench subsidence, water retention, slope or bank erosion and/or water erosion of soil are identified and mitigative measures implemented on timely basis. Routine monitoring by NGTL personnel will be continuous for the life of the pipeline loops.

11.0 REFERENCES

11.1 Literature Cited

Alberta Conservation Information Management System. 2011. ACIMS Data File Download - Non-Sensitive Element Occurrences and Sensitive Element Occurrences. July 2011. Website: http://tpr.alberta.ca/parks/heritageinfocentre/datarequests/dataDownloads.aspx. Accessed: July 2011.

Alberta Environment. 1999a. *Code of Practice for the Temporary Diversion of Water for Hydrostatic Testing of Pipelines.* 15pp. Website: http://www.qp.alberta.ca/documents/codes/DIVERSE.PDF.

Alberta Environment. 1999b. *Code of Practice for the Release of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Gas Pipelines*. 15pp. Website: http://www.qp.alberta.ca/documents/codes/RELEASE.PDF.

Alberta Environment. 2000a. *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*. Includes Amendments to February 2007. 26 pp. Website: http://www.qp.alberta.ca/documents/codes/PIPELINE.pdf.

Alberta Environment. 2000b. *Code of Practice for Watercourse Crossings*. Includes Amendments to February 2007. 26 pp. Website: http://www.qp.alberta.ca/documents/codes/CROSSING.pdf

Alberta Environment. 2006. Peace River Management Area. *Water Act* Code of Practice Management Area Maps.

Alberta Environmental Protection. 1999. *Code of Practice for the Release of Hydrostatic Test Water From Hydrostatic Testing of Petroleum Liquid and Gas Pipelines*. 13 pp. Website: http://www.qp.alberta.ca/documents/codes/RELEASE.PDF.

Alberta Sustainable Resource Development and Alberta Conservation Association. 2010. Status of the Woodland Caribou (*Rangifer tarandus caribou*) in Alberta: Update 2010. Alberta Sustainable Resource Development. Wildlife Status Report No. 30. Edmonton, Alberta. 88 pp.

Alberta Sustainable Resource Development. 2007. Smoky Area Land Management Referral Map. 1:250,000 map.

Alberta Sustainable Resource Development. 2010. Fisheries and Wildlife Management Information System Records. Received from AESRD Peace River Office (D. Moyles).

Boreal Caribou Committee. 2001. Strategic Plan and Industrial Guidelines for Boreal Caribou Ranges in Northern Alberta. 35pgs.

Breault, A., B. Harrison and S. Shisko. 2007. Breeding Distribution and Abundance of Trumpeter Swans (*Cygnus buccinator*) in British Columbia, Summer 2005. Technical Report Series No. 475. Canadian Wildlife Service, Pacific and Yukon Region. 34pp.

British Columbia Conservation Data Centre. 2009. Conservation Data Centre Mapping Service. Victoria, British Columbia, Canada. Website: http://www.env.gov.bc.ca/atrisk/ims.htm Accessed: July 2009.

British Columbia Conservation Data Centre. 2010. Conservation Data Centre Mapping Service. Victoria, British Columbia, Canada. Website: http://www.env.gov.bc.ca/atrisk/ims.htm. Accessed: December 2010.

British Columbia Conservation Data Centre. 2011. BC Species and Ecosystems Explorer. Ministries of Sustainable Resource Management and Water, Land and Air Protection. Website: http://a100.gov.bc.ca/pub/eswp/. Accessed: February 2011.

British Columbia Ministry of Environment. 2006. Water Quality: British Columbia Approved Water Quality Guidelines 2006 Edition. Environmental Protection Division, Science and Information Branch. Original Produced 1998.

British Columbia Ministry of Environment. 2008. Caribou Distribution in British Columbia by Ecotype. Map. December 2008.

British Columbia Ministry of Environment. 2010. Terms and Conditions for changes in and about a stream specified by Ministry of Environment Habitat Officers, Peace Sub-Region. Version 1.2. Website: http://www.env.gov.bc.ca/wsd/regions/nor/wateract/terms_conditions_per.pdf. Accessed: April 2011.

British Columbia Ministry of Environment. 2011a. Ungulate Winter Ranges. Website: http://www.env.gov.bc.ca/wld/frpa/uwr/approved_uwr.html. Accessed: March 2011.

British Columbia Ministry of Environment. 2011b. Wildlife Habitat Areas. Website: http://www.env.gov.bc.ca/cgi-bin/apps/faw/wharesult.cgi?search=slap_region&wlap=Peace. Accessed: March 2011.

British Columbia Ministry of Forests and Range. 2010. Emergency Bark Beetle Management Area and Strategic Planning Maps. Website: http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/maps/ebbma/. Accessed: September 2010.

British Columbia Ministry of Forests. 1995. Riparian Management Area Guidebook. Forest Practices Branch, British Columbia Ministry of Forests, Victoria, Website: http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/riparian/Rip-toc.htm.

British Columbia Ministry of Natural Resource Operations. 2011. Integrated Land Management Bureau iMapBC Internet Mapping Application. Website: http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc. Accessed: January 2011.

British Columbia Ministry of Water, Land and Air Protection. 2004.Standards and Best Practices for Instream Works. 2004. Ministry of Water, Land and Air Protection. Website: www.env.gov.bc.ca/wld/documents/bmp/iswstdsbpsmarch2004.pdf. Accessed: September 2009.

British Columbia Oil and Gas Commission. 2011. Environmental Protection and Management Guidebook. July 2011. Version 1.2. 92 pp.

Canadian Association for Petroleum Producers. 2005. Pipeline Associated Watercourse Crossings. 2005. (3rd edition). Website: http://www.capp.ca/getdoc.aspx?DocId=96717&DT=NTV

Canadian Council of Ministers of the Environment. 1999. Canadian soil quality guidelines for the protection of environmental and human health: In: Canadian environmental quality guidelines, 1999. Website: http://www.ccme.ca/publications/ceqg_rcqe.html. Accessed: November 2010.

Canadian Council of Ministers of the Environment. 2007. Canadian Water Quality Guidelines for the Protection of Aquatic Life: Summary Table. Update 7.1 December 2007. In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Ducks Unlimited and Canadian Wildlife Service. 2005. Trumpeter Swan Inventory. Science and Community Environmental Fund. Digital Data obtained from the BC Oil and Gas Commission October 2009.

Fisheries and Oceans Canada. 1995. Freshwater Intake End-of-Pipe Fish Screen Guidelines. 28pp. Website: http://www.dfo-mpo.gc.ca/library/223669.pdf.

Fisheries and Oceans Canada. 2008a. Fisheries and Oceans Canada Alberta Operational Statement for Beaver Dam Removal (Version 3.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008b. Fisheries and Oceans Canada Alberta Operational Statement for Clear-Span Bridges (Version 3.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008c. Fisheries and Oceans Canada Alberta Operational Statement for High-Pressure Directional Drilling (Version 3.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008d. Fisheries and Oceans Canada Alberta Operational Statement for Ice Bridges and Snow Fills (Version 3.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008e. Fisheries and Oceans Canada Alberta Operational Statement for Isolated or Dry Open-Cut Crossings (Version 1.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008f. Fisheries and Oceans Canada Alberta Operational Statement for Punch and Bore Crossings (Version 3.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008g. Fisheries and Oceans Canada Alberta Operational Statement for Temporary Stream Crossings (Version 3.0). Published by Fisheries and Oceans Central and Arctic Region Alberta Head Office. Calgary, Alberta.

Fisheries and Oceans Canada. 2008h. Fisheries and Oceans Canada Pacific Region Operational Statement for Clear Span Bridges (Version 3.0). Published by Fisheries and Oceans Pacific Region Head Office. Vancouver, British Columbia.

Fisheries and Oceans Canada. 2008i. Fisheries and Oceans Canada Pacific Region Operational Statement for Directional Drilling (Version 3.0). Published by Fisheries and Oceans Pacific Region Head Office. Vancouver, British Columbia.

Fisheries and Oceans Canada. 2008j. Fisheries and Oceans Canada Pacific Region Operational Statement for Dry Open-Cut Stream Crossings (Version 1.0). Published by Fisheries and Oceans Pacific Region Head Office. Vancouver, British Columbia.

Fisheries and Oceans Canada. 2008k. Fisheries and Oceans Canada Pacific Region Operational Statement for Ice Bridges and Snow Fills (Version 3.0). Published by Fisheries and Oceans Pacific Region Head Office. Vancouver, British Columbia.

Fisheries and Oceans Canada. 2008l. Fisheries and Oceans Canada Pacific Region Operational Statement for Punch and Bore Crossings (Version 3.0). Published by Fisheries and Oceans Pacific Region Head Office. Vancouver, British Columbia.

Fisheries and Wildlife Management Information System. 2011. Fish and Wildlife Service, Alberta Sustainable Resource Development. Area-specific search request and website: http://xnet.env.gov.ab.ca/imf/imf.jsp?site=fw_mis_pub. Accessed: January 2011.

Government of Alberta. 2010a. Wildlife Sensitivity Maps. Digital Spatial Data Layers. Alberta Sustainable Resource Development. Website: http://www.srd.alberta.ca/MapsFormsPublications/Maps/WildlifeSensitivityMaps/Default.aspx.

Government of Alberta. 2010b. Upstream Oil and Gas Approval Standards for the Enhanced Approval Process. 36 pp.

Government of Alberta. 2010c. Upstream Oil and Gas Operating Conditions for the Enhanced Approval Process. 17 pp.

Government of Alberta. 2010d. Upstream Oil and Gas Best Management Guidelines for the Enhanced Approval Process. 15 pp.

Government of Alberta. 2010e. Enhanced Approval Process Manual. 103 pp.

Government of Alberta. 2011. Upstream Oil and Gas Approval Standards for the Enhanced Approval Process. 36 pp.

Harper, W.L., J.P. Elliott, I. Hatter, and H. Schwantje. 2000. Management Plan for Wood Bison in British Columbia. B.C. Minist. Environ., Lands and Parks, Victoria, BC. 43 pp.

Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. Special Report Series 6, February 1991. Research Branch and Forest Sciences Section. BC Ministry of Forests. Victoria, BC. Website: http://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/Srs06.htm. Accessed: April 2011.

Mitchell, J.A., and C.C. Gates. 2002. Status of the Wood Bison (Bison bison athabascae) in Alberta. Alberta Sustainable Resource Development, Fish and Wildlife Division, and Alberta Conservation Association, Wildlife Status Report. No. 38. Edmonton, Alberta. 32 pp.

Natural Regions Committee. 2006. Natural Regions and Subregions of Alberta. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852.

Pettapiece, W.W. 1986. Physiographic subdivisions of Alberta. Agriculture Canada. 1:1,500,000 map.

TERA Environmental Consultants. 2011. Environmental and Socio-economic Assessment for the NOVA Gas Transmission Ltd. Northwest Mainline Expansion. April 2011. Prepared for NOVA Gas Transmission Ltd.

TERA Environmental Consultants. 2012. Construction and Sediment Control Plan for the Hay River Partial Isolation Contingency Crossing along the NOVA Gas Transmission Ltd. Northwest Mainline Expansion (Timberwolf Section). March 2012. Prepared for NOVA Gas Transmission Ltd.

Valentine, K.W.G., P.N. Sprout, T.E. Baker and L.M. Lavkulich. 1978. The Soil Landscapes of British Columbia. 197 pp.

11.2 GIS Data and Mapping

Alberta Tourism, Parks and Recreation - Parks Division. 2011. Protected Areas (digital file). Edmonton, Alberta. Available: hhttp://albertaparks.ca/albertaparksca/library/downloadable-data-sets.aspx. Acquired: November 2011. Last Update Check: May 2012.

AltaLIS. 2012. Alberta Municipal Boundaries (digital file). Calgary, Alberta. Available: http://www.altalis.com. Acquired: May 2012. Last Update Check: May 2012.

BC Forests, Lands and Natural Resource Operations. 2007. Tantalis Regional Districts (digital file). Victoria, BC. Available:https://apps.gov.bc.ca/pub/dwds/home.so. Acquired: March 2011. Last Update Check: May 2012.

BC Forests, Lands and Natural Resource Operations. 2008. Tantalis Parks, Ecological Reserves and Protected Areas (digital file). Victoria, BC. Available:https://apps.gov.bc.ca/pub/dwds/home.so. Acquired: November 2011. Last Update Check: February 2012.

IHS Inc. 2004. IHS Hydro Line Data (digital file). Calgary, Alberta. Available: http://energy.ihs.com/Solutions/Regions/Canada/. Acquired: June 2011. Last Update Check: October 2011.

IHS Inc. 2012. IHS Road Segments (digital file). Calgary, Alberta. Available: http://energy.ihs.com/Solutions/Regions/Canada/. Acquired: April 2012. Update Interval: Monthly.

Midwest Surveys Inc. 2011. Pipeline Routing (digital files). Calgary, Alberta. Acquired: September 2011.

Natural Resources Canada. 2011. CanVec - Transportation - 1020009 Railway (digital file). Sherbrooke, QC. Available: http://geogratis.cgdi.gc.ca/geogratis/en/download/topographic.html. Acquired: November 2011. Last Update Check: November 2011.

APPENDIX A

EMERGENCY CONTACTS

Contact	Location	Phone Number
	ALBERTA	
RCMP	Manning	911 or (780) 836-3007
RCMP	Rainbow Lake	911 or (780) 321-3753
Ambulance	Manning	911
Hospital	Manning	911 or (780) 836-3391
Medical Clinic	Rainbow Lake	(780) 956-3646
Alberta Disaster Services		(780) 427-2772
Alberta Energy Resources Conservation Board - Field Centre	High Level	(780) 926-5399
Alberta Environment and Sustainable Resource Development, Compliance Branch		(780) 422-4505
Alberta Environment and Sustainable Resource Development Emergency / Complaint Hotline (24 hours)		1-800-222-6514 (24 hr) or 7378 (Telus mobile)
Area “T” Oil Spill Co-operative - Wayne Maclennan	Grande Prairie	(780) 532-4331
Area “A” Oil Spill Co-operative - James Barnhill	Rainbow Lake	(780) 956-8052
Forest Fire		310-3473
STARS Emergency Link Centre		1-888-888-4567 or *4567 (cell phone) or 1-403-299-0932
Environment Canada - Paul Gregoire (Canadian Wildlife Service)	Edmonton	(780) 951-8696
DFO Major Projects Environmental Assesment and Review, Team Lead – Stephanie Jerred	Edmonton	(780) 495-8469
DFO Fisheries Biologist - Robyn Kutz	Peace River	(780) 618-3230
Provincial Wildlife Technician -Dave Moyles	Peace River	(780) 624-6465
Provincial Forest Officer - Norm Van Vliet	Rainbow Lake	(780) 956-3751
Provincial Forest Officer - Don Williams	Manning	(780) 780 836-7309
Alberta One-Call		1-800-242-3447
TransCanada Emergency		1-888-982-7222

Contact	Location	Phone Number
BRITISH COLUMBIA		
RCMP	Fort Nelson	(250) 774-2777
Ambulance	Fort Nelson	(250) 774-2344
Hospital	Fort Nelson	(250) 774-8100
Health Unit	Fort Nelson	(250) 774-7092
Fire	Fort Nelson	(250) 774-2222
BC Provincial Emergency Program (PEP)		1-800-663-3456
Area "C" Oil Spill Co-operative - Jamie Wilson	Fort Nelson	1-888-698-5565
DFO Fisheries Biologist - Jayson Kurtz	Prince George	(250) 561-5905
BC MFLNRO Contact (Conservation Officer) - Jeffrey Scott	Fort Nelson	(250) 774-7703
BC MOE Contact (Provincial Senior Wildlife Specialist) - Kerry Harvey	Fort St. John	(250) 787-3427
BC Forest Fire Reporting Centre		1-800-663-5555 (or *5555)
Provincial Senior Land Officer - Lane Libert	Fort St. John	(250) 787-3423
BC One-Call		1-800-474-6886

Contact	Location	Phone Number
FEDERAL		
National Energy Board	Calgary	1-800-899-1265
Transport Safety Board Emergency / Incident Line	Calgary	1-819-997-7887

APPENDIX B

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Barry Newton (AC
Land Use Planner Land Use Planning Section)
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Wayne Maclennan (In the Event of a Spill)
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James Barnhill (In the Event of a Spill)
Oil Spill Cooperative
Fish and Wildlife Division
Area “A” Regional Custodian
Rainbow Lake, Alberta
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Email: james.carnhill@huskyenergy.com
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Fax: (780) 956-8088
Cellular: (780) 956-1814

Alberta Environmental Hotline (In the Event of a Spill)
Phone: 1-800-222-6514

British Columbia

Jason Smith (Forestry Representative)
Fort Nelson Field Team Woodlands Advisor
British Columbia Ministry of Forests, Lands and Natural Resource Operations
Fort Nelson District
RR1, Mile 301, Alaska Highway
Fort Nelson, British Columbia V0C 1R0
Phone: (250) 774-5527
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Micah Knellar (Conservation Officer)
Conservation Officer
British Columbia Ministry of Environment
Environmental Stewardship Division
4604 Sunset Drive
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Alicia Goddard (Fish Representative)
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Kerry Harvey (Fish and Wildlife Representative)
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British Columbia Ministry of Environment
Ecosystems Section
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Lane Libert Senior Land Officer Regional Client Services Division British Columbia Ministry of Forests, Lands and Natural Resource Operations 370, 10003 - 110th Avenue Fort St. John, British Columbia V1J 6M7 Phone: (250) 787-3423 Fax: (250) 787-3219 Email: Lane.Libert@gov.bc.ca	(Integrated Land Management Bureau Representative)
Dr. Steven Acheson Heritage Resource Specialist British Columbia Ministry of Forests, Lands and Natural Resource Operations Archaeology Branch PO Box 9816, Stn. Prov. Govt. Victoria, British Columbia V8W 9W3 Phone: (250) 953-3306 Email: Steve.Acheson@gov.bc.ca	(In Case of Discovery of Archaeological, Palaeontological or Historical Site)
Katrina Stipec Information Co-ordinator British Columbia Ministry of Environment Conservation Data Centre Thompson Regional Office P.O. Box 9358, Stn Prov Govt Victoria, British Columbia V8W 9M2 Phone: (250) 356-0928 Fax: (250) 387-2733 Email: Katrina.Stipec@gov.bc.ca	(In Case of Discovery of Plant or Wildlife Species of concern)
Jamie Wilson Oil Spill Cooperative Area “C” Regional Custodian Clean Harbors Phone: (888) 689-5565 Fax: (250) 785-4571	(In the Event of a Spill)
Ken Ferns Oil Spill Cooperative Area "C" Chairman Provident Energy Limited Telephone: (250) 787-1252 Cellular: (250) 262-1711 Email: kferns@providentenergy.com	(In the Event of a Spill)
BC Provincial Emergency Program (PEP) Phone: 1-800-663-3456	(In the Event of a Spill)

ABORIGINAL COMMUNITIES

Community	Contact	Pipeline Section			NGTL Responsible Party
		Kyklo Creek Section	Timberwolf Section	Cranberry Section	
Beaver First Nation	Randy Hellwig Consultants Manager PO Box 2700 High Level, Alberta T0H 1Z0 Phone: (780) 927-3544 Fax: (780) 927-4064 beavermanager@gmail.com		X	X	Donna Semantha
Dene Tha' First Nation	Matt Munson Lands Department P.O. Box 120 Chateh, Alberta T0H 0S0 Phone: (780) 321-3774 matt.munson@denetha.ca	X	X	X	Donna Semantha
Doig River First Nation	Jane Calvert Lands Department Box 56 Rose Prairie, BC V0C 2H0 Phone: (250)827-3776 jcalvert@doigriverfn.com		X	X	Donna Semantha
Duncan's First Nation	Tom Green Lands Department P.O. Box, 148 Brownvale, Alberta T0H 0L0 Phone: (780) 597-3777 Fax: (780) 618-1274 lands-dfn@hotmail.com			X	Donna Semantha
Fort Nelson First Nation	Lana Lowe Lands Director Mile 295, Alaska Hwy Fort Nelson, BC V0C 1R0 Phone: (250) 774-7257 lana.lowe@fnnation.ca	X			Donna Semantha
Fort Nelson Métis Society	Sylvia Wiebe Acting President Box 1020 Fort Nelson BC V0C 1R0 Phone: (250) 774-3813	X			Donna Semantha
Fort Vermilion Métis Local 74	Sylvia Johnson President, MNA Region 6 9621 - 90th Avenue Peace River, Alberta T8S 1G8 Phone: (780) 624-4219 sjohnson@metis.org		X	X	Donna Semantha
Métis Nation of Alberta – Region 6	Sylvia Johnson President – MNA – Region 6 9621 - 90th Avenue Peace River, Alberta T8S 1G8 Phone: (780) 624-4219 sjohnson@metis.org		X	X	Donna Semantha
Paddle Prairie Métis Settlement	Joanne Ducharme Council Box 58 Paddle Prairie, Alberta T0H 2W0 Phone: (780) 981-2227 joanne@paddleprairie.com		X	X	Donna Semantha

Community	Contact	Pipeline Section			NGTL Responsible Party
		Kyklo Creek Section	Timberwolf Section	Cranberry Section	
Prophet River First Nation	Chief Lynette Tsakoza PO BOX 3250 Fort Nelson BC V0C 1R0 Phone: (250) 773-6555; ltsakoza76@hotmail.com	X			Donna Semantha
McLeod Lake Indian Band	Alec Chingee Lands Department General Delivery Mcleod Lake, BC V0J 2G0 Phone: (250) 788-2227 lignitecreek@hotmail.com		X	X	Donna Semantha
Métis Nation British Columbia	Colleen Hodgson Director industry Engagement 30691 Simpson Road, Abbotsford, BC V2T 6C7 Toll free: 1-800-940-1150 Phone: (604) 557-5851 Fax: (604) 557-2024 chodgson@mnbc.ca	X			Donna Semantha

TRAPPERS

Contact	Pipeline Section			NGTL Responsible Party
	Kyklo Creek Section	Timberwolf Section	Cranberry Section	
Adolphus Capot-Blanc Headsman Box 1799 Fort Nelson, BC VOC 1R0 Phone: (250) 774-7119	X			Kerry Auger
John Capot-Blanc Headsman Box 2381 Fort Nelson, BC VOC 1R0 Phone: (250) 774-3246	X			Kerry Auger
Knute Terry Loe Headsman Box 71, RR1 Alaska Hwy Fort Nelson, BC V0C 1R0 Phone: (250) 774-2191	X			Kerry Auger
Harvey Denechoan Sr. PO Box 84 Assumption, Alberta T0H 0S0 Phone: DTFN Administration at (780) 321-3775		X		Ken Jones
Mark Mcouat PO Box 1898 High Level, Alberta T0H 1Z0 Phone: DTFN Administration at (780) 321-3775		X		Ken Jones
Derwin Bellerose PO Box 5 Paddle Prairie, Alberta T0H 2W0 Phone: DTFN Administration at (780) 321-3775		X		Ken Jones
Tharen Soroka PO Box 164 Manning, Alberta T0H 2M0 Phone: (780) 836-2331			X	Ken Jones

Contact	Pipeline Section			NGTL Responsible Party
	Kyklo Creek Section	Timberwolf Section	Cranberry Section	
Keith Hutchison PO Box 716 Manning, Alberta T0H 2M0 Phone: (780) 836-5800 (Home) Phone: (780) 836-3498 (Work)			X	Ken Jones

GUIDE / OUTFITTERS

Contact	Pipeline Section			NGTL Responsible Party
	Kyklo Creek Section	Timberwolf Section	Cranberry Section	
Robert Freelend Chinchaga River Hunts Box 6696 Peace River, Alberta T8S 1S5 Phone: (780) 618-2179 Phone: (780) 618-2446 Fax: (780) 624-4248 rbf@chinchaga.ab.ca			X	Ken Jones
Bernd Licht Elk Island Outfitter 54149 Rge Rd 205 Ft Saskatchewan, Alberta T8L 3Z2 Phone: (780) 998-4976 Fax: (780) 998-4967 berndl@telus.net			X	Ken Jones
Ralph Cowie Peace Country Outfitting BOX 507 Manning, Alberta TOH 2MO Phone: (780) 836-3239 brcowie@telus.net			X	Ken Jones
Edith Nagy Edith Nagy/Pat Deuling Outfitting Box 281 Didsbury, Alberta T0M OWO Phone: (403) 335-4220 Fax: (403) 335-8857 huntedi@hunt-rockies.com		X		Ken Jones
Richard Deslauriers Alberta Bush Adventures Box 495 McLennan, Alberta T0H 2L0 Phone: (780) 324-2174 Fax: (780) 324-2276 altaba@telusplanet.net		X		Ken Jones
Roger Osmond Box 7322 Peace River, Alberta T8S 1S8 Phone: (780) 618-9111 Fax: (780) 624-0093 sunandthemoon@hotmail.com		X		Ken Jones

APPENDIX C

APPROVALS/PERMITS POTENTIALLY REQUIRED FOR PIPELINE DEVELOPMENT

FEDERAL Approval / Permit	**Issuing Agency[1]**
Certificate of Public Convenience and Necessity / Leave to Construct / Leave to Open	NEB
Water Crossings	
- Navigable Waters Approval (vehicle crossings of all navigable watercourses or pipeline crossings of large watercourses only)	TC
- Letter of advice or Authorization under Section 35(2) and/or Section 32 under the *Fisheries Act*.	DFO
- DFO Operational Statement Notifications	DFO
ALBERTA Permit/License	**Issuing Agency[1]**
Surface Rights - Pipeline Agreement (PLA) - Pipeline Agreement (PIL)	LFD
Water Crossings - Notification under the *Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body*	WM
- Notification under the *Code of Practice for Watercourse Crossings*	WM
- Notification or Registration under the Codes of Practice for withdrawal of water for hydrostatic testing and release of water following hydrostatic testing	RS, WM
- Fish Collection Permit for salvage of fish at isolated crossings	F&W
Historical Resources Act Clearance	AC
Road Crossing Permit	AT/MD/FMA
Burning Permit	LFD/CTY
Wildlife Damage Permit (beaver and beaver dam removal)	F&W
Master Land Withdrawal and Consent Agreement	FMA Holder
British Columbia Permit/License	**Issuing Agency[1]**
Surface Rights Licence of Occupation Crown Land Tenure - Investigative Use Permit	MFLNRO
Water Crossings - *Water Act* Approval	MFLNRO
- Fish Collection Permit for salvage of fish at isolated crossings	MFLNRO
Heritage Conservation Act Clearance	MFLNRO
Road Crossing Permits – BC	MOTI/MFLNRO/Others
Burning Permits – BC	MFLNRO
Wildlife Damage Permit (beaver and beaver dam removal) – BC	MFLNRO/DFO
Herbicide Permit	MFLNRO
Authorization to Discharge or Store Waste under the *Environmental Management Act*	MFLNRO
Registration under BC's Municipal Sewage Regulation	MFLNRO
Registration for Oil and Gas Production Facilities and Equipment	MOE
Permit for Water Use for hydrostatic testing and release of water to land following hydrostatic testing	MFLNRO
License to Cut	MFLNRO

For more information, see *Environmental Operating Practices for the Upstream Petroleum Industry Alberta Operations - Pipelines Volume* (1999) and *British Columbia* Operations - *Pipelines Volume* (2001) by CAPP.

NEB	=	National Energy Board
AC	=	Alberta Culture
AT	=	Alberta Transportation
DFO	=	Fisheries and Oceans Canada
F&W	=	Fish and Wildlife, Alberta Environment and Sustainable Resource Development
FMA Holder	=	Forest Management Area Holder (*i.e.,* Weyerhaeuser, Ainsworth)
LFD	=	Public Lands and Forests Division, Alberta Environment and Sustainable Resource Development
MD	=	Municipal District
RS	=	Regional Services, Alberta Environment and Sustainable Resource Development
TC	=	Transport Canada
WM	=	Water Management, Regional Services, Alberta Environment and Sustainable Resource Development
MFLNRO	=	BC Ministry of Forests, Lands and Natural Resource Operations
MOE	=	BC Ministry of the Environment
MOTI	=	BC Ministry of Transportation and Infrastructure