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Pointed Mountain Pipeline Abandonment Project

Environmental and Socio-economic Assessment

Final

January 2022

Westcoast Energy Inc.

Environmental and Socio-economic Assessment

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Executive Summary

Westcoast Energy Inc. (Westcoast) is planning to apply under Section 241 of the *Canadian Energy Regulator Act* for the Pointed Mountain Pipeline Abandonment Project (the Project). The Pointed Mountain Pipeline is a Nominal Pipe Size 20 natural gas pipeline situated in the southwest corner of the Northwest Territories (NWT), southeast corner of the Yukon Territory (the Yukon), and northeast corner of British Columbia (BC) and is regulated by the Canada Energy Regulator (CER).

The pipeline is deactivated and has no prospective future use. As such, Westcoast is planning to take the pipeline permanently out of service by moving on to the abandonment phase. Specifically, Westcoast is proposing to abandon approximately 54.4 kilometres (km) of the Pointed Mountain Pipeline in-place.

The carbon steel pipeline has previously been purged, cleaned of residual product, internally coated with corrosion inhibitor, and physically isolated from sources of upstream pressure. The pipeline has been filled with nitrogen gas to a minimum pressure of 70 kilopascals and currently has active cathodic protection systems to prevent corrosion. One section of pipe crossing the Kotaneelee River was decommissioned (removed) in 2016.

Westcoast's approach for abandoning the buried pipeline is abandonment in-place, which is expected to avoid undue environmental disturbance. Abandoning the buried pipeline in-place is less disruptive to the environment when compared to excavation and removal of the pipe. Physical abandonment activities (e.g., cutting, capping) will be confined to the existing right-of-way and areas where aboveground infrastructure is located.

No new permanent access roads are required for the Project. Access during physical abandonment activities will be via existing roads (e.g., high-grade petroleum development roads, resource, and winter roads), barge or ice bridge (across the Liard River), helicopter, and the existing Pointed Mountain Pipeline right-of-way. Access methods will vary depending upon the abandonment location. Vegetation brushing will be required on the existing pipeline right-of-way to facilitate an approximately 10 metre wide access route for a length of 18 km along the Pointed Mountain Pipeline.

Subject to receipt of regulatory approval, physical abandonment activities are planned to commence in November 2022 for PM-6, PM-7, PM-8, PM-9, and PM-10 (winter) and be completed by April 2023. Summer physical abandonment activities at PM-1, PM-2, PM-3, and PM-4 are planned to commence in June 2023 and be completed by July 2023.

This Environmental and Socio-economic Assessment (ESA) considers the factors listed in Guides A and B of the CER *Filing Manual* and pertinent issues and concerns identified through engagement with potentially affected landowners, stakeholders, Indigenous groups, and appropriate regulatory authorities.

Westcoast has been carrying out consultation and engagement activities with municipalities, regulatory authorities, public stakeholders, and Indigenous groups to provide information and to understand concerns or issues that may arise regarding the Project. Indigenous and stakeholder engagement does not conclude with the filing of the CER Project Application. Engagement, and the refinement of environmental and socio-economic mitigation, will continue as the Project progresses.

The potential environmental and socio-economic effects of the Project were identified through the results of Project-specific desktop studies and field surveys, applicable regulatory requirements and industry guidance, Indigenous group engagement, regulatory and government consultation with NWT, the Yukon, and BC, and professional experience of the assessment team informed by previous pipeline projects with similar conditions or potential issues.

This ESA concludes that physical abandonment activities and abandonment in-place is not expected to result in significant environmental or socio-economic effects. The environmental concerns identified are consistent with expected and known potential effects arising from the Project and can be mitigated by standard environmental protection and monitoring measures.

The socio-economic concerns identified are consistent with expected and known potential effects arising from the Project. Westcoast's engagement activities will continue post-application filing, with a focus on addressing issues that remain and informing all potentially affected parties as construction planning commences.

Following the completion of physical abandonment activities, reclamation and long-term monitoring will occur along the disturbed portions of the pipeline.

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Acronyms and Abbreviations

°C	degree(s) Celsius
μg/m^3	microgram(s) per cubic metre
AAC	allowable annual cut
AAQO	Ambient Air Quality Objective
ABA	Area-Based Analysis
AIA	Archaeological Impact Assessment
AOA	Archaeological Overview Assessment
BC	British Columbia
BCR	Bird Conservation Region
BC CDC	British Columbia Conservation Data Centre
BC EAO	British Columbia Environmental Assessment Office
BC ENV	British Columbia Ministry of Environment and Climate Change Strategy
BC MFLNRORD	British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development
BC *OGAA*	British Columbia *Oil and Gas Activities Act*
BC OGC	British Columbia Oil and Gas Commission
BGC	biogeoclimatic
BMP	Best Management Practice
BTEX	benzene, toluene, ethylbenzene, xylenes
BWBSmk	Boreal White and Black Spruce Moist Cool
CAAQS	Canadian Ambient Air Quality Standards
CAC	Criteria Air Contaminant
CCME	Canadian Council of Ministers of the Environment
CEA	Cumulative Effects Assessment
CEA Act, 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
CER	Canada Energy Regulator
CER Act	*Canadian Energy Regulator Act*
CER *OPR*	Canadian Energy Regulator *Onshore Pipeline Regulations*
CH_4	methane
cm	centimetre(s)
CM	Construction Manager
CNWA	*Canadian Navigable Waters Act*
CO	carbon monoxide
CO_2	carbon dioxide

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CO_2e	carbon dioxide equivalent
COP	Code of Practice
COSEWIC	Committee on the Status of Endangered Wildlife Species in Canada
CR	Conformity Requirement
CSA	Canadian Standards Association
CWCS	Canadian Wetlands Classification System
dBA	A-weighted decibels
DFO	Fisheries and Oceans Canada
ECCC	Environment and Climate Change Canada
ECD	erosion and sediment control device
EI	Environmental Inspector
EMR	Ministry of Energy, Mines and Resources (Yukon)
Enbridge	Enbridge Inc.
ENR	Environment and Natural Resources (NWT)
EPMG	Environmental Protection and Management Guideline
EPMR	*Environmental Protection and Management Regulation*
EPP	Environmental Protection Plan
ESA	Environmental and Socio-economic Assessment
ESIS	Environmental Site Information Sheet
EUB	Energy and Utilities Board
F	Fraction(s)
FISS	Fisheries Information Summary System
FMA	Forest Management Agreement
FMU	Forest Management Unit
FPWC	Federal Policy on Wetland Conservation
FRPA	*Forest and Range Protection Act*
GBA+	Gender-Based Analysis Plus
GHG	greenhouse gas
ha	hectare(s)
HADD	harmful alteration, disruption, or destruction
HEPH	heavy extractable petroleum hydrocarbon
HCA	*Heritage Conservation Act* (BC)
Hg	mercury
HORU	Human Occupancy and Resource Use
IAA	*Impact Assessment Act, 2019*
IAAC	Impact Assessment Agency of Canada
IK	Indigenous Knowledge

INDC	Intended Nationally Determined Contribution
km	kilometre(s)
km^2	square kilometre(s)
KP	Kilometre Post
kt CO2e/year	kilotonne(s) of carbon dioxide equivalent per year
kt/y	kilotonne(s) per year
L	litre(s)
LEPH	light extractable petroleum hydrocarbon
LRMP	Land and Resource Management Plan
LSA	Local Study Area
m	metre(s)
m^3	cubic metre(s)
masl	metre(s) above sea level
MBCA	*Migratory Birds Convention Act*
MLA	Member of Legislative Assembly
mm	millimetre(s)
MOU	Memorandum of Understanding
MVLWB	Mackenzie Valley Land and Water Board
N/A	not applicable
NO_2	nitrogen dioxide
NEB	National Energy Board
NPS	Nominal Pipe Size
NRM	NorthRiver Midstream
NRRM	Northern Rockies Regional Municipality
NWT	Northwest Territories
NWT CDC	Northwest Territories Conservation Data Centre
NWT *HRA*	Northwest Territories *Historical Resources Act*
NWT SARC	Northwest Territories Species at Risk Committee
OBSCR	*Open Burning Smoke Control Regulation* (BC)
OD	outside diameter
OGMA	Old Growth Management Area
PAH	polycyclic aromatic hydrocarbon
Paramount	Paramount Resources Ltd.
PCB	polychlorinated biphenyl
PCM	post-construction monitoring
PEL	Project Environment Lead
Phase I Assessment	Phase I Environmental Site Assessment

Phase II Assessment	Phase II Environmental Site Assessment
PHC	petroleum hydrocarbon
$PM_{2.5}$	particulate matter less than 2.5 micrometres
POM	Planning and Operational Measure
ppb	part(s) per billion
PWNHC	Prince of Wales Northern Heritage Centre
RAAD	Remote Access to Archaeological Data
RAP	Restricted Activity Period
RMA	Riparian Management Area
RMZ	Riparian Management Zone
RSA	Regional Study Area
RRZ	Riparian Reserve Zone
SARA	*Species at Risk Act*
SACC	Strategic Assessment of Climate Change
the Project	Pointed Mountain Pipeline Abandonment Project
THP	Timber Harvest Plan
TLP	Test Lead Post
TLRU	Traditional Land and Resource Use
TLU	Traditional Land Use
TSA	Timber Salvage Area
UTM	Universal Transverse Mercator
UWR	Ungulate Winter Range
WC	watercourse
Westcoast	Westcoast Energy Inc.
WHA	Wildlife Habitat Area
WMMP	Wildlife Management and Monitoring Plan
WSA	*Water Sustainability Act*
YAAQS	Yukon Ambient Air Quality Standards
YESAB	Yukon Environmental and Socio-Economic Assessment Board
YESAA	*Yukon Environmental and Socio-economic Assessment Act*
YISC	Yukon Invasive Species Council
YTC	Yukon Tourism and Culture
Yukon CDC	Yukon Conservation Data Centre
Yukon *HRA*	Yukon *Historical Resources Act*
Yukon	Yukon Territory
ZOI	zone of influence

1. Introduction

1.1 Overview

Westcoast Energy Inc. (Westcoast) is planning to apply under Section 241 of the *Canadian Energy Regulator Act* (*CER Act*) for the Pointed Mountain Pipeline Abandonment Project (the Project). The Nominal Pipe Size (NPS) 20 natural gas pipeline is situated in the southwest corner of the Northwest Territories (NWT), southeast corner of the Yukon Territory (the Yukon), and northeast corner of British Columbia (BC) and is regulated by the Canada Energy Regulator (CER).

The pipeline is deactivated and has no prospective future use. As such, Westcoast is planning to take the Pointed Mountain Pipeline permanently out of service by moving on to the abandonment phase. Specifically, Westcoast is proposing to abandon approximately 54.4 kilometres (km) of the Pointed Mountain Pipeline in-place.

The Pointed Mountain Pipeline is located in southwest NWT, southeast Yukon, and northeast BC (Figure 1.1-1). The carbon steel pipeline has been deactivated, which includes being purged, cleaned of residual product, internally coated with corrosion inhibitor, and physically isolated from sources of upstream pressure. The pipeline has been filled with nitrogen gas to a minimum pressure of 70 kilopascals. A short 1,200 metre (m) segment of the pipeline crossing the Kotaneelee River has been removed as part of a previous decommissioning project.

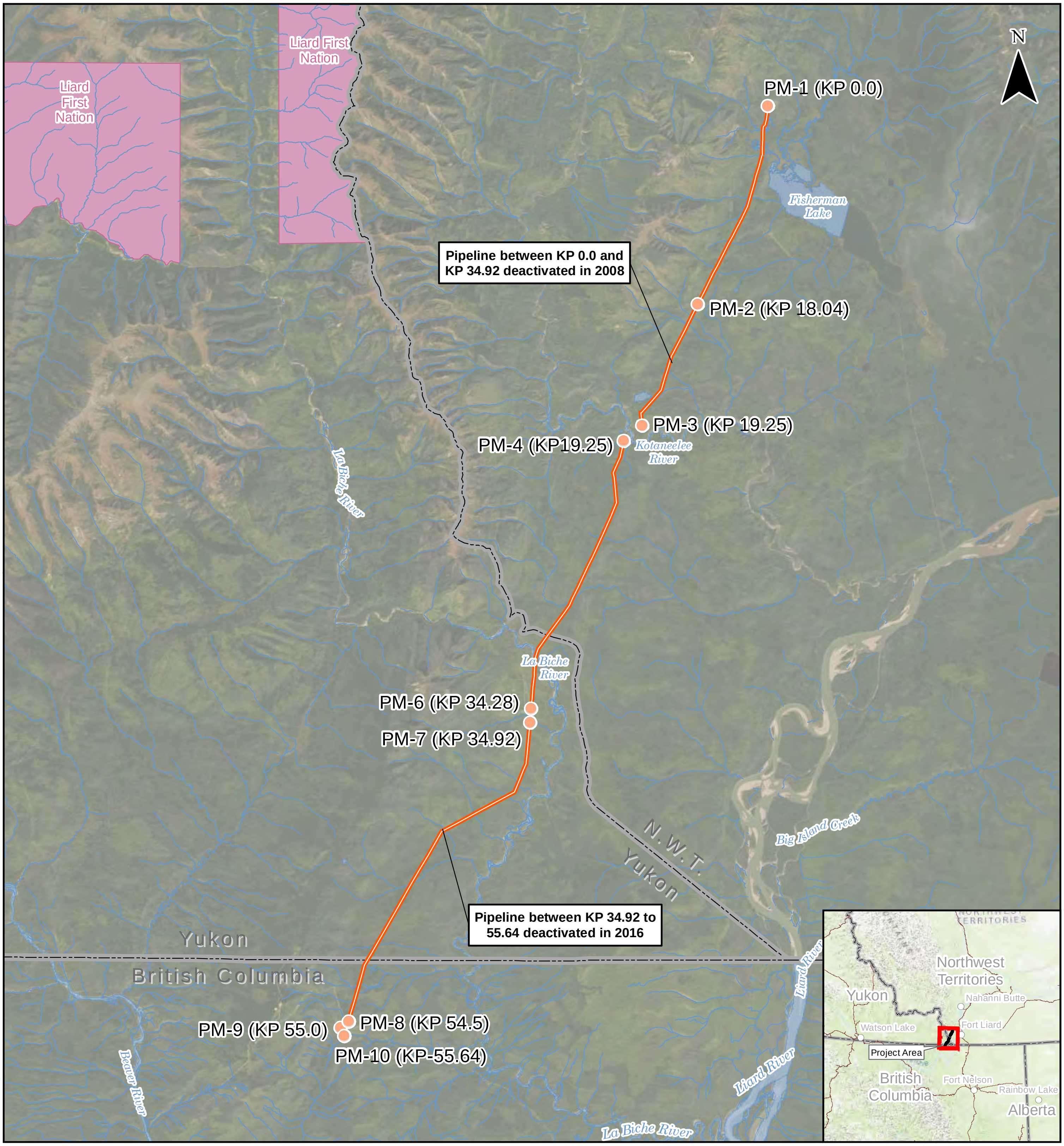
The Project will include:

- abandonment in-place of approximately 54.4 km of pipeline;
- removal of aboveground facilities associated with the Pointed Mountain Pipeline; and
- disconnecting cathodic protection facilities.

The buried pipeline will be abandoned in-place. Physical abandonment activities (e.g., cutting, capping) will be confined to the existing right-of-way and areas where aboveground infrastructure is located. Existing infrastructure (e.g., roads and pipeline right-of-way) will be used for access to the extent practical. No new permanent access or new construction camps are planned for the Project.

Subject to receipt of regulatory approval, physical abandonment activities are planned to commence in November 2022 for PM-6, PM-7, PM-8, PM-9, and PM-10 (winter) and be completed by April 2023. Summer physical abandonment activities at PM-1, PM-2, PM-3, and PM-4 are planned to commence in June 2023 and be completed by July 2023.

Westcoast commissioned Jacobs Consultancy Canada Inc. (Jacobs) to prepare this Environmental and Socio-economic Assessment (ESA) to identify potential effects, predict the residual effects, and evaluate their significance associated with the Project. This ESA has been prepared in accordance with Guides A and B of the *Filing Manual* (CER 2021a), and the level of detail contained is appropriate for the nature and magnitude of anticipated environmental and socio-economic effects.



Site Location
Pointed Mountain Pipeline Route
Provincial Boundary
Watercourse
Water Body
First Nations (Interim Protected Lands)

FIGURE 1.1-1

PROJECT OVERVIEW
PHASE I ENVIRONMENTAL SITE ASSESSMENT

WESTCOAST ENERGY INC.
POINTED MOUNTAIN PIPELINE ABANDONMENT PROJECT

ENBRIDGE

NAD 1983 UTM Zone 10N
Satellite Imagery: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; Roads: NRCan 2014-2015; Railway: NRCan 2012.

SCALE: 1:275,000
0 2.5 5
Kilometres
(All Locations Approximate)

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

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1.2 Scope of the Project

The scope of the Project includes the activities and components required to carry out the Project and allow it to proceed (CER 2021a), including the rationale for abandonment (subsection 2.5), a complete description of the facilities being abandoned (subsection 2.4), physical activities required to abandon the Pointed Mountain Pipeline (subsection 2.5), method of abandonment (subsection 2.5), and a plan outlining how facilities will be monitored, if necessary, during the post-abandonment phase (Section 19).

1.3 Scope of the Assessment

Scoping is the process of identifying the physical works and activities to include in the ESA, and the biophysical and socio-economic elements with the potential to be affected by the Project. Proper scoping reduces the risk of including unimportant or irrelevant information in the assessment or of excluding factors that should be assessed (CER 2021a).

The scope of the assessment includes the following:

- a summary of the Project's technical- and abandonment-related requirements;
- a description of the existing environmental and socio-economic conditions;
- the identification of the potential predicted effects of the Project within the defined spatial and temporal boundaries;
- the methods and rationale used for the identification and analysis of effects;
- the proposed mitigation strategies, including avoidance and enhancement measures, and inspection and monitoring approaches; and
- characterization and determination of the significance of predicted residual Project effects (i.e., any effects remaining after the implementation of Project mitigation and enhancement measures), and applicable cumulative effects.

The ESA considers the factors listed in the *Filing Manual* (CER 2021a), and pertinent issues and concerns identified through engagement with potentially affected landowners, stakeholders, Indigenous groups, and appropriate regulatory authorities.

The scope of the assessment was applied to the activities required for physical abandonment of the Pointed Mountain Pipeline within the spatial and temporal boundaries defined for the Project (subsection 4.5). Field and desktop studies and review of information received through consultation and engagement (Section 3 of this ESA, Consultation and Engagement) informed the identification and assessment of potential effects.

Guide B – Abandonment Funding and Applications to Abandon of the CER *Filing Manual* notes that an ESA is required for applications for abandonment, and that Guide A.2 filing requirements are to be included in addition to those outlined in Guide B. An ESA checklist identifying where information requested in Guides A and B of the *Filing Manual* (CER 2021a) is provided in Table 1.3-1.

Table 1.3-1. Canada Energy Regulator *Filing Manual* Checklist for Guide A – A.2 and Guide B – B.2 Environmental and Socio-economic Assessment

***Filing Manual* Number**	**Filing Requirement**	**ESA Reference**
A.2.5 Description of the Environmental and Socio-economic Setting		
A.2.5.1	Identify and describe the current biophysical and socio-economic setting of each element (i.e., baseline information) in the area where the project is to be carried out. Include a map at an appropriate scale.	Sections 5 to 15 Appendix C
A.2.5.2	Describe which biophysical or socio-economic elements in the study area are of ecological, economic, or human importance, and require more detailed analysis, taking into account the results of engagement (refer to Table A-1 of the *Filing Manual* for examples). Where circumstances require more detailed information in an ESA, refer to: ▪ Table A-2 – Filing Requirements for Biophysical Elements ▪ Table A-3 – Filing Requirements for Socio-economic Elements	Sections 5 to 15
A.2.5.3	Provide supporting evidence (e.g., references to scientific literature, field studies, local and Indigenous Knowledge (IK), previous environmental assessment, and monitoring reports) for: ▪ information and data collected; ▪ analysis completed; ▪ conclusions reached; and ▪ the extent of professional experience or experience relied upon in meeting these information requirements, and the rationale for that extent of reliance.	Sections 5 to 14
A.2.5.4	Describe and substantiate the methods used for any surveys (e.g., those pertaining to wildlife, fisheries, plants, species at risk, or species of special status, soils, Heritage Resources, or Traditional Land Use [TLU]) and for establishing the baseline setting for the atmospheric and acoustic environment.	Sections 5, 6, 8, 9, 10, 11, 12, and 13
A.2.5.5	Applicants will consult with other expert federal, provincial, or territorial departments, and other relevant authorities on requirements for baseline information and methods.	Section 3
B.2.2	ESA	Sections 5 to 17
B.2.2-1	Describe the environmental and socio-economic setting found at the project location. Include whether or not the project is on Federal lands.	Sections 5 to14
B.2.2-2	Using Table B-1 of the Guide: ▪ Categorize the pipeline right-of-way by land use type ▪ For each land use segment of the pipeline provide a high-level assessment of the potential short-term and long-term environmental effects on each valued environmental and socio-economic component that may result from the pipeline being abandoned in-place and/or removed regardless of the preferred abandonment method.	Subsection 2.2 Appendix A
B.2.2-3	For the preferred abandonment method complete an interactions table or provide an environmental and socio-economic assessment	Section 5 to 19

Table 1.3-1. Canada Energy Regulator *Filing Manual* Checklist for Guide A – A.2 and Guide B – B.2 Environmental and Socio-economic Assessment

Filing Manual **Number**	**Filing Requirement**	**ESA Reference**
B.2.2-4	Provide a Phase I Environmental Site Assessment conducted for the pipeline right-of-way and associated facilities as per the guidance in the most recent version of the CSA Standard Z768.	Appendix D
B.2.2-5	If warranted provide a copy of a Phase II plan that describes the procedures to be implemented for investigating all existing and/or potential contamination identified in the Phase I assessment, including sampling methodology.	Appendix K of Appendix D
B.2.2.6	Provide an Environmental Protection Plan (EPP).	Appendix B
B.22-7	Describe the desired goal(s) for reclamation, including restoration (where applicable), for the entire length and width of the pipeline right-of-way and facility sites (not just limited to the disturbance sites), and provide a plan for how the environment will be reclaimed to achieve the desired goal(s).	Section 19
B.2.2-8	Provide a preliminary Reclamation Monitoring Plan which describes the reclamation/restoration parameters to be monitored, the criteria that will be used to monitor the success of those parameters, and the monitoring methods that will be used. Describe the criteria for when adaptive or corrective actions will be implemented and provide a schedule of when monitoring will be conducted, and the results reported to the CER.	Section 19
A.2.6 Effects Assessment		
Identification and Analysis of Effects		
A.2.6.1.1	Describe the methods used to predict the effects of the project on the biophysical and socio-economic elements, and the effects of the environment on the project.	Section 4
A.2.6.1.2	Predict the effects associated with the project, including those that could be caused by construction, operations, decommissioning, or abandonment, as well as accidents and malfunctions. Also include effects that the environment could have on the project. For those biophysical and socio-economic elements or their valued components that require further analysis (refer to Table A-1 of the *Filing Manual*), provide the detailed information outlined in Tables A-2 and A-3.	Section 5 to 17
Mitigation Measures for Effects		
A.2.6.2.1	Describe the standard and project-specific mitigation measures and their adequacy for addressing the project effects, or clearly reference specific sections of company manuals that provide mitigation measures. Ensure that referenced manuals are current and filed with the CER.	Sections 5 to 17 Appendix B
A.2.6.2.2	Ensure that commitments about mitigation measures will be communicated to field staff for implementation through an Environmental Protection Plan (EPP).	Appendix B
A.2.6.2.3	Describe plans and measures to address potential effects of accidents and malfunctions during construction and operations of the project.	Section 16 Appendix B

Table 1.3-1. Canada Energy Regulator *Filing Manual* Checklist for Guide A – A.2 and Guide B – B.2 Environmental and Socio-economic Assessment

Filing Manual **Number**	**Filing Requirement**	**ESA Reference**
Evaluation of Significance		
A.2.6.3.1	After taking into account any appropriate mitigation measures, identify any remaining residual effects from the project.	Sections 5 to 17
A.2.6.3.2	Describe the methods and criteria used to determine the significance of adverse effects, including defining the point at which any particular effect on a valued component is considered "significant".	Section 4 Sections 5 to 17
A.2.6.3.3	Evaluate the significance of residual adverse environmental and socio-economic effects against the defined criteria.	Sections 5 to 17
A.2.6.3.4	Evaluate the likelihood of significant residual adverse environmental and socio-economic effects occurring and substantiate the conclusions made.	Sections 5 to 17
A.2.7 Cumulative Effects Assessment (CEA)		
Scoping and Analysis of Cumulative Effects		
A.2.7.1.1	Identify the valued components for which residual effects are predicted and describe and justify the methods used to predict any residual results.	Sections 5 to 15
A.2.7.1.2	For each valued component where residual effects have been identified, describe and justify the spatial and temporal boundaries used to assess the potential cumulative effects.	Sections 5 to 15
A.2.7.1.3	Identify other physical works or activities that have been or will be carried out within the identified spatial and temporal boundaries for the CEA.	Sections 5 to 15
A.2.7.1.4	Identify whether the effects of those physical works or activities that have been or will be carried out would be likely to produce effects on the valued components within the identified spatial and temporal boundaries.	Sections 5 to 15
A.2.7.1.5	Where other physical works or activities may affect the valued components for which residual effects from the applicant's proposed project are predicted, continue the CEA, as follows. ▪ Consider the various components, phases, and activities associated with the applicant's project that could interact with other physical work or activities. ▪ Provide a description of the extent of the cumulative effects on valued components. ▪ Where professional knowledge or experience is cited, explain the extent to which professional knowledge or experience was relied upon and justify how the resulting conclusions or decisions were reached.	Sections 5 to 15
Mitigation Measures for Cumulative Effects		
A.2.7.2	Describe the general and specific mitigation measures, beyond Project-specific mitigation already considered, that are technically and economically feasible, to address the cumulative effects.	Sections 5 to 14

Table 1.3-1. Canada Energy Regulator *Filing Manual* Checklist for Guide A – A.2 and Guide B – B.2 Environmental and Socio-economic Assessment

***Filing Manual* Number**	**Filing Requirement**	**ESA Reference**
Applicant's Evaluation of Significance of Cumulative Effects		
A.2.7.3.1	After taking into account any appropriate mitigation measures for cumulative effects, identify any remaining residual cumulative effects.	Sections 5 to 14
A.2.7.3.2	Describe the methods and criteria used to determine the significance of remaining adverse cumulative effects, including defining the point at which each identified cumulative effect on a valued component is considered "significant".	Subsection 4.8
A.2.7.3.3	Evaluate the significance of adverse residual cumulative effects against the defined criteria.	Sections 5 to 14
A.2.7.3.4	Evaluate the likelihood of significant, residual adverse cumulative environmental and socio-economic effects occurring and substantiate the conclusions made.	Sections 5 to 14
A.2.8 Inspection, Monitoring, and Follow-up		
A.2.8.1	Describe inspection plans to ensure compliance with biophysical and socio-economic commitments consistent with Sections 48, 53, and 54 of the Canadian Energy Regulator *Onshore Pipeline Regulations* (CER *OPRs).*	Sections 18 and 19
A.2.8.2	Describe the surveillance and monitoring program for the protection of the pipeline, the public, and the environment, as required by Section 39 of the CER *OPRs*.	Section 19
A.2.8.3	Consider any particular elements in the Application that are of greater concern and evaluate the need for a more in-depth monitoring program for those elements.	Section 19
Table A-1 Circumstances and Interactions Requiring Detailed Biophysical and Socio-economic Information		
Physical and Meteorological Environment		Section 5
Soil and Soil Productivity		Section 5
Vegetation		Section 6
Water Quality and Quantity		Section 7
Fish and Fish Habitat, including any required *Fisheries Act* Authorizations offsetting measures		Section 7
Wetlands		Section 8
Wildlife and Wildlife Habitat		Section 9
Species at Risk or Species of Special Status and Related Habitat		Sections 6, 7, and 9
Air Emissions		Section 10
Greenhouse Gas (GHG) Emissions and Climate Change		Section 10
Acoustic Environment		Section 11

Table 1.3-1. Canada Energy Regulator *Filing Manual* Checklist for Guide A – A.2 and Guide B – B.2 Environmental and Socio-economic Assessment

Filing Manual **Number**	**Filing Requirement**	**ESA Reference**
Heritage Resources		Section 12
Traditional Land and Resource Use (TLRU)		Section 13
Navigation and Navigation Safety		Section 14
Human Occupancy and Resource Use (HORU)		Section 14
Social and Cultural Well-being		Section 14
Human Health and Aesthetics		Section 14
Infrastructure and Services		Section 14
Employment and Economy		Section 14

The requirements of the current Guide B of the *Filing Manual* (CER 2021a) are identified in Table 1.3-1. In addition, cathodic protection systems will be removed at 9 locations and abandoned in-place at 13 locations. The potential effects on soil and water of abandonment in-place of cathodic protection systems are included in this ESA.

1.4 Applicable Legislation

Abandonment is defined as the permanent cessation of the operation of a pipeline which results in the discontinuance of service (CER 2021a). The Project requires CER approval pursuant to Section 241 of the *CER Act* for leave to abandon the specified facilities. Physical abandonment activities will comply with current regulatory requirements including Canadian Standards Association (CSA) Z662-19 and the CER *OPRs*. The Project is federally-regulated and is subject to compliance with the terms and conditions imposed by the CER. The Project is not considered a designated project under the *Impact Assessment Act*, *2019* (*IAA*).

The CER requires that any abandonment application include the rationale for the abandonment and the measures to be employed in the abandonment. The CER also expects that applicants provide evidence that:

- the proposed abandonment will be carried out in a technically safe manner;
- potential environmental, socio-economic, economic, and financial effects are identified and addressed; and
- all landowners and other persons potentially affected are sufficiently notified and have their rights protected.

Pursuant to Guide A.2.1 (CER 2021a) and B.2 of the *Filing Manual* (CER 2021a), the level of detail contained in this ESA corresponds to the nature and magnitude of the anticipated environmental impacts.

For the purpose of the assessment, physical abandonment activities are considered to be the same as or similar to typical pipeline construction activities, including travel and use of equipment and machinery, ground disturbance and soil handling, and reclamation and monitoring.

1.5 Environmental Obligations

The *CER Act* requires applications to consider the extent to which the effects of a project hinder or contribute to the Government of Canada's ability to meet its environmental obligations. The Project will adhere to the requirements set out in applicable federal environmental legislation and regulations. The extent to which the effects of the Project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and commitments in respect of climate change are outlined in Section 10. Table 1.5-1 lists the environmental acts, regulations, and policies that are applicable to the Project.

Table 1.5-1. Environmental Obligations

Company	Requirement/Obligation	Location in ESA
General		
CER Act	Under the *CER Act*, the CER is responsible for assessing the environmental and socio-economic effects of energy projects within its jurisdiction.	Sections 5 to 17
CER *OPRs*	Under the *CER Act*, the CER *OPRs* are established to manage safety, security, and environmental protection throughout the entire lifecycle (design, construction, operation, and abandonment) of facilities.	Sections 5 to 17
Species and Habitat Protection		
Species at Risk Act (*SARA*)	Environment and Climate Change Canada (ECCC) is responsible for the protection of species listed as Extirpated, Endangered, and Threatened on federally-regulated land or designated critical habitat. Specifically: ▪ Section 32 prohibits killing, harming, capturing, or taking species at risk ▪ Section 33 prohibits damage or destruction of residences of species at risk ▪ Section 58(1) prohibits the destruction of critical habitat The status of species is assessed and designated by the Committee on the Status of Endangered Wildlife Species in Canada (COSEWIC). Fisheries and Oceans Canada (DFO) is responsible for aquatic species at risk under *SARA*.	Sections 6, 7, and 9
Migratory Birds Convention Act (*MBCA*)	ECCC is obligated to protect and conserve migratory bird populations and individuals and their nests in Canada. Section 6 of the *Migratory Birds Regulations* prohibits the disturbance, destruction, or taking of a nest, egg, nest shelter, eider duck shelter, or duck box of a migratory bird, or possession of a migratory bird, carcass, skin, nest, or egg of a migratory bird without authorization. There are no authorizations to allow construction-related effects on migratory birds and their nests, therefore best management practices (BMPs) will be followed to comply with the *MBCA*.	Section 9

Table 1.5-1. Environmental Obligations

Company	Requirement/Obligation	Location in ESA
Fisheries Act	Under the *Fisheries Act*, DFO prohibits activities that result in the death of fish by means other than fishing as per subsection 34.4(1), or that result in the harmful alteration, disruption or destruction (HADD), as per subsection 35(1). Subsection 34.3 makes provisions for the maintenance of flows and fish passage and Section 36 prohibits the introduction of unauthorized deleterious substances into waters frequented by fish. DFO has published guidance documents in support of the *Fisheries Act*, including the Fish and Fish Habitat Protection Policy Statement (DFO 2019a), Measures to Protect Fish and Fish Habitat (DFO 2019b), and interim Codes of Practice (COPs) (DFO 2021). Through the Memorandum of Understanding (MOU) (CER 2020a), the CER reviews the effects assessment to determine likelihood of HADD of fish habitat and DFO considers authorizations under the *Fisheries Act* for pipelines subject to the *CER Act*.	Section 7
Federal Policy on Wetland Conservation (FPWC)	ECCC is responsible for overseeing the implementation of principles regarding No Net Loss of wetland function and applies for projects occurring on federal lands, waters that receive federal funding, and wetlands of international importance (e.g., Ramsar Convention of Wetlands). Although no wetlands of international importance will be impacted by the Project, the policy is used as guidance to maintain consistency with national priorities for wetland conservation.	Section 8
Navigation Safety		
Canadian Navigable Waters Act (*CNWA*)	For purposes related to navigation, the *CER Act* includes regulations respecting sections or parts of pipelines that pass in, on, over, under, through or across a navigable watercourse, including their abandonment. The watercourses crossed by the Project are not on the *CNWA* List of Scheduled Waters; however, the public right to navigate applies to all navigable watercourses, including non-scheduled waters.	Section 14

Table 1.5-1. Environmental Obligations

Company	Requirement/Obligation	Location in ESA
Greenhouse Gas Emissions		
Paris Agreement - GHGs	Canada and other countries agreed to limit global average temperature rise to less than 2 degrees Celsius (°C) as part of the Paris Agreement. In anticipation of the Paris Climate Conference, each country publicly outlined the climate actions it intended to take; these actions are known as their Intended Nationally Determined Contribution (INDC). Canada's INDC included a 2030 target of 30 percent below the 2005 GHG emission levels (United Nations Framework Convention on Climate Change 2017). To meet this target, Canada has established the Pan-Canadian Framework on Clean Growth and Climate Change (Government of Canada 2016).	Section 10
Pan-Canadian Framework – GHGs	As part of the Pan-Canadian Framework, the Government of Canada has released the *Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds* (Upstream Oil and Gas Sector) (Government of Canada 2018), which require the management of methane emissions from the operation of natural gas pipeline systems.	Section 10

2. Project Description

This section describes and identifies the Project purpose, location, components, and phases considered in the assessment including physical abandonment activities and reclamation along the Pointed Mountain Pipeline and the post-abandonment phase.

2.1 Project Purpose

The purpose of the Project is to abandon approximately 54.4 km of pipeline and associated facilities that are no longer necessary to meet Westcoast's customers' future transportation or delivery demands.

2.2 Alternatives to The Project

Alternatives are the various technically-, economically-, and environmentally-feasible means of meeting the needs of the Project. The *Filing Manual* (CER 2021a) stipulates that the ESA should include a discussion of alternative means that were considered to reduce any potential greenhouse gas emissions of the project, and how the preferred option was chosen (e.g., alternatives to venting gas). Alternative means were identified through abandonment methods, as only abandonment of the identified components realistically meets the Project need and purpose. The decision to abandon a pipeline in-place or by removal was made on a site-specific basis in consideration of the potential environmental and socio-economic effects that may occur.

As per CSA Z662-19, the abandonment plan of a pipeline needs to consider potential safety hazards, and the effect on the environment, watercourse crossings, road crossings, and railway crossings. It is typical for pipeline abandonment projects to include more than one abandonment technique; therefore, a combination of pipe removal and abandonment in-place along the pipeline is often implemented. Land use is also an important consideration when determining if a pipeline section should be abandoned in-place or removed (NEB 1996).

2.2.1 Abandonment In-Place

Abandonment in-place with remediation (where required) and reclamation of the right-of-way to equivalent land capability following abandonment activities generally creates far less disturbance to land and land user activities, particularly for smaller diameter pipelines, as described in the National Energy Board (NEB) Pipeline Abandonment Scoping Study (Det Norske Veritas 2010). The retirement option matrix in the scoping study shows that abandonment in-place is generally the preferred option, except where the surrounding land use is agricultural, which is not the case for this Project. The study indicates that site-specific consideration is warranted at river approaches and pipeline crossings.

With abandonment in-place, cathodic protection of the pipeline will be discontinued, and no other measures are expected to be taken to maintain the structural integrity of the pipeline. There are no railway crossings, or other locations that are considered highly sensitive to subsidence.

Proponents also consider the long-term structural deterioration of a pipeline abandoned in-place and ground subsidence that may result with any attendant potential for water channelling and subsequent erosion, lead to topsoil loss, impacts to land use and aesthetics, or safety risks. A right-of-way monitoring program is included in post-abandonment plans.

2.2.2 Abandonment by Removal

Pipeline abandonment by removal is essentially the reverse operation of pipeline construction. Completely removing the abandoned pipeline from the right-of-way produces similar environmental and socio-economic effects as pipeline construction techniques including greater ground disturbance. Pipeline removal can lead to soil and groundwater contamination during the removal process introducing potential hazards (e.g., health, flammability).

However, it is expected that the pipeline is cleaned to acceptable standards prior to being removed. Pipelines cleaned and removed may eventually be put to future use (e.g., pilings) and may require further study to determine the appropriate cleanliness. Erosion and slope stability issues need to be assessed prior to the decision to remove the pipeline, and remediation efforts are more extensive than abandoning a pipeline in-place.

2.2.3 Comparison of Effects for Different Abandonment Methods

Guide B of the Filing Manual (CER 2021a) requires that a high-level comparison of the effects of abandonment in-place to effects of pipeline removal is conducted, considering how these effects may differ for different land uses along the pipeline right-of-way.

The Project falls within the following land uses, which are considered in more detail throughout the assessment:

- watercourse crossings
- forested
- wetlands
- shrubs and cleared vegetation
- disturbed

Table 2.2-1 identifies the land cover along the Pointed Mountain Pipeline within the NWT, Yukon, and BC.

Table 2.2-1. Land Cover Along the Pointed Mountain Pipeline

Land Cover Classification	Area on Existing Pipeline Right-of-Way[a]
NWT	
Forested	8.4 (7.4% of area on pipeline right-of-way)
Wetlands	20.5 (18.2% of area on pipeline right-of-way)
Water	0.0 (0.0% of area on pipeline right-of-way)
Shrubs and cleared	32.3 (28.8% of area on pipeline right-of-way)
Disturbed	0.1 (0.1% of area on pipeline right-of-way)
TOTAL	**61.3 (54.6% of area on pipeline right-of-way)**
Yukon	
Forested	11.9 (10.6% of area on pipeline right-of-way)
Wetlands	10.8 (9.6% of area on pipeline right-of-way)
Water	0.2 (0.2% of area on pipeline right-of-way)
Shrubs and cleared	19.3 (17.2% of area on pipeline right-of-way)
Disturbed	0.3 (0.2% of area on pipeline right-of-way)
TOTAL	**42.5 (37.8% of area on pipeline right-of-way)**

Table 2.2-1. Land Cover Along the Pointed Mountain Pipeline

Land Cover Classification	Area on Existing Pipeline Right-of-Way[a]
BC	
Forested	0.8 (0.7% of area on pipeline right-of-way)
Wetlands	3.4 (3.0% of area on pipeline right-of-way)
Water	0.0 (0.0% of area on pipeline right-of-way)
Shrubs and cleared	4.2 (3.8% of area on pipeline right-of-way)
Disturbed	0.1 (0.1% of area on pipeline right-of-way)
TOTAL	**8.5 (7.6% of area on pipeline right-of-way)**

[a] Areas (hectares [ha]) are approximate.

Potential adverse effects on the elements assessed in this ESA were compared at a high-level for both physical removal and abandonment in-place for the different land uses identified along the Pointed Mountain Pipeline right-of-way. Table A-1 in Appendix A provides a high-level comparison of different abandonment methods by land use type. Activities that were common to both abandonment methods (e.g., removal of aboveground infrastructure at select locations) were not considered in the comparison in order to focus on the differences in adverse environmental and socio-economic effects of the two abandonment methods.

The adverse environmental and socio-economic effects of removal of the Pointed Mountain Pipeline are anticipated to be longer in duration and larger in scale than abandonment in-place. For several elements (Vegetation, Wildlife and Wildlife Habitat, Air Emissions and GHGs, Acoustic Environment, Heritage Resources, Social and Cultural Well-Being, HORU, Infrastructure and Services, Employment and Economy, and Accidents and Malfunctions) the abandonment in-place of the Pointed Mountain Pipeline avoids adverse effects on the element.

For Physical and Meteorological Environment, Soils and Soil Productivity, Water Quality and Quantity, and Wetlands potential deterioration of the pipeline abandoned in-place could cause subsidence and also lead to contamination of soils or water. For Fish and Fish Habitat and Navigation and Navigation Safety there is potential for pipeline exposure to occur in watercourses through scouring and erosion in the water channel when the pipeline is abandoned in-place. The pipeline under the Kotaneelee River was removed in 2016 and the pipeline under the La Biche River was replaced in 2006 using a horizontal directional drill. Therefore, there is no risk of exposure at the Kotaneelee River. At the La Biche River the risk of exposure reoccurring is reduced by the greater depth at which the pipe is buried and the larger setback distances using the horizontal directional drill method of installation (Matrix Solutions Inc 2018).

Removal of the pipeline is anticipated to have adverse effects on multiple elements. Activities associated with the removal of the pipeline include ground disturbance, brushing and removal of vegetation and use of machinery. These physical activities have the potential to adversely affect the following elements:

- **Physical and Meteorological Environment**: potential terrain instability along steep slopes
- **Soil and Soil Productivity**: potential loss of soil productivity due to mixing of topsoil and subsoil horizons through the mixing of topsoil and subsoil horizons
- **Vegetation**: clearing or alteration of vegetation communities, potential effects to rare plant species and rare ecological communities, and introduction of invasive species
- **Water Quality and Quantity**: potential for groundwater contamination during removal activities, potential for changes in natural flow patterns

- **Fish and Fish Habitat**: potential alteration of fish and fish habitat, potential fish injury or mortality, potential temporary blockage of fish movement, potential transfer of aquatic invasive species
- **Wetlands**: disturbance to all wetlands, changes to wetlands may result in reduced or altered wetland habitat function, altered hydrological function and biogeochemical function following reclamation
- **Wildlife and Wildlife Habitat**: potential clearing of wildlife habitat, potential barriers to wildlife movement, increase in noise may temporarily disturb wildlife, increased wildlife mortality risk
- **Air Emissions and GHGs**: air and GHG emissions from equipment use, vegetation removal will contribute to GHG emissions
- **Acoustic Environment**: increased noise levels from equipment use
- **HORU**: change in land use due to decreased access and sensory disturbance
- **Heritage Resources**: potential to uncover Heritage Resources
- **TLRU**: loss or alteration of traditionally used species, decreased access to TLRU sites, sensory disturbance
- **Human Health or Aesthetics**: potential contamination of environmental media that could have health effects, change in aesthetics
- **Infrastructure and Services**: increased demand on waste facilities due to pipe disposal
- **Accidents and Malfunctions**: inadvertent small spills during physical activities for pipeline removal could contaminate or otherwise alter the physical environment

The effects of the Project are largely indistinguishable between various land use considerations when the pipeline is abandoned in-place. If the pipeline is removed, the effects may vary by land use type for several elements. For Vegetation and Wildlife and Wildlife Habitat, the effects of pipeline removal are experienced in all land use types, but are different for forests compared to shrublands, wetlands, and watercourses.

For some elements (e.g., Water Quality and Quantity, Fish and Fish Habitat, and Wetlands) the effects are primarily experienced in one land use type; watercourses and wetlands, respectively. For Navigation and Navigation Safety, the effects are limited to the watercourses land use type. For Physical and Meteorological Environment, Soils and Soil Productivity, Air and GHG Emissions, Acoustic Environment, Heritage Resources, HORU, TLRU, Human Health and Aesthetics, Infrastructure and Services, and Accidents and Malfunctions the effects of removal of the pipeline do not change based on land use type.

For the land uses encountered by the Pointed Mountain Pipeline, abandonment in-place avoids or decreases the duration and magnitude of adverse environmental and socio-economic effects and is the preferred abandonment method carried forward for detailed assessment.

2.3 Project Location

The Pointed Mountain Pipeline is located in a remote area of southwest NWT, southeast Yukon, and northeast BC (Figure 1.1-1). It commences at Kilometre Post (KP) 0.0 located approximately 25 km northwest of Fort Liard, NWT, within 95C1NE (NTS Grid 20k) (in the NWT) and angles southwest to approximately KP 55.64 located within 94N16NE (BC PNG Grid - quarters) (in BC). A summary of the Project location is provided in Table 2.3-1.

Table 2.3-1. Summary of Project Location

Pipeline Section	Territory/Province	Approximate KP Range	Legal Description	Approximate Length (km)
Pointed Mountain Pipeline	NWT	0 to 29.38	95B5NW to 95C1NE	28.18
	Yukon	29.38 to 49.67	95C1NE to 95C1SE	20.29
	BC	49.67 to 55.64	95C1SE to 94N16NE	5.97

2.4 Project Description

All pipeline components to be abandoned have been deactivated (i.e., purged, cleaned of residual product, coated with corrosion inhibitor, and physically isolated from upstream pressure) and filled with nitrogen, with the exception of a 1.2 km segment crossing the Kotaneelee River which has been removed. The NPS 20 (508 millimetre [mm] outside diameter [OD]) Pointed Mountain Pipeline is approximately 55.6 km long and has an extruded polyethylene outer coating. The existing pipeline is set within an 18 m to 20 m wide right-of-way located primarily on provincial and territorial Crown land, with 600 m at the southern end privately owned by NorthRiver Midstream (NRM).

The Pointed Mountain Pipeline was constructed in 1972. In 2008, KP 0 to KP 34.92 was deactivated pursuant to NEB Order MO-11-2008. In April 2016, a 1,200 m segment of the pipeline crossing the Kotaneelee River was decommissioned pursuant to NEB Order MO-071-2015. The remainder of the Pointed Mountain Pipeline (KP 34.92 to KP 55.64) was deactivated in July 2016 pursuant to NEB Order MO-003-2016.

Physical abandonment activities (e.g., excavation, isolation, backfilling) along the Pointed Mountain Pipeline will occur at nine site locations (Table 2.4-1).

Table 2.4-1. Site Features Along the Pointed Mountain Pipeline

Site Feature (Appendix C of this ESA)	KP	Legal	Province
PM-1: Pointed Mountain Launcher	0.00	95B5NW (NTS Grid 20k)	NWT
PM-2: Producer Tie-in	11.10	95B5SW (NTS Grid 20k)	NWT
PM-3: N2 Vent	18.04	95B4NW (NTS Grid 20k)	NWT
PM-4: N2 Vent	19.25	95B4NW (NTS Grid 20k)	NWT
PM-6: Producer Tie-in	34.28	95C1SE (NTS Grid 20k)	Yukon
PM-7: Launcher	34.92	95C1SE (NTS Grid 20k)	Yukon
PM-8: Aboveground Riser	54.5	94N16NE (NTS Grid 20k)	BC
PM-9: Aboveground Riser	55.0	94N16NE (NTS Grid 20k)	BC
PM-10: Receiver	55.64	94N16NE (NTS Grid 20k)	BC

Note: PM-5 – La Biche River exposed pipe work was previously completed and is not part of this Project.

Temporary workspace along the Pointed Mountain Pipeline is required to accommodate physical abandonment activities, and will include:

- **Site Feature PM-1**: a 20 m by 20 m temporary workspace area centred around riser and shack and an approximately 50 m by 32 m temporary workspace area. Additional workspace is required for removal of infrastructure within the flare pit to the east. Additional workspace is required for remediation of the previously recorded diesel spill. The results of the Phase II soil sampling program will determine the location and extent of this additional workspace.
- **Site Feature PM-2**: a 20 m by 20 m temporary workspace area centred on the producer tap (not to exceed width of right-of-way). Brushing on right-of-way at this site will be required for helicopter landing.
- **Site Feature PM-3**: a 20 m by 20 m temporary workspace area centred on the nitrogen vent (not to exceed width of right-of-way). Brushing on right-of-way at this site will be required for helicopter landing.
- **Site Feature PM-4**: a 20 m by 20 m temporary workspace area centred on the nitrogen vent (not to exceed width of right-of-way). Brushing on right-of-way at this site will be required for helicopter landing.
- **Site Feature PM-6**: a 15 m by 40 m temporary workspace area around piping to the producer meter building and a 20 m by 60 m temporary workspace area over the right-of-way.
- **Site Feature PM-7**: an approximately 155 m by 120 m temporary workspace area around launcher site and a 20 m by 115 m temporary workspace area over the right-of-way.
- **Site Feature PM-8**: an 18 m by 20 m temporary workspace area centered on the riser.
- **Site Feature PM-9**: a 20 m by 30 m temporary workspace area around the riser and additional workspace required to remove a concrete block.
- **Site Feature PM-10**: a 30 m by 80 m temporary workspace area around the receiver site.

Permanent pipeline infrastructure to be abandoned or removed as part of the Pointed Mountain Pipeline are described in Table 2.4-2.

Table 2.4-2. Pointed Mountain Pipeline – Associated Facility Components

Site Feature	Associated Facility Components
PM-1: Pointed Mountain Launcher (KP 0.00)	NPS 24 Pig launcher and catch basin
	Pipe support (ten)
	NPS 20 S-bend riser
	NPS 6 flare riser
	Flare stack control panel support
	Diesel tank and tubing (two)
	Propane tank (four)
	NPS 4 aboveground flare piping, kicker piping, and associated valves and actuator
	NPS 20 aboveground piping and associated valves and actuators
	Building
	Diesel tank support frame
	Platforms and stairs
	Cathodic protection
	NPS 20 risers/elbows and check valve on the piping to the producer plant (two)
	NPS 2 N2 vent and valve on Pointed Mountain Pipeline

Table 2.4-2. Pointed Mountain Pipeline – Associated Facility Components

Site Feature	Associated Facility Components
PM-2: Producer Tie-in (KP 11.10)	NPS 4 producer tap, piping, and valve (three)
PM-3: N2 Vent (KP 18.04)	NPS 2 nitrogen vent and valves
PM-4: N2 Vent (KP 19.25)	NPS 2 nitrogen vent and valves
PM-6: Producer Tie-in (KP 34.28)	NPS 2 hot tap riser from Pointed Mountain deactivated pipeline
	NPS 6 hot tap riser from Pointed Mountain deactivated pipeline
	Pipe support (four)
	NPS 6 S-bend riser
	NPS 6 aboveground piping and valves from Pointed Mountain Pipeline to bypass
	NPS 2 aboveground piping and valves from Pointed Mountain Pipeline to bypass
	Corrugated metal pipe (two)
	NPS 6 aboveground piping and valves at meter building
	NPS 2 aboveground piping and valves at meter building
PM-7: Launcher (KP 34.92)	NPS 2 nitrogen vent and valves (two)
	NPS 20 S-bend riser
	NPS 24 pig launcher
	Stairs and platform
	NPS 20 aboveground piping, valves, and actuators
	NPS 20 aboveground mainline block valve stem
	NPS 6 mainline block valve blow-off piping and piping supports (two)
	NPS 6 aboveground flare piping, kicker piping, and associated valves and actuators
	NPS 6 S-bend riser (bypass line)
	NPS 6 aboveground bypass piping and valves to from producer to launcher and flare
	NPS 6 flare riser and support posts
	Flare stack control panel support
	Pipe support (14)
	Building
	Support structure and stairs for building and diesel tank
	Diesel tank and tubing
	Propane tank (four)
	Exterior electrical control structure
	Cathodic protection
PM-8: Aboveground Riser (KP 54.5)	NPS 2 aboveground pipe elbow and support
PM-9: Aboveground Riser (KP 55.0)	NPS 20 aboveground pipe elbow
	Concrete pipe supports

Table 2.4-2. Pointed Mountain Pipeline – Associated Facility Components

Site Feature	Associated Facility Components
PM-10: Receiver (KP 55.64)	NPS 20 S-bend riser
	NPS 24 pig receiver
	Launcher stairs and platform
	Pipe support (three)
	NPS 20 aboveground crossover piping, valves, and actuators
	NPS 4 aboveground flare piping, receiver line piping, kicker piping, and associated valves and actuators

In addition, Test Lead Posts (TLPs) that are part of the cathodic protection system for the Pointed Mountain Pipeline will be removed at nine locations (Table 2.4-3). The TLPs consist of a core assembly within a PVC conduit which extends approximately 0.6 m above grade. While 9 TLPs are being removed, 13 are not readily accessible and removal would require substantial vegetation clearing, including forested lands and wetlands, and additional construction of temporary access roads. Four of these TLPs to be abandoned in-place are located within wetlands (two treed fens, a treed bog and a shrub fen) and would require disturbance within the wetlands to remove. Based on the additional clearing requirements, additional disturbance within wetlands and the low risk and anticipated negligible effects of contamination, they will not be removed.

Table 2.4-3. Test Lead Posts to be Removed

TLPs to be Removed	KP	Legal	Province
TLPs	18.70	95B4NW	NWT
	39.65	95C1SE	Yukon
	43.23	95C1SE	Yukon
	45.05	95C1SE	Yukon
	46.68	95C1SE	Yukon
	48.34	95C1SE	Yukon
	50.38	95C1SE	Yukon
	51.62	94N16NE	BC
	54.35	94N16NE	BC

2.4.1 Access

No new permanent access roads are required for the Project. Access during physical abandonment activities will be via existing roads (e.g., high-grade petroleum development roads, resource, and winter roads), barge, helicopter, and the existing Pointed Mountain Pipeline right-of-way. Westcoast will install an ice bridge at the Liard River to connect the existing road on either side of the river. At PM-8 access will use a shoofly to the southeast of the right-of-way in order to avoid a wet area. Vegetation clearing and/or brushing is not anticipated for the construction of access roads. However, brushing on the right-of-way will be required to facilitate helicopter landing at select locations (i.e., PM-2, PM-3, PM-4). Access plans and construction schedule are outlined in Table 2.4-4.

Table 2.4-4. Site Feature Access Plans

Site Feature	Construction Timing	Planned Access
PM-1	Summer	Major roads, barge from Fort Liard to high-grade road access point, high-grade road
PM-2	Summer	Major roads, barge from Fort Liard to high-grade road access point, high-grade road
PM-3	Summer	Helicopter
PM-4	Summer	Helicopter
PM-6	Winter	Major and high-grade roads, ice bridge across Liard River, high-grade road, Pointed Mountain right-of-way
PM-7	Winter	Major and high-grade roads, ice bridge across Liard River, high-grade road, Pointed Mountain right-of-way
PM-8	Winter	Major and high-grade roads, ice bridge across Liard River, high-grade road, Pointed Mountain right-of-way, shoofly around wet area on Pointed Mountain right-of-way
PM-9	Winter	Major and high-grade roads, ice bridge across Liard River, high-grade road, Pointed Mountain right-of-way
PM-10	Winter	Major and high-grade roads, ice bridge across Liard River, high-grade road, Pointed Mountain right-of-way

2.5 Project Activities

Westcoast plans to abandon the Pointed Mountain Pipeline in-place and remove aboveground infrastructure at nine locations.

2.5.1 Physical Abandonment Activities

Abandonment in-place will include physical activities to cap, plug, and seal the Pointed Mountain Pipeline. Standard activities and typical equipment required for safe and successful pipeline abandonment are described in Table 2.5-1.

Table 2.5-1. Physical Abandonment Activities

Pipeline Construction Activity	Description and Typical Equipment
Access	Access to the Project Footprint will require some minor vegetation brushing along existing access roads and proposed helicopter landing locations. Snow and ice fill bridges will be used for vehicle and equipment travel. Additional brushing will be required on the previously disturbed pipeline right-of-way to facilitate helicopter landing. Access to the Project Footprint at PM-1 and PM-2 will entail use of a barge across the Liard River. Construction of an ice bridge across the Liard River. Access to the various infrastructure and workspace locations will be controlled during use of the site, if warranted, for public safety and to prevent vandalism of equipment or facilities.

Environmental and Socio-economic Assessment

Table 2.5-1. Physical Abandonment Activities

Pipeline Construction Activity	Description and Typical Equipment
Surveys	Activities include flagging and staking of the boundaries of the Project Footprint, including temporary workspace, as well as marking the existing right-of-way and utilities. Avoidance areas (e.g., protected habitats or rare plants) will be appropriately fenced or flagged.
Transportation of equipment, workers, and supplies	Supplies and equipment will be transported to the Project Footprint using large trucks and trailers. Workers will use regular vehicles and trucks for travel to and from the Project Footprint for the duration of the physical abandonment schedule. Heavy equipment will travel along the right-of-way, as needed. For PM-3 and PM-4 supplies, equipment and workers will be transported by helicopter.
Clearing/brushing	Vegetation (i.e., stumps, brush, and other vegetation) and snow will be cleared from the Project Footprint, as needed, to facilitate physical abandonment activities. Vegetation will be brushed by selective clearing in required locations including temporary workspace and access along the Pointed Mountain Pipeline. Equipment used during brushing may include mulchers, or other clearing equipment, as well as skidders, dozers, and excavators.
Vegetation disposal	Vegetative debris may be disposed of through burning. Burning will be conducted following the *Forest Protection Act* (Government of the NWT 1988), *Forest Protection Regulations* under the *Yukon Forest Protection Act* (Government of Yukon 2003a) and the *Open Burning Smoke Control Regulation* (*OBSCR*) (Government of BC 2019). Burn pile locations will be stripped of topsoil prior to burning.
Strippings handling (forested lands)	Strippings will be salvaged at areas where excavation is required to access belowground piping. The width and depth of strippings salvage depends on a number of factors including the soil conditions at the time of abandonment and microtopography. Typical equipment used during strippings handling activities includes backhoes and excavators.
Excavation	Excavation will occur at cut and cap locations where the pipeline will remain in-place. Typical equipment used for excavation includes backhoes and tracked excavators.
Depressurization and capping	Following principles in the latest edition of CSA Z662-19, the existing pipelines will be depressurized, capped, plugged, and left without any internal pressure. The pipelines will be capped at start and end points, third-party connections, and flare sites.
Watercourses	All watercourse crossings will be abandoned in-place to avoid disturbance to the watercourse. The section of pipe under the Kotaneelee River was removed in 2016.
Road crossings	Several roads crossed by the pipelines are seasonal and rebuilt every year. Sections of the pipelines crossing seasonal roads will be abandoned in-place.
Third-party crossings	Pipeline sections that cross third-party pipelines will be abandoned in-place unless otherwise required to eliminate the risk of contact with the third-party pipeline during removal.
Backfilling	Excavation areas will be backfilled using backhoes, excavators, graders, dozers, or other specialized backfilling equipment.
Cleanup and reclamation (forested lands)	Upon completion of abandonment activities, cleanup, and reclamation procedures will be initiated following backfilling using dozers, backhoes, or graders. Any remaining garbage or debris will be removed and disposed of in compliance with applicable regulations. Topsoil/strippings, where salvaged, will be replaced. All disturbed, upland areas will be revegetated using natural recovery, or seeded with an appropriate native seed mix.
Remediation	As per CSA Z662-19, soils on abandoned facility sites will require testing to ensure residual contamination is not present. If soil is found to be contaminated, the site will be remediated to the appropriate land use standards.

Table 2.5-1. Physical Abandonment Activities

Pipeline Construction Activity	Description and Typical Equipment
Site dismantle	Any aboveground piping and appurtenances associated with the Pointed Mountain Pipeline will be dismantled and removed from the site. Cathodic protection to the pipeline will be disconnected. Supports and utilities will be removed to pipeline depth belowground unless still required and owned by third-party operators. All third-party connections will be disconnected.
Disposal	Pipeline and equipment to be removed will be salvaged or disposed of in accordance with applicable regulations.

Following physical abandonment activities, the Pointed Mountain Pipeline will be abandoned in-place. No further physical work is planned once the activities outlined in Table 2.5-1 are complete.

2.5.2 Post-Abandonment Activities

Reclamation and monitoring will occur along the disturbed portions of the pipeline. Post-abandonment activities are detailed in Section 19, Follow-up and Monitoring.

2.6 Project Schedule

Pending regulatory approval, physical abandonment activities are planned to commence in November 2022 and end in July 2023. Project activities will be conducted during summer months at four facility locations (i.e., PM-1: Pointed Mountain Launcher, PM-2: Producer Tie-in, PM-3: N2 Vent, and PM-4: N2 Vent) within the NWT, commencing in June 2023 and ending in July 2023. Project activities will be conducted at the remaining facility locations (i.e., PM-6: Producer Tie-in, PM-7: Launcher, PM-8: Aboveground Riser, PM-9: Aboveground Riser, and PM-10: Receiver) during winter months and frozen ground conditions, starting in November 2022 and ending in April 2023.

2.7 Project Work Force

Physical abandonment activities will require an estimated peak workforce of up to 25 people at one time. Necessary skills will range from entry level labourers to highly skilled trades. Physical abandonment activities can be accomplished by persons of any gender, sex, culture, or ethnic group, provided they possess the requisite skills, training, and physical ability. In addition, qualified members of Indigenous groups will be provided an opportunity to be employed as Environmental or Construction Monitors during physical abandonment activities.

The Project workforce is anticipated to reside at an existing industrial camp in the area for the duration of abandonment activities. These typically offer a full range of services including single occupancy rooms, meals, recreational opportunities (e.g., gym), laundry, and services (e.g., internet, television).

Westcoast is committed to working with Indigenous groups to understand how economic benefits can be achieved from the Project, including using locally sourced and or/Indigenous-owned businesses, where appropriate.

3. Consultation and Engagement

Westcoast has been carrying out consultation and engagement activities with municipalities, provincial regulatory authorities, public stakeholders, and Indigenous groups to provide information and to understand concerns or issues that may arise regarding the Project.

Detailed information regarding the Project-specific Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. Attachment 4 provides details of the groups engaged and how they were engaged on the Project. Refer to each element discussion in Sections 5 to 17 of this ESA for summaries of how outcomes of consultation and engagement have influenced the assessment for each element, where applicable.

3.1 Indigenous Engagement

On June 17, 2020, Westcoast requested that the CER complete a preliminary Traditional Territory analysis for the Project. Based on the CER's Traditional Territory Analysis and Project engagement, the following Indigenous groups were identified as having known or asserted Traditional Territory in the Project area, or have expressed interest in being engaged on the Project:

- Acho Dene Koe First Nation
- Dehcho First Nations
- Fort Nelson First Nation
- Fort Liard Métis Local 87
- Kaska Nation
- Liard First Nation
- Nahæâ Dehé Dene Band (Nahanni Butte)
- Ross River Dena Council (Ross River First Nation)
- Sambaa K'e Dene Band/Trout Lake

Westcoast's engagement activities with Indigenous groups potentially impacted by the Project commenced in May 2020 and focused on early interest identification.

3.2 Project-Specific Engagement Activities and Participation of Indigenous Groups

Westcoast's Engagement Program sought to understand how local knowledge and IK could be incorporated into the CER Project Application and planning and relied on Indigenous groups to identify site-specific concerns that are tied to Aboriginal or Treaty Rights or Indigenous interests or Traditional Use.

Acho Dene Koe First Nation and Liard First Nation were invited to participate in the Jacobs Project-specific biophysical field assessments which included archaeology, wetlands, vegetation, and wildlife and wildlife habitat surveys focused on the areas where existing infrastructure is located and where physical abandonment activities and workspace will be used.

Given the current COVID-19 restrictions and timing of the field surveys, Liard First Nation declined involvement in the work; however, members from Acho Dene Koe First Nation participated.

Westcoast will continue to work with communities to identify site-specific concerns or areas of interest that may require specific mitigation or reclamation methods during the abandonment process. Element-specific issues, concerns and IK shared by Indigenous groups during Project-specific engagement are included in Sections 5 to 17 of this ESA including a description of how outcomes of engagement have influenced the assessment, where applicable.

An assessment of Project effects on TLRU is included in Section 13 of this ESA (Assessment of Effects on Traditional Land and Resource Use). The *CER Act* requires that the Rights of Indigenous Peoples in Canada are considered in regard to pipeline projects. As per Table A-3 of the *Filing Manual* (CER 2021a), the level of detail and depth of information relating to potential project effects on Aboriginal and Treaty Rights and Indigenous interests is commensurate with the scale and scope of the Project. Project-specific input brought forward by potentially affected Indigenous groups has been reflected in the assessment.

4. Assessment Methods

4.1 Overview of Approach

The assessment evaluated the potential environmental and socio-economic effects and potential cumulative environmental effects of the Project for all Project components (Section 2). The assessment method applied the following process.

- Identify the environmental and socio-economic elements (subsection 4.3).
- Determine the spatial and temporal boundaries for the assessment (subsection 4.5).
- Describe the environmental and socio-economic setting (current conditions) (Sections 5 to 17).
- Categorize the right-of-way by land use type and compare the effects of different abandonment methods (subsection 2.3.3).
- For the preferred abandonment method complete an environmental and socio-economic assessment.
- Identify the potential environmental and socio-economic effects, based on the potential interactions of the Project with each element for each land use type under current conditions (subsection 4.3, Sections 5 to 17).
- Develop appropriate technically and economically practical site-specific mitigation and, where warranted, enhancement measures, to avoid or reduce residual effects or to enhance positive effects (Section 5 to 17).
- Identify the predicted residual effects and determine their significance based on the significance evaluation process outlined in subsection 4.7 (Sections 5 to 17).
- Identify the predicted residual effects that potentially interact with existing or reasonably foreseeable activities to have cumulative effects (Sections 5 to 17).
- Conduct the CEA and determine the significance of cumulative effects, based on the significance evaluation process outlined in subsection 4.8 (Sections 5 to 17).

This environmental and socio-economic effects assessment methodology has been developed using guidance from:

- *Filing Manual* (CER 2021a)
- Impact Assessment Agency of Canada (IAAC) Gender-Based Analysis Plus (GBA+) in Impact Assessment (IAAC 2019)
- Canadian Environmental Assessment Agency (CEA Agency) (2018a) Interim Technical Guidance: Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act, 2012 (*CEA Act, 2012*)
- CEA Agency (2018b) Interim Technical Guidance: Assessing Cumulative Environmental Effects under the *CEA Act, 2012*
- CEA Agency's Cumulative Effects Assessment Practitioners Guide (Hegmann et al. 1999)

These documents were considered relevant to the Project, as they reflect the methods commonly used by ESA practitioners, along with the most recent guidance from appropriate regulatory authorities.

4.2 Scope of the Assessment

Guide B.4 of the *Filing Manual* (CER 2021a) requires an ESA be completed to support applications for abandonment. Filing requirements provided in Guide B.4 refer to the requirements and guidance in Guide A.2, in addition to those outlined in Table 1.3-1. In addition, the revised guidance for information to be included in an ESA identified in the proposed changes to Guide B (CER 2021a) are included in this assessment.

Guide A.2.6.1 of the *Filing Manual* (CER 2021a) assumes the identification of potential environmental and socio-economic effects reflects a valued component-based approach, where the valued components could be the broad elements or a subset of those elements, as described in:

- Table A-1, Circumstances and Interactions Requiring Detailed Biophysical and Socio-economic Information
- Table A-2, Filing Requirements for Biophysical Elements
- Table A-3, Filing Requirements for Socio-economic Elements

The identification of the potential environmental and socio-economic effects generally focuses on the broad environmental (i.e., biophysical) and socio-economic elements as the valued components. Potential effects are identified as subsets of each element, representing interactions with the biophysical and socio-economic environment that may be affected by the Project. An analysis of Project-related potential effects is the means by which residual effects are then predicted and assessed in the ESA.

4.2.1 Integration of Indigenous Knowledge into the Project Assessment

IK is a body of unique knowledge held and built up by a group of people through generations of living in close contact with nature. It is cumulative and dynamic; it builds upon the historical experiences of a people and adapts to social, economic, environmental, spiritual, and political change. It may consist of Traditional Ecological Knowledge and TLRU information, but also forms part of a larger body of information, which encompasses knowledge about cultural, environmental, economic, political, and spiritual inter-relationships.

IK information was provided by Acho Dene Koe First Nation during Project-specific field surveys and throughout the ESA writing process. Liard First Nation also provided information throughout the ESA writing process.

IK shared by Indigenous groups was considered in the identification of potential effects of the Project on TLRU (Section 13 of this ESA) as well as relevant biophysical elements. Information collected for the Project was considered in subsection 13.6, Assessment of Residual Effects on TLRU and throughout the ESA, where relevant, in accordance with guidance from the *Filing Manual* (CER 2021a) for the collection of Traditional Use information and Reference Guide: Considering Aboriginal Traditional Knowledge in Environmental Assessments Conducted under the *CEA Act, 2012* (CEA Agency 2015a).

4.2.2 Gender-Based Analysis Plus

As per Guide A.2 of the *Filing Manual* (CER 2021a), GBA+ should be applied when considering each of the socio-economic elements outlined in Table A-3. GBA+ was considered in the identification of potential effects on socio-economic elements considered in this ESA. Considering the physical activities are of relatively short duration in any specific location, and an established construction camp offering full amenities (e.g., single occupancy rooms with showers, recreational opportunities) will be used to accommodate Project work crews, it is not anticipated that diverse groups of people within will be differentially affected by the Project. Therefore, highly detailed information regarding GBA+ was not provided in this ESA (CER 2021a).

4.3 Selection of Environmental and Socio-economic Elements

The assessment team identified potential interactions using professional experience working on pipeline and facility projects with similar scope, conditions, and potential issues (including decommissioning and abandonment projects); the results of the Project-specific desktop and field studies; applicable regulatory requirements; and Westcoast's project experience; as well as feedback gathered through the engagement of potentially affected stakeholders, Indigenous groups and appropriate regulatory authorities (Section 3).

Environmental and socio-economic elements potentially interacting with the Project are summarized in Table 4.3-1.

Table 4.3-1. Element Interaction

Element[a] (ESA Section Reference)	Interaction with Project Phase[b]	
	Physical Abandonment Activities	**Abandonment In-place**
Biophysical Elements		
Physical and Meteorological Environment (Section 5)	No – activities will occur on level ground within the existing right-of-way.	No – the buried pipeline is expected to be stable over the long-term; ground subsidence from eventual corrosion or pipeline collapse is not expected to affect the physical environment.
Soil and Soil Productivity (Section 5)	Yes	Yes
Vegetation (Section 6)	Yes	Yes
Water Quality and Quantity (Section 7)	Yes	Yes
Fish and Fish Habitat (Section 7)	Yes	Yes
Wetlands (Section 8)	Yes	Yes
Wildlife and Wildlife Habitat (Section 9)	Yes	Yes
Species at Risk (Sections 6, 7, and 9)	**Vegetation** No **Fish and Fish Habitat** Yes **Wildlife and Wildlife Habitat** Yes	**Vegetation** No **Fish and Fish Habitat** Yes **Wildlife and Wildlife Habitat** Yes
Air and GHG Emissions and Climate Change (Section 10)	Yes	No – abandonment in-place will not require the use of vehicles or equipment following physical activities.
Acoustic Environment (Section 11)	Yes	No – abandonment in-place will not require the use of vehicles or equipment following physical activities.

Table 4.3-1. Element Interaction

Element[a] (ESA Section Reference)	Interaction with Project Phase[b]	
	Physical Abandonment Activities	**Abandonment In-place**
Socio-Economic Elements		
HORU (Section 14)	Yes	No – physical work that would disrupt land use will not be required once the pipeline is abandoned.
Heritage Resources (Section 12)	Yes	No – if surface or buried Heritage Resource sites were present, they would have been disturbed as a result of previous physical activities.
Navigation and Navigation Safety (Section 14)	No – physical abandonment activities will not be conducted in, on, over, under, through or across a navigable waterway when the water is flowing.	Yes
TLRU (Section 13)	Yes	Yes
Social and Cultural Well-being (Section 14)	No – the Project will entail a small workforce using the services of an established, permanent construction camp over a relatively short period. Consequently, the following potential social and cultural well-being effects noted in Table A-3 of the *Filing Manual* do not apply to the Project: ▪ stresses on family and household cohesion; ▪ alcohol and substance abuse; or ▪ illegal or other potentially disruptive activities.	
Human Health and Aesthetics (Section 14)	Yes – identified interactions with Human Health include sensory disturbances of nearby land users, which are addressed under the Air Emissions element (Section 10), Acoustic Environment element (Section 11), HORU element (Section 14) and TLRU element (Section 13). Potential effects associated with accidents are assessed under Accidents and Malfunctions (Section 16).	Yes
Infrastructure and Services (Section 14)	Yes	No – changes to infrastructure and services will not be required once the pipeline is abandoned.
Employment and Economy (Section 14)	Yes	No – physical work that would require a workforce will not be required once the pipeline is abandoned.
Rights of Indigenous People (Section 15)	Yes	Yes

[a] The ESA Section numbers are noted for each element in Table 4.3-1.

[b] In accordance with Guide A.2.6 of the *Filing Manual* (CER 2021a), no further analysis is warranted for those elements where interactions between the Project component and an environmental or socio-economic element are not predicted.

In addition to the environmental and socio-economic elements listed in Table 4.3-1, the potential effects arising from accidents and malfunctions, and effects of the environment on the Project, are assessed in Sections 15 and 16. In accordance with Guide A.2.6 of the *Filing Manual* (CER 2021a), no further analysis is warranted for elements where interactions between the Project component or activity and an environmental or socio-economic element are not predicted.

4.4 Potential Effects, Effect Pathways, and Effects Indicators

The potential environmental and socio-economic effects of the Project were identified through the results of Project-specific desktop studies and field surveys, applicable regulatory requirements and industry guidance, Indigenous engagement, regulatory and government consultation process, and professional experience of the assessment team informed by previous pipeline projects with similar conditions or potential issues. The potential environmental and socio-economic effects arising from the Project are identified in Sections 5 to 17 for each element assessed.

The assessment of each element includes a description of the effect pathway whereby Project-specific activities, components, or phases are anticipated to interact with the element.

Effect indicators are defined for each effect pathway to characterize measurable change in the element that may result from the Project. The effect indicators may be quantitative or qualitative and contribute to the determination of significance of residual adverse effects. Where qualitative assessment indicators are used, they are defined considering the results of relevant literature, industry guidance, and the experience of the assessment team.

4.5 Assessment Boundaries

The ESA predicts the potential effects of the Project on the environmental and socio-economic elements within defined spatial and temporal boundaries. These boundaries will vary with the biophysical or socio-economic elements or interactions to be considered, and will reflect:

- the biophysical and socio-economic baseline setting within the spatial boundaries of the Project;
- the area potentially affected by abandonment activities, including the proposed physical works and physical activities;
- the area in which an element occurs or functions, and within which a Project effect may be detected;
- the time required for an effect to become evident; and
- the time required for an element to recover from an effect and return to a pre-effect condition.

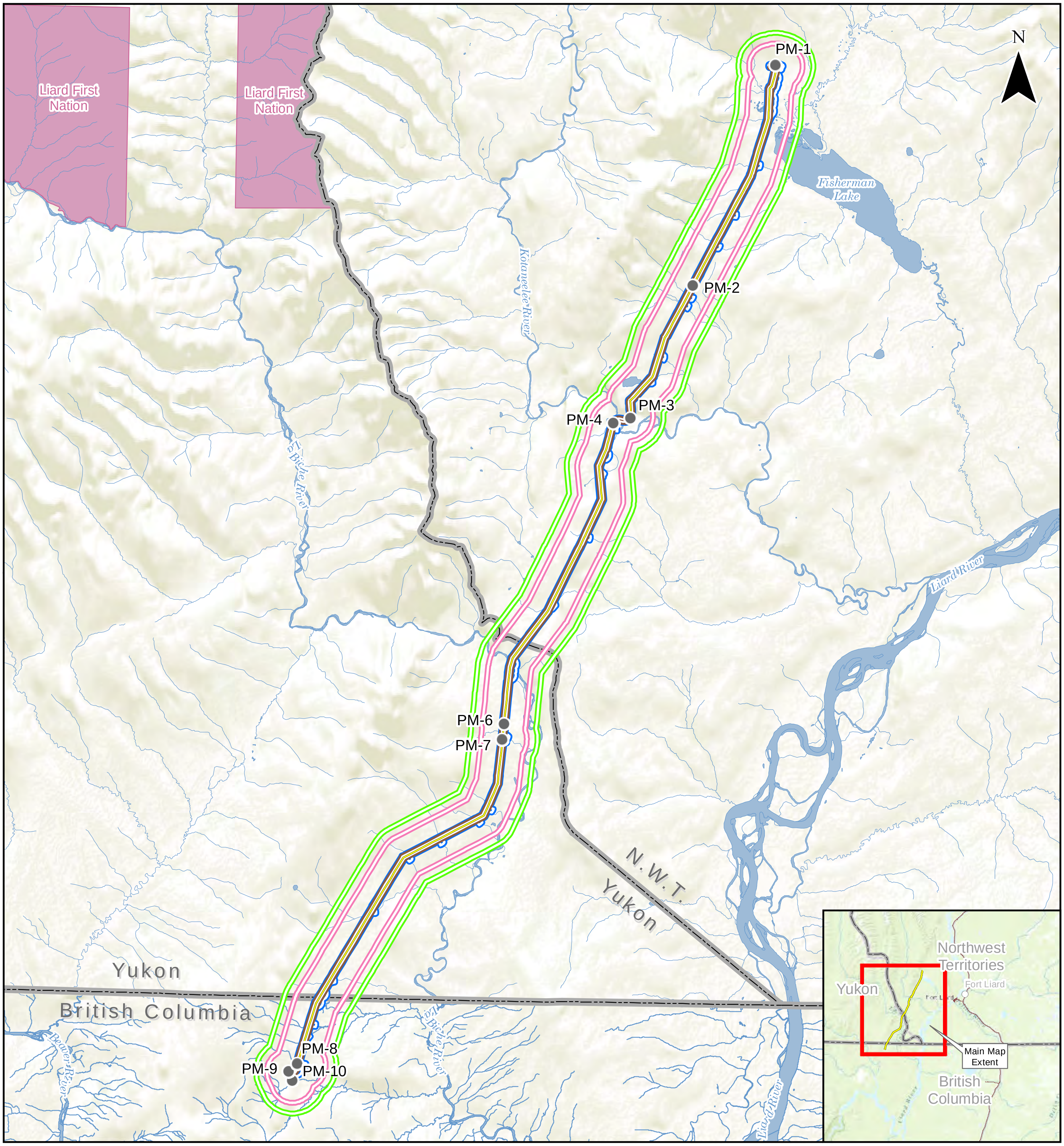
4.5.1 Spatial Boundaries

The spatial boundaries for the Project residual and CEA encompass the areas potentially affected by the Project, the areas within which a biophysical or socio-economic element occurs or functions, and the areas within which Project effects might occur. Four categories of study areas are defined for the ESA.

1) **Project Footprint**: the land area directly disturbed by the physical abandonment activities, including associated physical works and activities for the right-of-way, associated facilities, and temporary workspace. The Project Footprint is the same for all elements included in this ESA. Physical abandonment activities will generally be conducted on the existing pipeline right-of-way.
2) **Local Study Area (LSA)**: varies with the environmental and socio-economic element being considered. The LSA includes the Project Footprint and extends beyond it to incorporate the area within which the element is most likely to be affected by the Project.

3) **Regional Study Area (RSA)**: varies with the environmental and socio-economic element being considered. The RSA includes the Project Footprint and LSA, and the area beyond the LSA boundaries where the predicted likely residual effects from the Project may act in combination with those of existing and reasonably foreseeable developments and activities to cause cumulative effects.
4) **Beyond RSA**: the area extending beyond the RSA identified for each element.

The LSA and RSA boundaries reflect a balance between choosing an area that is large enough for potential effects to be measurable and meaningful, but not so large as to mask or dilute the effects. The definitions and rationale for the establishment of spatial boundaries are provided by element in Sections 5 to 16 and are shown on Figures 4.5-1, 4.5-2, and 4.5-3. Where the spatial boundaries are the same for multiple elements, the spatial boundaries were combined for simplicity (e.g., the Aquatics LSA and RSA cover the Water and Water Quality element and the Fish and Fish Habitat element).



- Site Feature
- Existing Pipeline
- Provincial Boundary
- Watercourse
- Water Body
- First Nations (Interim Protected Lands)

Local Study Areas

- Acoustic Environment, TLRU, HORU and Navigation and Navigation Safety LSA
- Aquatics LSA
- Physical Environment and Soil Productivity, Vegetation and Wetland LSA
- Wildlife and Wildlife Habitat LSA

FIGURE 4.5-1

BIOPHYSICAL LOCAL STUDY AREA BOUNDARIES

POINTED MOUNTAIN PIPELINE ABANDONMENT PROJECT
WESTCOAST ENERGY INC.

ENBRIDGE

NAD 1983 UTM Zone 10N
Hillshade: TERA 2008; Hydro: BC FLNRO 2008 and NRCan 2007-2011 ; Provincial Boundary: ESRI 2005. First Nations: Yukon Government 2010.

SCALE: 1:250,000
0 2.5 5
Kilometers
(All Locations Approximate)

Jacobs

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.

January 2022 | CE809300

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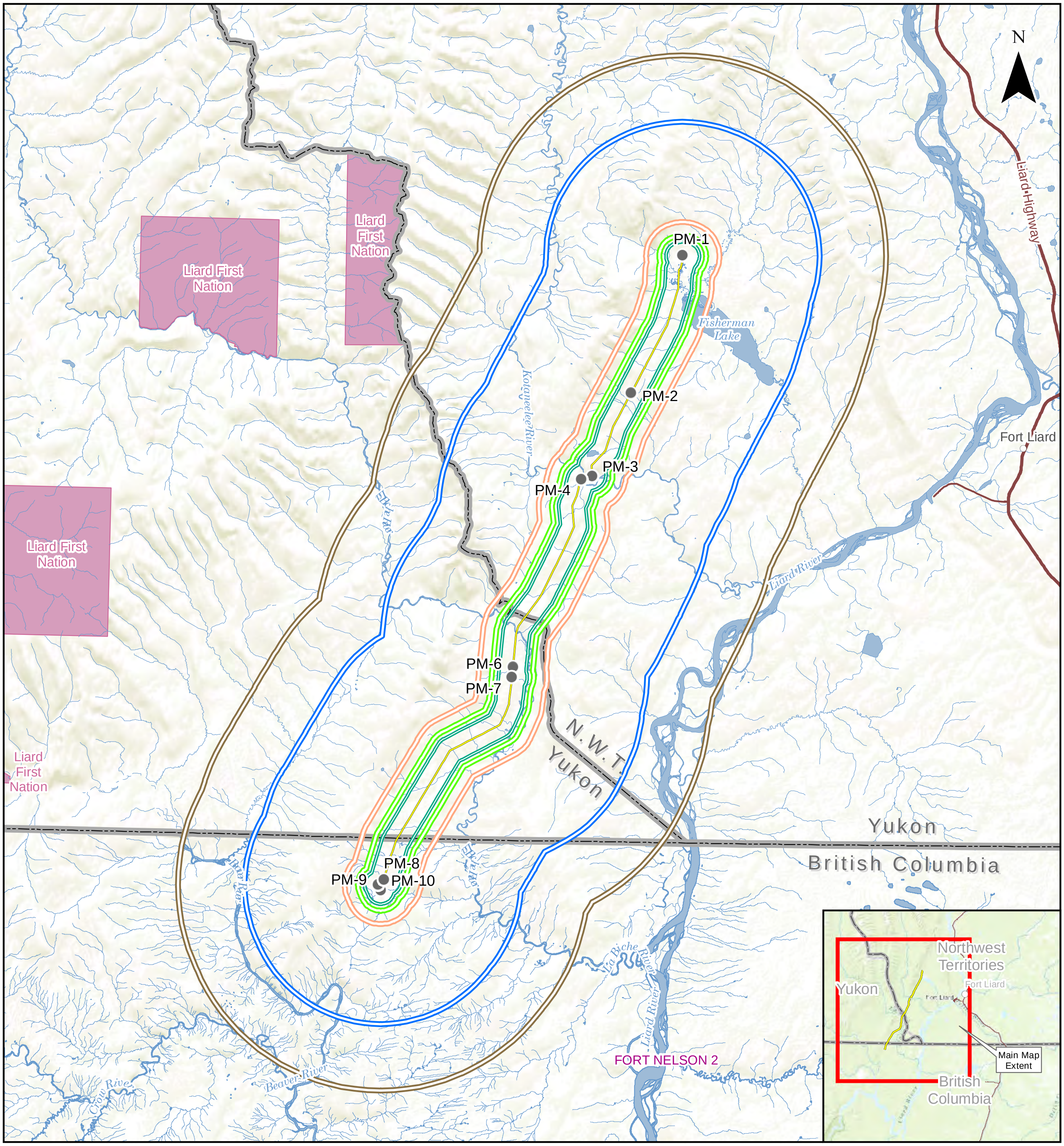

- Town/Village
- Site Feature
- Existing Pipeline
- Road/Highway
- Provincial Boundary
- Watercourse
- Water Body
- First Nations (Interim Protected Lands)

Local Study Areas

- Acoustic Environment RSA
- Air Quality RSA
- Vegetation RSA
- Water Quality and Quantity, Wetlands RSA
- Wildlife and Wildlife Habitat, TLRU, HORU, and Navigation and Navigation Safety RSA

FIGURE 4.5-2

BIOPHYSICAL REGIONAL STUDY AREA BOUNDARIES

POINTED MOUNTAIN PIPELINE ABANDONMENT PROJECT
WESTCOAST ENERGY INC.

ENBRIDGE

NAD 1983 UTM Zone 10N
Hillshade: TERA 2008; Hydro: BC FLNRO 2008 and NRCan 2007-2011 ; Provincial Boundary: ESRI 2005. First Nations: Yukon Government 2010.

SCALE: 1:400,000
0 2.5 5
Kilometers
(All Locations Approximate)

Jacobs

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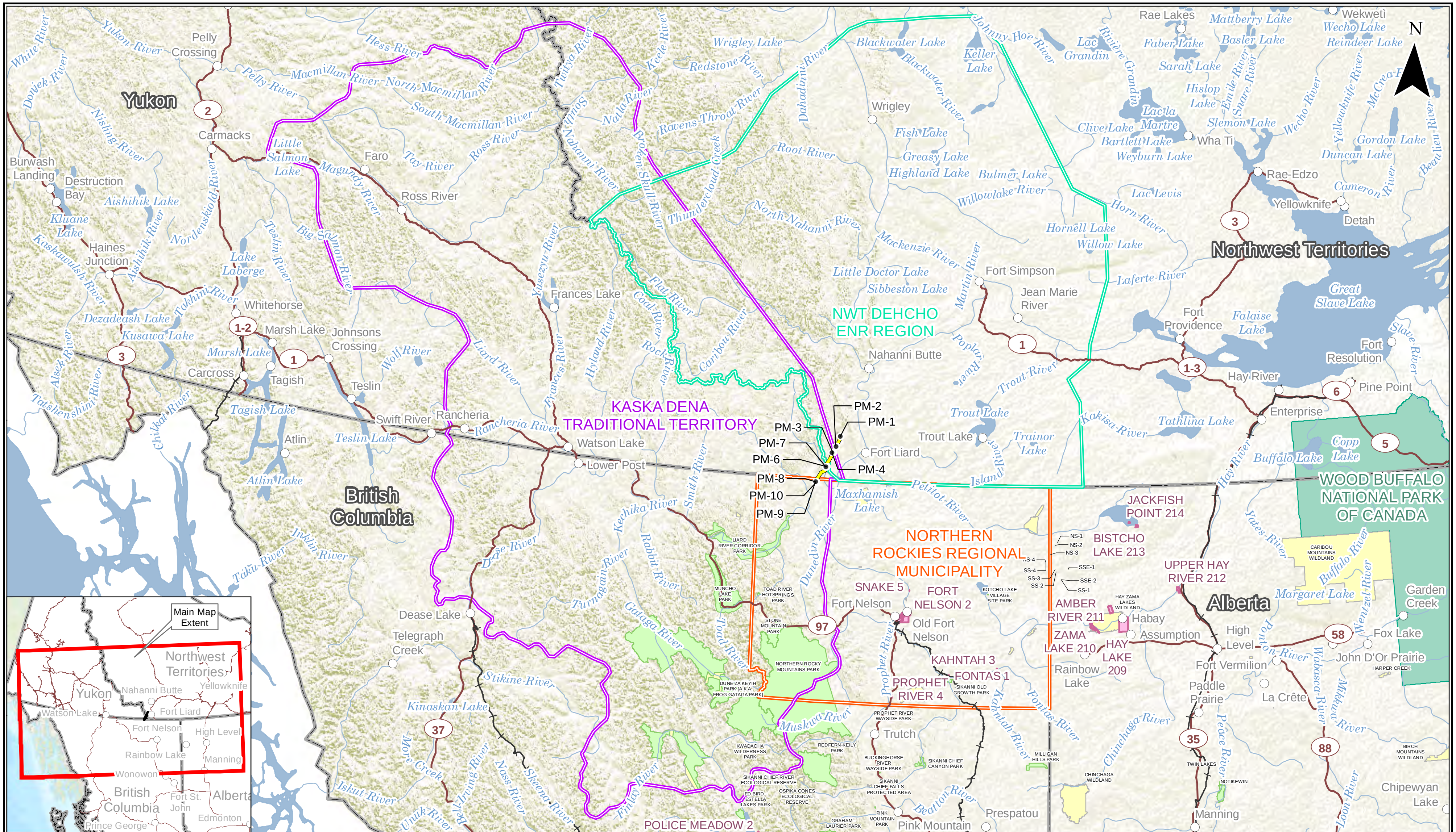

Settlement/Town/City	Provincial Boundary	**Parks and Protected Areas**	**Regional Study Areas**
Site Feature	Watercourse	Ecological Reserve, Natural Area, PLUZ, Wildland Park and Provincial Recreation Area	Community RSA
Existing Pipeline	Water Body	Provincial Park	NWT ENR Region - Dehcho
Railway	Indian Reserve	National Park	Kaska Dena Traditional Territory
Highway/Road			

FIGURE 4.5-3

COMMUNITY SPATIAL BOUNDARIES

POINTED MOUNTAIN PIPELINE ABANDONMENT PROJECT WESTCOAST ENERGY INC.

ENBRIDGE

NAD 1983 UTM Zone 10N

Satellite Imagery: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community; Roads: NRCan 2014-2015; Railway: NRCan 2012; National Parks: NRCan 2017; Parks and Protected Areas: BC MFLNRO 2008 and AltaLIS 2012; Hydro: NRCan 2010; Indian Reserves: Government of Canada 2018; Provincial Boundaries: ESRI 2005; Municipal Boundaries: BC MFLNRO 2007 and AltaLIS 2016; Urban Areas: NRCan 2003.

SCALE: 1:5,500,000

0 50 100
Kilometers

(All Locations Approximate)

Jacobs

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4.5.2 Temporal Boundaries

The timeframes used in the assessment of the Project are defined as the temporal extent of interactions between the Project and the biophysical and socio-economic elements. The temporal context of this ESA encompasses:

- abandonment of the existing pipelines and existing associated infrastructure: the period of time required to complete physical abandonment activities; and
- abandonment in-place: the period of time following the completion of physical abandonment activities up to the completion of monitoring activities.

Subject to receipt of regulatory approval, Project activities are anticipated to commence in November 2022 and be completed by July 2023. At PM-1, PM-2, PM-3, and PM-4 Project activities will occur in the summer (June 2023 to July 2023). At PM-6, PM-7, PM-8, PM-9, and PM-10 Project activities will occur in the winter (November 2022 to April 2023).

The *Filing Manual* (CER 2021a) defines baseline information as the state of the environment, or the environmental or socio-economic setting for a particular element, providing a reference point for the element with which to compare future conditions and potential project effects. The assessment considers current conditions as the baseline for evaluating potential changes from the Project, including cumulative effects that could adversely affect environmental and socio-economic elements. Baseline data for the Project are summarized for each element in Sections 5 to 16. The setting informs the identification of Project interactions and known effect pathways to determine the potential effects for each element, which are also presented for each element in Sections 5 to 16.

4.6 Mitigation

Mitigation is considered to be the elimination, reduction, or control of a project’s adverse environmental effects, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or any other means (CER 2021a). This definition also applies to reducing or managing a project's adverse socio-economic effects. For the purpose of this assessment, an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

To verify that potential adverse environmental and socio-economic effects are reduced, and potential positive effects are enhanced during all phases of the Project, general and site-specific mitigation and enhancement measures have been proposed based upon current industry accepted standards, engagement with appropriate regulatory authorities, interested groups, individuals, Indigenous groups, and the professional experience of the assessment team.

Mitigation and, where applicable, enhancement measures are identified for each element assessed in Sections 5 to 16, as well as in the Project-specific EPP (Appendix B of this ESA) and the Environmental Site Information Sheets (ESIS) (Appendix C of this ESA). Since physical abandonment activities will be occurring in both summer and winter, key mitigation measures were identified for all seasons. In addition, various requirements and guidelines of appropriate regulatory authorities, and industry standards and guidelines, have been considered in this ESA, and the applicable documents are referenced in Sections 5 to 16.

4.7 Evaluation of Residual Effects

The determination of significance of predicted likely residual effects followed the guidelines and principles of the *Filing Manual* (CER 2021a), CEA Agency's Interim Technical Guidance: Determining Whether a Designated Project is Likely to Cause Significant Adverse Environmental Effects under the *CEA Act, 2012* (CEA Agency 2018a), Interim Technical Guidance: Assessing Cumulative Environmental Effects under the *CEA Act, 2012* (CEA Agency 2018b) and the CEA Agency Cumulative Effects Assessment Practitioners Guide (Hegmann et al. 1999). The agencies identify several possible methods for the determination of whether residual environmental or socio-economic effects are significant. These include:

- the use of regulatory environmental standards, guidelines, or objectives in relation to predicted residual effects;
- quantitative assessment of the predicted residual effects; and
- qualitative assessment of the predicted residual effects.

The *Filing Manual* (CER 2021a) indicates quantitative methods should be used, where practical; otherwise, qualitative methods can be used. Where there are no standards, guidelines, objectives, or other established and accepted thresholds to define quantitative rating criteria, or where quantitative thresholds are not appropriate, a qualitative method that is informed by relevant literature is considered to be the appropriate method for determining the significance of predicted residual effects.

The predicted residual effects of the Project were characterized according to a set of qualitative and quantitative criteria based on those identified by Hegmann et al. (1999). The criteria used in the analysis of predicted residual effects and their definitions are presented in Table 4.7-1.

The characterization of residual effects using the criteria ratings defined in Table 4.7-1 considered ecological and regulatory context. Context is informed by the setting information, as well as regulatory policy, guidelines, standards, thresholds or targets, and levels of existing disturbance relevant to each element. Context is particularly influential in the determination of magnitude ratings for socio-economic elements. For elements in which quantitative thresholds or targets are available, the magnitude rating is determined by, or strongly influenced by, the Project's effect relative to the threshold or target.

Table 4.7-1. Characterization of Residual Effects for Evaluation of Significance

Assessment Criteria	Definition
Direction	
Positive	Residual effect has a net benefit to the environment or socio-economic conditions.
Neutral	Residual effect has no net benefit or loss to the environment or socio-economic conditions.
Adverse	Residual effect has a net loss or is a detriment to the environment or socio-economic conditions.
Spatial Boundary	
Project Footprint	The land area directly disturbed by the physical abandonment activities, including associated physical works and activities for the right-of-way, associated facilities, and temporary workspace. The Project Footprint is the same for all elements included in this ESA.
LSA	The LSA varies with the environmental and socio-economic element being considered. The LSA includes the Project Footprint and extends beyond it to incorporate the area within which the element is most likely to be affected by the Project. The element-specific LSAs and rationale for their delineation are described in Sections 5 to 14 and are illustrated on Figures 4.5-1 and 4.5-2.

Table 4.7-1. Characterization of Residual Effects for Evaluation of Significance

Assessment Criteria	Definition	
RSA	The RSA varies with the environmental and socio-economic element being considered. The RSA includes the Project Footprint and LSA, and an additional area beyond the LSA boundaries where the predicted likely residual effects from the Project may act in combination with those of existing and reasonably foreseeable developments and activities to cause cumulative effects. The element-specific RSAs and rationale for their delineation are described in Section 5 to 14 and are illustrated on Figures 4.5-1, 4.5-2, and 4.5-3.	
Beyond RSA	The area extending beyond the RSA defined for each element.	
Temporal Context		
Duration (period of the predicted residual effect)	Immediate	Residual effect is limited to 2 days or less.
	Short-term	Residual effect is limited to the physical abandonment and reclamation phase or any 1-year post-abandonment.
	Medium-term	Residual effect extends up to 10 years post-abandonment of the existing pipeline and associated infrastructure.
	Long-term	Residual effect extends more than 10 years post-abandonment of the existing pipeline and associated infrastructure.
Frequency (how often the predicted residual effect would occur)	Rare	Residual effect occurs uncommonly or unpredictably (e.g., as a result of an accident or malfunction) over the assessment period.
	Isolated	Residual effect is confined to a specified phase of the assessment period.
	Occasional	Residual effect occurs intermittently and sporadically over the assessment period.
	Periodic	Residual effect occurs intermittently, but repeatedly, over the assessment period.
	Continuous	Residual effect occurs without interruption throughout the assessment period.
Reversibility	Reversible	Residual effect is reversible to pre-physical abandonment activities or equivalent conditions.
	Irreversible	Residual effect is permanent.
Magnitude - Residual Environmental Effects		
Negligible	Residual effects may not be detectable or are within the range of natural variability or inconsequential to the function, health, performance, or sustainability of the element.	
Low	Residual effects are detectable; however, they are well within environmental or regulatory standards, or both.	
Medium	Residual effects are detectable and may approach, but are still within, the environmental or regulatory standards, or both.	
High	Residual effects are beyond environmental or regulatory standards, or both.	

For many of the elements under evaluation, there are no specific environmental or socio-economic standards, guidelines, thresholds, targets, or objectives. Therefore, the determination of magnitude of the residual effects often entailed consideration of previous assessments of magnitude made by regulatory authorities. Magnitude is further defined per element in Sections 5 to 16, where applicable. In addition, determination of magnitude relied on the experience of the assessment team, informed by outcomes of previous projects with similar conditions and potential issues.

4.7.1 Confidence

The assessment team determines the level of confidence (i.e., certainty) in the assessment of predicted residual effects based on an understanding of cause-effect relationships and information pertinent to the Project area. The level of confidence is driven by knowledge of the interaction between the Project activities and the element, and an understanding of the effectiveness of mitigation to address the predicted adverse effects of this interaction. Where the assessment team does not have a high-level of confidence in the assessment of predicted residual effects, strategies such as using conservatively higher (i.e., precautionary) effect criteria ratings and adding additional monitoring are considered.

There is inherent uncertainty in the characterization of cumulative effects because of the predictive nature of those effects. This uncertainty is a result of the predictions and assumptions related to temporal and spatial interactions of the Project with other future projects and activities on the landscape that may or may not happen. The level of confidence of both residual and cumulative effects in the assessment is informed by:

- Project details, including location, scheduling, personnel and equipment requirements, and Project activities (Section 2);
- results of consultation and engagement with potentially affected stakeholders, Indigenous groups, and appropriate regulatory authorities (Section 3);
- results of Project-specific fieldwork and data collection;
- available literature relevant to the likely interactions and effect pathways;
- industry and regulatory guidelines; and
- success of mitigation implemented for previous pipeline projects with similar conditions and potential issues, and outcomes of those projects.

4.7.2 Significance Definition

The assessment team completed a determination of significance for the predicted residual effects based on a qualitative evaluation of all assessment criteria for each residual effect, which is referred to as a qualitative aggregation method (CEA Agency 2018a). Qualitative significance determinations incorporate professional judgement, which allows for the integration of all effects criteria ratings to provide relevant significance conclusions that are sensitive to context and that facilitate decision-making (Lawrence 2007). The assessment team consisted of discipline experts, experienced assessment practitioners, and senior reviewers. Since physical abandonment activities are similar in nature to routine pipeline construction activities, the evaluation of significance benefited from a review of select post-construction monitoring (PCM) reports from previous projects either completed in proximity to the Project, or where the Project encountered similar issues, for relevant residual effects.

For environmental elements, a residual effect is considered significant if the effect is predicted to be either of the following:

- irreversible and of high magnitude; or
- reversible, but long-term in duration, and of high magnitude.

For socio-economic elements, a residual effect is considered significant if the effect is predicted to be either of the following:

- high magnitude, reversible, and regional or beyond in extent; or
- high magnitude and irreversible, within any spatial boundary.

Where a predicted residual effect is determined to be significant, the likelihood of the significant residual effect's occurrence is further evaluated. A significant residual effect is not likely to occur if the probability is low. Alternatively, a significant residual effect is likely to occur if probability is high. In both circumstances, the outcome is determined through an understanding of cause-effect relationships and available information pertinent to the Project area.

4.8 Cumulative Effects Assessment Method

The scope of this Project-specific CEA reflects the guidance provided in Guide A.2.7 of the *Filing Manual* (CER 2021a) and is appropriate for the scale of the Project. Project-specific CEAs will determine whether the project under review is incrementally responsible for adversely affecting a given element (Hegmann et al. 1999). Project-specific CEAs may also assist municipal, provincial, and federal agencies by identifying requirements for additional planning, monitoring, or mitigation that are beyond the direct control of the proponent and need to be implemented or led by others. Therefore, the total cumulative effect on a given element from all actions will be identified; however, the CEA will also make clear to what degree the project under review is contributing to that total cumulative effect.

The CEA evaluates the predicted adverse residual effects of the Project (identified and assessed in Sections 5 to 14), in combination with existing and reasonably foreseeable effects arising from other projects and activities that have been or will be carried out in the element-specific LSA or RSA. Future projects considered in the assessment do not include potential or hypothetical projects where formal plans have not been disclosed. Subsection 4.8.2 describes the past, present, and existing activities and events that are reflected in the current conditions. Subsection 4.8.3 describes reasonably foreseeable activities and developments.

The Project CEA applies the following steps.

1) Evaluate the predicted adverse residual effects of the Project (identified and assessed in Sections 5 to 17).
2) Determine spatial and temporal boundaries for each environmental and socio-economic element where the predicted residual effects of the Project have the potential to act in combination with existing activities or reasonably foreseeable developments to have a cumulative effect.
3) Identify the existing activities and reasonably foreseeable developments that may act in combination with the residual effects of the Project.
4) Identify the predicted cumulative effects.
5) Where cumulative effects are predicted, consider additional technically and economically practical mitigation.
6) Determine the significance of cumulative effects based on the significance evaluation process outlined in subsection 4.8.

4.8.1 Identification and Assessment of Cumulative Effects

Scoping of the predicted residual effects to be included in the CEA helps focus it on issues that are nontrivial. While Hegmann et al. (1999, 2002), Finley and Revel (2002), and Antoniuk (2000, 2002), among others, support the idea of narrowing the scope of issues to those of regional concern and selecting Valued Ecosystem Components ("elements" in this ESA), Duinker and Greig (2006) recommend that project-scale environmental assessments should proceed on the assumption that all effects are cumulative.

The latter statement reflects the expectations of the CER, which are that each predicted residual environmental or socio-economic effect is evaluated for potential cumulative effects (Guide A.2.7 of the *Filing Manual* [CER 2021a]). Consequently, all the predicted adverse residual environmental and socio-economic effects are evaluated for potential cumulative effects for each element in Sections 5 to 17.

The CEA excluded predicted positive residual effects of the Project and the predicted residual effects from accidents and malfunctions and effects of the environment on the Project since they are considered unlikely. In addition, Table A-2 of the *Filing Manual* (CER 2021a) indicates predicted residual effects related to Physical and Meteorological Environment and GHG Emissions need not be subject to a CEA.

The depth of analysis of potential cumulative effects depends upon the relative contribution of the applied-for project to the predicted cumulative effects, as noted by the *Filing Manual* (CER 2021a). The Project's contribution to potential cumulative effects depends on various factors, such as:

- the source of the disturbance;
- the spatial and temporal boundaries;
- the resilience of the receiving environment; and
- the way in which disturbances interact in time and space.

The level of detail provided in the CEA reflects the extent to which a cumulative effect on an environmental or socio-economic element is probable, the likely scale or magnitude of effect, as well as the extent to which these effects can be accurately and reasonably described relative to the receiving environment.

An integrated approach was used for the CEA for the Project, which combines features of qualitative, fine-filter (i.e., detailed or in-depth), and coarse-filter (i.e., less detailed as to cover a larger geographic area) methods appropriate to the scope of the Project and associated issues (Antoniuk 2000; Magdych et al. 2002). The potential cumulative effects were assessed qualitatively and incorporated quantitative metrics to inform the understanding of the Project's contribution to cumulative effects.

Existing activities and disturbances or reasonably foreseeable developments and activities that are likely to interact with the predicted residual effects of the Project vary, depending upon the spatial boundaries identified for the specific environmental or socio-economic element, and temporal overlap with Project activities. As previously noted, future projects considered in the assessment do not include proposed or hypothetical projects where formal plans have not been disclosed.

4.8.2 Existing Activities and Disturbances

Existing activities and disturbances in the LSAs and RSAs for the various elements include:

- forestry (e.g., Forest Management Agreements [FMAs], Timber Harvest Plans [THPs] and Forest Management Units [FMUs]);
- oil and gas (e.g., pipelines, and oil or gas facilities);

- recreation (e.g., cross-country skiing, hiking, hunting, fishing, and snowmobiling);
- natural resource harvest (excluding forestry and energy development) (e.g., hunting, fishing, trapping, guide outfitting, and traditional and subsistence activities);
- transportation (e.g., resource and winter roads); and
- natural disturbances (e.g., wildfires) (Section 17, Assessment of the Effects of the Environment on the Project).

4.8.2.1 Forestry

Within the NWT, the Project is located in the Dehcho Region for forest planning. The Dehcho Region is one of three areas identified for commercial forestry in the NWT. Timber volume and forest inventory levels specific to the Dehcho Region are not publicly available, but commercial forestry is an allowable activity. Digaa Enterprises Limited has a FMA authorizing harvest of commercial timber within the Dehcho Region, near Fort Providence, 500 km northeast of the Project (Digaa Enterprises Limited 2015). There are currently no FMUs in the Project RSAs within the NWT (Government of the NWT 2021a).

Within the Yukon, the Project is located in the Watson Lake Region for forest planning. Commercial harvest occurs in the Watson Lake Region and is authorized by the Forest Management Branch of the Yukon Government using THPs. There are several THPs for the Watson Lake Region, however none are within the Project RSAs in the Yukon (Government of Yukon 2021a).

Within BC, the Project is located in the Northern Rockies Regional Municipality (NRRM) within the Fort Nelson Timber Supply Area covering approximately 9.8 million ha of land (Province of BC 2021a). As of 2019, the allowable annual cut (AAC) was established at 2,582,350 cubic metres (m^3) and will remain in effect for up to 10 years until a new AAC is determined (BC MFLNRORD 2019).

There are no active forest cut blocks for the Project Footprint in BC, and timber harvesting or other related activities are expected to be low (BC MFLNRORD 2020a). There are no Tree Farm Licences that fall within the RSAs established for the Project (BC MFLNRORD 2018a).

4.8.2.2 Oil and Gas

Oil and gas development is one of the main land use activities in the various RSAs established for the Project within the NWT and Yukon. In the NWT in 2018, natural gas production was 1.4 million cubic feet per day. This represented less than 0.1 percent of total Canadian natural gas production (CER 2021d). The southern NWT where the Project is located is estimated to have 48 trillion cubic feet of recoverable, sales-quality natural gas resources, mostly shale gas in the Liard Basin. Natural gas has historically been produced in southern NWT; however, production was suspended in 2015 for economic reasons. In the Yukon there are currently no natural gas production sites. Small volumes of natural gas were produced in the Kotaneelee field in southeastern Yukon where the Project is located until 2012, when production was suspended for economic reasons (CER 2021e).

Within the NRRM in BC, oil and gas production represents a strong economic force as the NRRM acts as the largest shale gas reserve in the province (NRRM 2020a). The BC government and the NRRM are currently working together to develop further long-term infrastructure for supporting oil and gas production in this area.

Oil and gas companies currently operating in the various RSAs for the Project in the NWT, Yukon, and BC include Paramount Resources Ltd. (Paramount) and NRM. Existing oil and gas activities expected to take place in the various Project RSAs include operations and maintenance activities for wells, pipelines, and facilities (e.g., pump stations, meter stations), and abandonment and reclamation activities.

4.8.2.3 Recreation

Current and ongoing recreational use of lands in the various Project RSAs in the NWT, Yukon, and BC may include camping, hiking, canoeing/kayaking, fishing, hunting, boating, snowmobiling, snowshoeing, and all-terrain vehicle use (NRRM 2020b). However, the number of recreational uses near the Project Footprint is likely low, as lands are predominately forested and difficult to access. The closest designated park, recreation area, or natural area to the Project is Maxhamish Lake Provincial Park and Protected Area, located approximately 40 km southeast of the Pointed Mountain Pipeline. Nahanni National Park, which is located approximately 51 km north of the Project in the NWT is the next closest. There are no designated parks or recreation or natural areas that are considered to overlap spatially or temporally with the Project.

4.8.2.4 Fishing, Hunting, and Trapping

There are ongoing activities related to fishing, hunting, and trapping in the various Project RSAs.

Within the NWT, the Project is located within Zone D of the NWT hunting regions (Government of the NWT 2021b) where hunting is allowed throughout defined times of the calendar year, based on the wildlife species hunted. Species hunted in the region include black bear, grizzly bear, wolf, wolverine, boreal caribou, Dall's sheep, white-tailed deer, mule deer, and moose, mountain goat and wood bison (Government of the NWT 2021b). Small game hunted includes groundhog, porcupine, northern flying squirrel, hare, marmot, ground squirrel, red squirrel, ptarmigan, grouse, and woodchucks. In addition, fur trappers are able to trap beaver, coyote, ermine, fisher, fox, lynx, marten, mink, muskrat, and otter.

Within the Yukon, the Project is located within Zone 11 of the Yukon hunting regions (Government of Yukon 2021b) where there are no hunting area restrictions, but hunting is allowed throughout defined times of the calendar year, based on the wildlife species hunted. Species hunted in the region include black bear, grizzly bear, wolf, wolverine, caribou, sheep, deer, moose, goat, and coyote (Government of Yukon 2021b).

Within BC, the Project is located in the Peace Region 7B hunting, trapping and fishing region within Wildlife Management Unit 7-53 (Province of BC 2021b). Trapping season runs from October 1 to May 31, depending on the species of furbearers being trapped. Species trapped in the region include beaver, black bear, coyote, fisher, fox, lynx, marten, mink, muskrat, raccoon, river otter, skunk, squirrel, weasel, wolf, and wolverine.

Hunting season runs from August 1 to November 30. Species hunted in the region include white-tailed deer, moose, black bear, wolf, cougar, coyote, wolverine, lynx, snowshoe hare, spruce and ruffed grouse, sharp-tailed grouse, common snipe, duck, and geese.

Wildlife Management Unit 7-56 includes the Liard River Watershed and fishing season for lakes and streams is dependant on the species that is being fished (Province of BC 2021c). Species of fish harvested in this unit include walleye, northern pike, yellow perch, and trout. There are no major lakes and streams used for sportfishing that are considered to overlap spatially with the Project.

The practice of subsistence hunting and traditional harvest holds a substantial cultural, social, and economic value to Indigenous groups, these activities remain an important activity for Indigenous groups within the Project area.

4.8.2.5 Transportation

Access on existing roads during physical abandonment activities will be via high-grade petroleum development roads and winter roads. Due to the remote location of the Project, public traffic on the secondary and access roads is unlikely. There are no NWT, Yukon, or BC airports or rail networks that are considered to overlap spatially with the Project.

4.8.3 Identification of Reasonably Foreseeable Developments

The *Filing Manual* (CER 2021a), Operational Policy Statement for Assessing Cumulative Environmental Effects under the *CEA Act, 2012* (CEA Agency 2018b) and the best practices approach described in the Cumulative Effects Assessment Practitioners' Guide (Hegmann et al. 1999) advise the inclusion of certain and reasonably foreseeable activities for CEA. The certain and reasonably foreseeable developments and activities identified for this assessment adopt this approach, using the following criteria.

- Certain – the activity or development will proceed, or there is a high probability it will proceed (i.e., the development is either under construction or has been approved)
- Reasonably foreseeable – the activity or development is expected to proceed (i.e., the development is in the process of obtaining approval and permits, or the proponent has publicly disclosed its intention to seek the necessary approvals to proceed)

The assessment includes all the certain and reasonably foreseeable activities and developments identified for each Project-specific RSA as of September 4, 2021, which are referred to herein as reasonably foreseeable activities or developments.

The sources reviewed to identify any projects or activities that could have cumulative interactions with the Project Footprint located in NWT include Mackenzie Valley Land and Water Board (MVLWB) (MVLWB 2021), Major Projects Management Office Inventory (Province of BC 2021d), CER (2021b), and Government of the NWT Environment and Natural Resources (ENR) (Government of the NWT 2021c).

The sources reviewed to identify any projects or activities that could have cumulative interactions with the Project Footprint located in Yukon include Yukon Environmental and Socio-Economic Assessment Board (YESAB) Registry (YESAB 2021) MPO (Province of BC 2021d), CER (CER 2021b), and Government of Yukon (Government of Yukon 2021c).

The sources reviewed to identify any projects or activities that could have cumulative interactions with the Project Footprint located in BC include the BC Environmental Assessment Office (BC EAO) (2021), BC Hydro (2021), (BC OGC 2021a) BC Ministry of Transportation and Infrastructure (BC MoTI 2021), CER (2021b), ECCC (2021a), Government of Canada (2021a), IAAC (2021), Province of BC (2021d), and local and regional websites (NRRM 2020c).

Some reasonably foreseeable developments are expected to have been completed prior to, or are scheduled to commence after, Project construction. Where construction schedules for reasonably foreseeable developments were not known, it was conservatively assumed that construction schedules are concurrent and overlap with Project construction activities. Reasonably foreseeable activities or developments are described in the following subsections and are grouped by the major economic activities. The following sections identify the reasonably foreseeable developments and activities that are likely to interact spatially or temporally with the Project.

4.8.3.1 Agriculture

No reasonably foreseeable agriculture and livestock developments (e.g., feedlots) with the potential to interact with the Project were identified.

4.8.3.2 Energy Transmission

No reasonably foreseeable energy transmission projects with the potential to interact with the Project were identified.

4.8.3.3 Forestry

No reasonably foreseeable forestry projects with the potential to interact with the Project were identified.

4.8.3.4 Mineral Resources

No reasonably foreseeable mineral resource developments with the potential to interact with the Project were identified.

4.8.3.5 Oil and Gas

No new oil and gas extraction projects were determined to be occurring within the Project RSAs. Paramount has been granted land use permits by the MVLWB to conduct abandonment, reclamation, and monitoring activities in the southwestern part of the NWT, within the Project RSAs.

In addition, NRM has existing pipelines in northeastern BC. NRM is expected to continue operations and maintenance activities, which will potentially interact temporally with the physical abandonment activities of the Project.

There are no new proposed oil and gas activities within the spatial boundaries of the Project.

4.8.3.6 Recreation and Tourism

No reasonably foreseeable recreation and tourism developments with the potential to interact with the Project were identified. For all Project RSAs, it is expected that the existing recreation and tourism activities described in subsection 4.8.2.3 will continue into the foreseeable future.

4.8.3.7 Settlement and Rural and Urban Development

No reasonably foreseeable settlements and rural developments with the potential to interact with the Project were identified.

4.8.3.8 Fishing, Hunting, and Trapping

For the purpose of the CEA, it is assumed that fishing, hunting, and trapping activities within the various Project RSAs in the NWT, Yukon, and BC will continue.

4.8.3.9 Transportation and Infrastructure

No reasonably foreseeable transportation or infrastructure projects with potential to interact with the Project were identified.

4.8.4 Mitigation Measures

Mitigation measures provided in the Project-specific EPP (Appendix B of this ESA) are guided by Enbridge Inc.'s (Enbridge's) Environmental Guidelines for Construction and Enbridge's EPP for Gas Transmission and Liquids Pipelines Engineering Projects – Canada, and based on industry best practices, which are implemented to mitigate Project-specific effects and often reduce the potential cumulative environmental effects. The goal of mitigation is to attempt to avoid or reduce the potential adverse effects to acceptable or non-significant levels. Mitigation measures are implemented to reduce the magnitude and extent of the effect, and to shorten the duration of the effect.

4.8.5 Cumulative Effect Characterization and Significance Determination

The overall potential cumulative effects on an element, and the Project's contribution to these cumulative effects, are described for each applicable element in Sections 5 to 14, using available context, literature, baseline data and, where applicable, quantitative analyses to inform the assessment. The predicted cumulative effects are characterized, and the significance is determined for each predicted cumulative effect, following the method previously outlined in subsection 4.7.2.

5. Assessment of Effects on Physical Environment and Soil Productivity

The assessment team conducted studies to establish the existing conditions (i.e., baseline setting) for physical and meteorological environment and soil and soil productivity from which the potential effects of the Project can be determined. The study was based on a review of existing literature, internet searches, consultation and engagement, field surveys, and expert opinion.

5.1 Scope of the Assessment

The physical and meteorological environment and soil and soil productivity are included in this assessment based on the biophysical elements identified in the *Filing Manual* (CER 2021a). The Project may impact physical features, including physiography, bedrock, topography, geology, or may result in a reduction of soil productivity or integrity. Therefore, the terrain, topography, and soil productivity or integrity are considered in this assessment and herein referred to as physical environment and soil productivity.

Inadvertent small spills during physical abandonment activities are assessed in Accidents and Malfunctions (Section 16, Assessment of Effects on Accidents and Malfunctions). Effects that have potential to occur as the result of meteorological conditions or extremes, or other natural hazards that may impact the Project are assessed in Effects of the Environment on the Project (Section 17, Assessment of Effects of the Environment on the Project).

5.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements was used to identify the circumstances and interactions to be considered for the assessment of the physical environment and soil productivity for all phases of the Project.

5.1.1.1 Federal

Canadian Energy Regulator Onshore Pipeline Regulations

Abandonment activities will be carried out in accordance with the *CER Act*, CER *OPR*s, and CSA Z662-19. Companies are responsible for meeting the requirements of the CER *OPRs* to manage safety, security, and environmental protection throughout the entire lifecycle of their facilities, from design, through to construction, operation, and abandonment including the protection of soil from contamination. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

Canada Energy Regulator Remediation Process Guide

The CER Remediation Process Guide (CER 2020c) provides companies with direction on how to protect the environment and human health against contaminant exposure related to CER-regulated facilities and infrastructure. The CER Remediation Process Guide includes a framework to effectively demonstrate the management and mitigation of potential environmental impacts associated with contaminant release as well as successful remediation and details on how to properly adhere to CER expectations.

5.1.1.2 Provincial and Territorial

The Project will comply with applicable provincial regulatory requirements in NWT, Yukon, and BC and generally follow the intent, where practical, of provincial and territorial objectives and guidance that may be relevant to the Project. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to physical environment and soil productivity may include the following.

Northwest Territories

- *Environmental Protection Act*

In NWT, the federal government has environmental jurisdiction to ensure the preservation, protection, or enhancement of the environment. The owner of the site is responsible for immediately reporting any incidents and ensuring an appropriate evaluation of the potential adverse effects and risks is properly completed to determine the proper actions are taken.

Yukon

- *Contaminated Sites Regulation* (Government of Yukon 2020a)

The Yukon *Contaminated Sites Regulation* establishes cleanup standards, processes for identifying and investigating contaminated sites, and permits for managing contaminated materials within the Yukon. If Westcoast encounters suspected or known contamination during or as a result of abandonment activities within the segment of the Pointed Mountain Pipeline in the Yukon, measures to assess and cleanup the contamination are included in the Yukon *Contaminated Sites Regulation* (Government of Yukon 2020a).

British Columbia

- *BC Contaminated Sites Regulation (BC Reg. 375/96, Environmental Management Act)*

The BC *Contaminated Site Regulation* sets the requirements for remediation in BC for sites that have become contaminated during past industrial activities that may have resulted in chemicals or toxic materials being spilled or deposited on land. Regulated under the BC *Environmental Management Act,* responsible parties can find guidance for contaminated site definitions, liability and associated compensation, remediation or relocation standards, and remediation plan approval and completion.

- *BC Environmental Protection and Management Regulation (EPMR) (BC Reg. 200/2010, BC Oil and Gas Activities Act [BC OGAA])*

The BC *EPMR* provides guidelines under the BC *OGAA*. The *EPMR* sets requirements for conserving soil by maintaining soil stability and minimizing the alternation of natural surface drainage during oil and gas activities. The *EPMR* also outlines restoration requirements for soil decompaction, soil handling to restore structure and drainage, erosion control and slope stabilization.

- BC Oil and Gas Commission (BC OGC) Environmental Protection and Management Guideline (EPMG) (BC OGC 2021f)

The BC OGC EPMG sets management guidelines for conserving soil during oil and gas activities. The EPMG requires the implementation of mitigation measures and practices to maintain slope stability, soil productivity, natural drainage patterns and erosion control (BC OGC 2021f). The EPMG outlines restoration requirements for slope stabilization, recontouring to restore surface drainage patterns, erosion control, regrading, soil handling (including stripping, topsoil replacement, soil amendments decompaction) to maintain soil productivity, vegetation establishment and reclamation success. The EPMG refers to the Certificate of Restoration Application and Restoration Verification Audit Program for all oil and gas wellsites and facilities to be remediated.

The EPMG provides additional guidance for mapping terrain hazards, restoration, and reclamation practices for disturbed soils, and identifying wetland soils.

5.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding the physical environment or soil and soil productivity have been raised.

Westcoast has also engaged potentially affected Indigenous communities through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no concerns regarding the physical environment have been raised.

Acho Dene Koe First Nation participated in the Phase I Assessment and Phase II Assessment conducted for the Project.

5.1.3 Potential Effects, Pathways, and Effect Indicators

Table 5.1-1 identifies the potential effect pathways of the Project on the physical environment and soil productivity during physical abandonment activities, and as a result of abandonment in-place.

Project effects on physical environment and soil and soil productivity may occur within all of the land uses encountered by the Project.

Table 5.1-1. Project Activities, Effect Pathways, and Indicators for Physical Environment and Soil Productivity

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in terrain	Physical abandonment activities may result in terrain and/or slope instability.	▪ Slope classes and extent ▪ Surficial geology and landforms ▪ Water erosion risk
	Excavations for removal of facilities may result in localized slumping and erosion.	
	Abandonment in-place may lead to subsidence caused by in-filling of the existing pipeline.	
Change in soil productivity	Soil handling and storage may lead to a loss of topsoil or admixing during Project activities.	▪ Topsoil and subsoil composition (e.g., texture or composition) ▪ Depth of topsoil (centimetres [cm]) ▪ Compaction and rutting risk ▪ Wind and water erosion risk ▪ Presence of stones in surface horizon ▪ Number, type, and extent of areas of previously recorded contamination ▪ Areas of deteriorated pipe
	Vehicle and equipment movement and soil handling may increase soil compaction, rutting, or pulverization during Project activities.	
	Excavations for removal of facilities may result in localized slumping.	
	Following vegetation clearing, soil loss may occur as a result of water or wind erosion.	
	Topsoil salvage handling and grading during Project activities may increase stoniness in surface horizons.	
	Clearing of vegetation or surface gravel, topsoil salvage, and grading may disturb historically contaminated soils during Project activities.	
	Frost heave (in areas of permafrost) or subsidence due to structure deterioration may occur over the right-of-way, resulting in drainage issues, causing reduced soil productivity.	
	Abandonment in-place may result in the pipeline becoming a preferred water conduit, causing reduced soil productivity from poor drainage or erosion, or as a result of the transportation of contamination.	

5.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 5.1-2 describes the remaining spatial boundaries for physical environment and soil productivity and the rationale for choosing them.

Table 5.1-2. Spatial Boundaries for Physical Environment and Soil Productivity

Element	Spatial Boundaries	Rationale
Physical environment and soil productivity	**Physical Environment and Soil Productivity LSA:** A 100-m buffer extending from the Project Footprint (Figure 4.5-1).	**Physical Environment and Soil Productivity LSA**: A Physical Environment and Soil Productivity LSA was established to incorporate the area in which the physical environment and soils are most likely to be affected by all phases of the Project. While most Project effects are expected to be localized within the Project Footprint, the Physical Environment and Soils LSA includes a 100-m zone of influence (ZOI), where effects may extend beyond the Project Footprint. The ZOI is defined as the area likely to be affected by all phases of the Project and incorporates the potential cumulative effects interactions that may extend beyond the Project Footprint. Potential effects and cumulative effects interactions are not anticipated to extend beyond the Physical Environment and Soil Productivity LSA. Therefore, no RSA was defined for these elements.

5.1.5 Ecological Context

Physical abandonment activities required for abandonment in-place will be conducted within the previously disturbed pipeline right-of-way. The potential for altering terrain is reduced through the implementation of appropriate excavation and soil handling techniques where slope or the potential for terrain instability may occur.

The potential for impacting soil productivity is reduced by the use of previously disturbed land for Project activities and minimizing ground disturbance. The Pointed Mountain Pipeline will be abandoned in-place and Westcoast has not identified any areas where the removal of buried piping is required. Contaminated soil will be remediated according to the Project-specific EPP (Appendix B of this ESA).

5.2 Existing Conditions for Physical Environment and Soil Productivity

5.2.1 Methods

Information collected for the existing conditions of the physical environment and soil productivity elements was obtained from Project-specific desktop reviews and soil surveys, existing literature, regulatory agencies, government databases and internet searches, all of which are cited in Section 21, References. A Phase I Assessment has been completed for the Project at locations where associated pipeline infrastructure will be removed.

5.2.2 Overview

5.2.2.1 Physical Environment Overview

Terrain and Geology

Geology, topography, drainage patterns, vegetation, soil texture, and soil placement influence terrain stability. Terrain stability is closely linked to erosion and is mainly a concern where sloping topography is encountered including plateaus, valleys, approach slopes, and the banks of watercourses. Bedrock geology can influence terrain stability on level ground (e.g., limestone and karst formation). The portion of the Project in the NWT is underlain by carbonate rock, making it susceptible to the processes that result in the creation of caverns and sinkholes and thus susceptible to effects on terrain stability.

Northwest Territories

In the NWT, the Project is located in the Liard Plateau of the Mackenzie Mountain Area physiographic region (Bostock 1967). Ranging from undulating to steep slopes, elevations range from 290 metres above sea level (masl) to 550 masl. Till blanket, fine-grained lacustrine sediments and undifferentiated colluvial sediments are the dominant surficial geology (NRCan 2021). The bedrock formation underlying the Project area is characterized by Upper Paleozoic Siliciclastic/Carbonate Shelf (Ootes et al. 2013).

This portion of the Project runs along the Canadian Cordillera's Foreland Belt's boundary with the Interior Plains (Wetmiller et al. 1988). Several thrust faults exist in this area, and seismic activity is known to occur, with a 6.6 magnitude earthquake occurring on October 5, 1985 and a 6.9 magnitude earthquake occurring on December 23, 1985 (Wetmiller et al. 1988). Both earthquakes occurred at the same epicentre, approximately 92 km north of PM-1 (Ootes et al. 2013; Wetmiller et al. 1988).

Yukon

In the Yukon, the Project area is located in the Fort Nelson Lowland of the Interior Plains physiographic region and the Liard Plateau of the Mackenzie Mountain Area physiographic region (Bostock 1967). Ranging from gently undulating to steep slopes adjacent to watercourses, elevations range from 380 masl to 620 masl. Till blanket is the dominant surficial geology (NRCan 2021). The bedrock formation underlying the Project area is characterized by the Fort St. John Group (Government of Yukon 2021c).

This geological formation was deposited in a marine offshore environment and consists of mudstone, siltstone, and shale fine clastic sedimentary rocks deposited in the Upper Cretaceous Age and the Cretaceous-Paleogene Boundary (formerly known as the Cretaceous-Tertiary Boundary) (Erdmer & Cui 2009).

British Columbia

In BC, the Project area is located in the Fort Nelson Lowland of the Interior Plains physiographic region (Bostock 1967). Gently undulating with deeply incised watercourses, till blanket and undifferentiated alluvial sediments are the dominant surficial geology with an average elevation of 420 masl (NRCan 2021). The bedrock formation underlying the Project area is characterized by the Fort St. John Group (Government of BC 1995).

This geological formation was deposited in a marine offshore environment and consists of mudstone, siltstone, and shale fine clastic sedimentary rocks deposited in the Upper Cretaceous Age and the Cretaceous-Paleogene Boundary (formerly known as the Cretaceous-Tertiary Boundary) (Erdmer & Cui 2009).

Meteorology and Natural Hazards

The Project area in NWT, Yukon, and BC is located within the Muskwa Plateau Ecoregion of the Taiga Plains Ecoprovince (referred to as an Ecozone in NWT and Yukon), which is part of the Sub-Arctic Ecodivision (Demarchi 2011).

This area is characterized by dry and cold conditions with long winters and short summers (Demarchi 2011). Average annual temperature is -1.0°C, with average summer highs of 23°C (July) and winter lows of -26°C (January). Winters are dominated by Arctic high-pressure systems, resulting in little precipitation and cold weather (Demarchi 2011). The summers are often cloudy with unstable weather conditions due to the area's location between the Arctic and Pacific air masses (Demarchi 2011).

Precipitation is largely convective, and thus little precipitation is accumulated (Demarchi 2011). Average annual precipitation is reported as 452 mm. Most precipitation occurs in June, which has an average monthly precipitation of 98 mm. April is the snowiest month, with a monthly average of 44 cm of snowfall. Drainage is poor and sometimes impacted by discontinuous permafrost, resulting in extensive wetlands and muskeg areas (Demarchi 2011).

The Project crosses three permafrost boundaries (Agriculture and Agri-Food Canada 2013).

- Approximately 45 percent of the Project crosses Sporadic Discontinuous (<10 percent) Permafrost: Low (<10 percent) Ground Ice, from KP 19.70 to 26.85 and KP 37.16 to 54.24
- Approximately 36 percent of the Project crosses Sporadic Discontinuous (50 to 90 percent) Permafrost: Low (<10 percent) Ground Ice, from KP 0.00 to 19.70
- Approximately 19 percent of the Project crosses Extensive Discontinuous (50 to 90 percent) Permafrost: Medium-Low (<20 percent) Ground Ice, from KP 26.85 to 37.16

Frost heave is common in moist, silty, thick active layers that are typical of areas with discontinuous permafrost. The potential occurrence of frost heave may result in changes in drainage patterns around the pipeline abandoned in-place.

The Sub-Arctic growing season is short, but plants can take advantage of up to 18.5 hours of daylight at summer solstice (Demarchi 2011). The Taiga Plains Ecoprovince has the least floral diversity of any BC Ecoprovince; extensive fires in recent years have decimated the would-be climax community of white and black spruce (Demarchi 2011). Instead, trembling aspen forests are common, as are balsam poplar and paper birch (Demarchi 2011). Lodgepole pine and jack pine occur in drier areas, though they are becoming uncommon (Demarchi 2011).

Northwest Territory Hazards

The NWT portion of the Project is located within a medium to medium-high risk seismic hazard range (NRCan 2015). The NWT portions range from high fire risk to moderate fire risk (NRCan 2009b). The Project is located within the Dehcho Forest Management Region, where the NWT is responsible for managing wildfires (NWT ENR 2020a).

Yukon Hazards

The Yukon portion of the Project is located within a medium-high risk seismic hazard range (NRCan 2015) and has moderate to high fire risk (NRCan 2009a).

British Columbia Hazards

The BC portion of the Project is located within a medium to medium-high risk seismic hazard range (NRCan 2015). The portion of the project in BC is in a high fire risk zone (NRCan 2009a) and is in the Prince George Fire Centre’s zone, where the province is responsible for managing fires (BC Wildfire Service 2021). The Project is not located within a defined floodway or flood fringe (Province of BC 2021c). No tornadoes have been recorded in the Physical Environment and Soil Productivity LSA (NRCan 2010).

Soil Overview

Northwest Territories

Approximately 29.4 km of the Project crosses through NWT. Soils at the north end of the Project (PM-1) primarily consist of poorly-drained Typic Mesisols (Trail River soil unit) associated with wetland land uses. Cyric and Hydric Fibrisols also occur (Government of Canada 1975).

North of the Kotaneelee River, soils along the Project are dominated by Orthic Gray Luvisols (Celibeta soil unit) developed over fine-textured lacustrine materials. These soils are associated with gently sloping and undulating (2 to 5 percent slopes) to moderately sloping and gently rolling topography (5 to 9 percent slopes). Brunisolic Gray Luvisols and Gleyed Orthic Brunisols also occur (Government of Canada 1975).

Soils south of the Kotaneelee River primarily consist of Orthic Gray Luvisols (Trout Lake and Pointed Mountain soil units) developed over fine-textured lacustrine materials along gently sloping and undulating terrain (2 to 5 percent slopes) and till deposits along steeply sloping and rolling topography (15 to 30 percent slopes) (Government of Canada 1975).

Regosols (Hillwash and Exposure soil units) soils at the Kotaneelee River are associated with steep erodible slopes and rock outcrops (30 to 60 percent) (Government of Canada 1975).

Rego Gleysols (Big Island and Fisherman Lake soil units) developed over fine-textured lacustrine materials are common in level to very gently sloping (0.5 to 2 percent slopes) terrain. Brunisolic Gray Luvisols, Gleyed Orthic Brunisols, and Gleyed Eutric Brunisols also occur (Government of Canada 1975).

Yukon

There are no detailed soil surveys available for the portion of the Project area in southeastern Yukon. Approximately 20.3 km of the Project crosses through Yukon. The Project is located in the Muskwa Plateau Ecoregion.

Soils in the Muskwa Plateau Ecoregion primarily consist of Brunisolic Gray Luvisols developed over fine-textured morainal or glaciolacustrine deposits. Brunisolic Gray Luvisols typically have an LFH layer, coarse-textured Bm or thin Bf horizon (<10 cm thick) developed overtop or within an eluvial A (Ae) horizon. Subsoils typically consist of the diagnostic illuvial B (Bt) horizon enriched with clay, over BC, C, or Ck horizons (Smith et al. 2004; Soil Classification Working Group 1998).

Well-drained Eutric Brunisols over coarse-textured parent materials also occur, while imperfectly to poorly-drained Orthic and Humic Gleysols are common in depressions and low laying areas. Wetlands are occupied by Organic Cryosols, Fibrisols, or Mesosols (Smith et al. 2004).

British Columbia

There are no detailed soil surveys available for the portion of the Project area in northern BC. Approximately 6.0 km of the Project crosses into BC. Soils in this region are dominated by Luvisols, consistent with available data coverage for the Yukon and NWT. Poorly-drained Gleysolic soils and organic soils associated with low laying areas and wetlands are also present (Government of Canada 2020b).

Soil Productivity

The pipeline segments located in NWT, Yukon, and BC do not encounter Agricultural Land Reserve land which is protected for long-term agricultural use (ALC 2018).

The Project is located mainly on forested land. In forested areas, the uppermost layer is often referred to as strippings which includes organic litter, fine woody material and the layer of topsoil above the mineral soils of the forest floor. Soil productivity is generally defined as the capacity for soil to support healthy plant growth. The capability of soil to support the plant growth is reduced if the soil becomes compacted. Compaction affects soil capability by reducing porosity, thereby restricting root penetration and elongation, and restricting air and water movement. Compaction will be greatest if soil handling and equipment movement occurs during wet/thawed soil conditions. If the soils are frozen during physical activities, compaction is not as likely to occur.

Wind erosion risk is considered negligible and therefore, unrated by Natural Resources Canada along the existing pipeline right-of-way (NRCan 2009b).

Potential of water erosion is influenced by factors such as texture, available soil moisture, organic matter content, surface cover, slope, and rainfall intensity. Moderate water erosion risk is generally associated with fine-textured topsoil where they occur on slopes greater than 5 percent. Project activities are generally considered to present low water erosion risk. Physical abandonment activities will be conducted within existing right-of-way and associated temporary workspace.

A search of the Federal Contaminated Sites Inventory (Treasury Board of Canada Secretariat 2021) did not return any results of known contamination along the right-of-way. The nearest known federal contaminated site to the Project is located approximately 14 km southeast of the existing Pointed Mountain Pipeline right-of-way (Treasury Board of Canada Secretariat 2021).

No sites of known contamination are listed on the Government of Canada's NWT Contaminated Sites List (Government of Canada 2013). However, a diesel spill was reported in 2018 at PM-1 (Pointed Mountain Launcher) located at KP 0.00, 95B5NW (NTS Grid 20k). A Phase I Assessment has been completed and delineation is ongoing as part of a Phase II investigation.

A search of the Yukon Contaminated Sites Database found one nearby contaminated site at the Kotaneelee Gas Plant, approximately 430 m west of the existing Pointed Mountain Pipeline right-of-way (Government of Yukon 2021f).

The BC Environmental Remediation Sites Database showed one area of known contamination at the Beaver River Field Well No. B-68-J (BC ENV 2021a) 431964.3 mE 6649127.1 mN (Zone 10) in the NE 1/4 of block J/94-N-16. This site is approximately 100 m from the existing Pointed Mountain Pipeline right-of-way.

Areas of potential concern and contaminants of potential concern are summarized in Table 5.2-1.

Table 5.2-1. Summary of Areas of Potential Concern and Associated Contaminant of Potential Concern

Site	Area(s) of Potential Concern	Contaminant(s) of Potential Concern
PM-1: Pointed Mountain Launcher (KP 0.00)	Aboveground infrastructure including: ▪ NPS 24 pig launcher and catch basin – pipe supports (ten) – NPS 20 S-bend riser – NPS 6 flare riser – NPS 4 aboveground flare piping, kicker piping and associated valves and actuator – NPS 20 aboveground piping and associated valves and actuators ▪ NPS 20 risers/elbows and check valve on the piping to the producer plant (two) ▪ NPS 2 nitrogen vent and valve on Pointed Mountain Pipeline ▪ Building, platforms, and stairs ▪ Cathodic protection ▪ Hydraulic fluid observed leaking from actuator system	Petroleum hydrocarbons (PHCs) fractions (F)1-F4, benzene, toluene, ethylbenzene, xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs)
	Former flare stack and flare pad	PHCs F1-F4, BTEX, PAHs Herbicides
	Diesel Tank and tubing (two) and tank support frames	PHCs F1-F4, BTEX, PAHs
	Generator building (location of 2018 diesel spill)	PHCs F1-F4, BTEX, PAHs
	Cathodic protection	Mercury (Hg) and polychlorinated biphenyls (PCBs) associated with electrical equipment
	Historic methanol (15,000 litre [L] capacity) and inhibitor tanks (location of tanks and type of inhibitor not provided)	Methanol, PHCs F1-F4, BTEX, PAHs
	Pig launcher, unidentified substance leaking from pig catch basin	PHCs F1-F4, BTEX, PAHs
	Area sprayed for broadleaf control	Herbicides
PM-2: Producer Tie-in	None identified	
PM-3: N2 Vent	None identified	
PM-4: N2 Vent	None identified	
PM-6: Producer Tie-in	Aboveground infrastructure including: ▪ NPS 2 and NPS 6 hot tap riser from Pointed Mountain deactivated pipeline ▪ Pipe support (four) ▪ NPS 6 S-bend riser ▪ NPS 2 and NPS 6 aboveground piping and valves from Pointed Mountain Pipeline to bypass ▪ Tie-in to meter building: NPS 2 and NPS 6 aboveground piping and valves	Hydrocarbons (including bioavailable petroleum hydrocarbons, light extractable petroleum hydrocarbon [LEPH], heavy extractable petroleum hydrocarbon [HEPH], BTEX, PHC F1 to F4), PAHs

Table 5.2-1. Summary of Areas of Potential Concern and Associated Contaminant of Potential Concern

Site	Area(s) of Potential Concern	Contaminant(s) of Potential Concern
PM-7: Launcher	Aboveground infrastructure including: ▪ NPS 2 nitrogen vent and valves (two) ▪ NPS 20 S-bend riser ▪ NPS 24 pig launcher ▪ Stairs and platform ▪ NPS 20 piping, valves, and actuators ▪ NPS 20 mainline block valve stem ▪ NPS 6 mainline valve block blow-off piping and piping supports (two) ▪ NPS 6 flare piping, kicker piping, and associated valves and actuators ▪ NPS 6 S-bend riser (bypass line) ▪ NPS 6 bypass piping and valves from producer to launcher and flare ▪ Meter building ▪ Pipe support (14) ▪ Support structure and stairs for building ▪ Exterior electrical control structure	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Historic flare and flare pad (including NPS 6 flare riser and support posts)	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Diesel tank with soil staining beneath, tubing and tank support frames	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Generator building	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Historic use of methanol and inhibitor during operation (location unknown)	Diesel associated with inhibitor – Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs Methanol
	Area sprayed for broadleaf control	Herbicides
PM-8: Aboveground Riser	NPS 2 aboveground pipe elbow and support	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Former flare and flare pad	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Location of former receiving barrel. Exact location of former barrel in right-of-way unknown.	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
PM-9: Aboveground Riser	NPS 20 aboveground pipe elbow – capped with leaking substance	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Concrete pipe supports (former pig supports)	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Red drum (contents unknown) in its side near concrete supports	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Areas sprayed for broadleaf control	Herbicides

Table 5.2-1. Summary of Areas of Potential Concern and Associated Contaminant of Potential Concern

Site	Area(s) of Potential Concern	Contaminant(s) of Potential Concern
PM-10: Receiver	Aboveground infrastructure including: ▪ NPS 20 S-bend riser, crossover piping, valves, and actuators ▪ NPS 24 pig receiver ▪ Pipe support (three) ▪ Launcher platform and stairs ▪ NPS 20 crossover piping, valves, and actuators ▪ NPS 4 flare piping, receiver line piping, kicker piping, and associated valves and actuators	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs
	Former tanks: Methanol (15,000 L), diesel, inhibitor (location of tanks and type of inhibitor unknown)	Hydrocarbons (including VPH, LEPH, HEPH, BTEX, PHC F1-F4), PAHs Methanol
	Areas sprayed for broadleaf control	Herbicides

Note:
Hydrocarbon contaminant of potential concern to be investigated varies by jurisdiction (i.e., NWT, Yukon, BC)

Over time, the abandoned pipeline may corrode such that eventual perforation may influence the flow of water along the pipeline segments abandoned in-place through the creation of a water conduit. The water conduit has the potential to alter soil productivity through the transportation of contaminants, either from unidentified existing contamination along the route or as a result of contaminants derived from the pipeline epoxy coating.

However, pipeline corrosion is known to be slow and localized, with structural failure of the pipeline not likely to occur for decades or even centuries (NEB 1996). Abandonment in-place may result in the pipeline becoming a preferred water conduit, causing reduced soil productivity from poor drainage or erosion, or as a result of the transportation of contamination. However, it is not anticipated that the pipeline segments abandoned in-place will create preferential flow along the entire right-of-way (Pipeline Abandonment Steering Committee 1996; Det Norske Veritas 2010; AMEC 2017).

Frost heave may increase uplift on an abandoned pipeline due to the reduction of heat from the surrounding soil compared to an operating pipeline (PTAC 2016); however, frost heave is generally experienced within the top 120 cm of soil that freezes perennially (Broll and Tarnocai 2020). The pipeline was constructed with a minimum depth of 0.9 m (1.2 m at watercourse crossings). Westcoast has identified hazards (e.g., pipe exposure), evaluated associated risks, and developed controls and communication protocols for hazards identified.

5.3 Project Interactions with Physical Environment and Soil Productivity

Table 5.3-1 identifies the Project components that may interact with Physical Environment or Soil Productivity to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 5.6. A justification for no interaction is provided following Table 5.3-1.

Table 5.3-1. Project Interactions with Physical Environment and Soil Productivity

Project Activities	Project Interaction	
	Change in Terrain	Change in Soil Productivity
Pointed Mountain Pipeline		
Physical Abandonment	-	✓
Abandonment in-place	-	✓

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

5.3.1 Project Interactions Scoped Out of Further Consideration

5.3.1.1 Change in Terrain

There are no anticipated changes related to terrain as a result of physical abandonment activities since removal activities will be conducted at sites mostly within existing pipeline rights-of-way on generally level terrain. Abandoning the existing pipeline in-place is not anticipated to create a change in terrain, since the buried pipeline is expected to be stable over the long-term (Pipeline Abandonment Steering Committee 1996; Det Norske Veritas 2010; AMEC 2017).

5.3.1.2 Mitigation

Westcoast intends to implement minimal surface disturbance construction practices (i.e., limiting ground disturbance to the physical abandonment locations). Physical abandonment activities will be conducted under frozen and non-frozen conditions.

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on soil productivity. Contaminated soil encountered during physical abandonment activities will be addressed in accordance with the requirements set out in the CER Remediation Process Guide (CER 2020c). The Project-specific EPP (Appendix B of this ESA) includes environmental commitments and mitigation measures. Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons. Table 5.3-2 identifies these key mitigation measures for each effect pathway identified for Project components.

Table 5.3-2. Key Mitigation Measures for Each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in soil productivity	Soil handling and storage may lead to a loss of topsoil or admixing during Project activities.	Consult the Environmental Inspector (EI) before salvaging topsoil to the colour/texture change (e.g., transition layer), plough layer, bottom of sod or duff layer, or 10 cm, whichever is deepest, unless otherwise specified by the appropriate regulatory authority.
		Where soil layers are not readily distinguishable by colour the EI will advise on the depth of topsoil to be salvaged based on the soil survey results (if available) and an evaluation of soil texture and structure.
		Where there is little to no topsoil on bush land, salvage all available root zone material, to the colour change, or to 15 cm, whichever is greatest.
		Store topsoil within the Project Footprint boundaries, in a manner that avoids admixing of topsoil and spoil. Confirm subsoil is not collected with topsoil during salvage.
		Avoid admixing by maintaining separation between the topsoil/peat piles and the subsoil.
		A Westcoast Representative or EI should oversee topsoil salvage in areas where there is poor colour change between topsoil and subsoil, there are erodible soils and/or, there is uncertainty about the depth of topsoil salvage.
		Where soil layers are not readily distinguishable by colour the EI will advise on the depth of topsoil to be salvaged based on the soil survey results (if available) and an evaluation of soil texture and structure.
		Store topsoil within the Project Footprint boundaries, in a manner that avoids admixing of topsoil and spoil. Ensure subsoil is not collected with topsoil during stripping.
		Grade snow over the access, if rough, to improve driving conditions; and either grade the spoil pile area or grade snow over the spoil pile area to facilitate removal of spoil during backfilling.
		Limit removal of snow from the spoil areas. Remove excess snow that could interfere with backfilling operations. An 8 to10 cm buffer layer of snow may be left in place to avoid topsoil/subsoil mixing during backfilling.
		Backfill the construction area without mixing spoil with the topsoil pile.
		Frozen conditions: Maintain snow cover over the area to be salvaged as long as practical, as an insulator. Remove snow immediately prior to topsoil salvage and windrow to the edges of the Project Footprint.

Table 5.3-2. Key Mitigation Measures for Each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in soil productivity (cont'd)	As above	**Frozen conditions:** Remove or pack snow on the work area to increase frost penetration into the soil in the winter. In mid- to late- winter, pack snow on the work area to avoid premature thawing of the upper soils.
		Frozen conditions: Use specialized equipment capable of accurately separating topsoil from subsoil when salvaging topsoil during frozen conditions. On rare occurrences, mulching of frozen topsoil may be necessary for proper separation. Discuss this practice with the EI and the Project Environment Lead (PEL) prior to implementation to identify scenarios where this technique is suitable.
	Vehicle and equipment movement and soil handling may increase soil compaction, rutting, pulverization, or during Project activities.	Rip compacted subsoils, temporary access trails and soils damaged during wet weather to a depth of 30 cm prior to topsoil replacement. If soils are moist, postpone ripping until dry to ensure that the soils fracture when ripped.
		Blade rutted subsoils flat prior to soil replacement.
		Implement the use of the following measures to reduce the potential for compaction and/or rutting: ▪ Use of construction matting ▪ Planning activities around daily temperature fluctuations ▪ Monitoring dewatering requirements ▪ Soil compaction relief following completion of activities
		If weather conditions prevent effective soil decompaction treatment, perform soil decompaction through the topsoil to a deeper depth when soils become dry enough for effective treatment. If decompaction cannot occur through the topsoil to the required subsoil depth, the topsoil will be stripped prior to decompaction when conditions are suitable.
		Restrict construction traffic where the potential for pulverization of soil or sod is high. Provide alternate access to the Project Footprint, if practical, to avoid unnecessary travel.
		Consider salvage of topsoil where heavy traffic is anticipated as well as extremely dry areas to reduce loss of soil structure.
		Provide alternative access to the construction disturbance area to avoid areas prone to soil/sod pulverization.
		Salvage areas of topsoil before pulverization worsens.

Table 5.3-2. Key Mitigation Measures for Each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in soil productivity (cont'd)	Excavations for removal of facilities may result in localized slumping.	Use thaw-stable materials as backfill, or as otherwise approved by a geotechnical expert. Where spoil material has high ice content, approved imported backfill material may be required.
		If multiple lifts of soil were salvaged to maintain soil quality, these must be replaced in their original order.
		Regrade areas with vehicle ruts, erosion gullies, or where excavation areas have settled.
	Following vegetation clearing, soil loss may occur as a result of water or wind erosion.	Confirm erosion control measures are in place at wetlands and watercourse crossings prior to commencing grading (EPP Figure 3, Installing Silt Fence).
		Install temporary berms on approach slopes to watercourses and wetlands and erect silt fence or equivalent temporary erosion/sediment control device near the base of approach slopes to watercourses immediately following grading (EPP Figures 3 and 4).
		Install temporary erosion and sediment control devices (ECDs) (e.g., silt fences) within 24 hours of backfilling the wetland crossing. Verify silt fences have been installed properly, are solid and filter fabric is tight (EPP Figure 3, Installing Silt Fence).
		Postpone replacing topsoil during wet weather or high winds to prevent damaging soil structure or erosion of topsoil.
		To reduce drifting soils and loss of topsoil in areas prone to wind erosion, spread wood chips, sow a fast-growing ground cover, and walk down tree and shrub debris over exposed soils.
		Walk down topsoil pile and pile snow over the topsoil pile to reduce the risk of wind erosion during the winter. Consider watering down the topsoil windrow if snow is not available.
		If winter conditions prevent final cleanup and topsoil restoration, the area will be stabilized and temporary ECDs will remain in place until installation of permanent erosion control measures is complete. Depending on site and weather conditions, Westcoast may require the use of dormant seeding, mulching, and/or installation of erosion control blankets on stream banks or other sensitive locations in accordance with EPP Section 9 – Erosion and Sediment Controls.
		Where soil is fine-grained and/or of high ice content on permafrost terrain, implement erosion control measures as quickly as practical after surface disturbance.

Table 5.3-2. Key Mitigation Measures for Each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in soil productivity (cont'd)	Topsoil salvage handling and grading may increase stoniness in surface horizons.	Remove stones from disturbed subsoil to achieve equivalence with the surrounding off right-of-way subsoil. Dispose of stones at locations approved by the appropriate land/regulatory authority.
		Remove stones from disturbed topsoil to achieve equivalence with the surrounding off right-of-way topsoil. Dispose of stones at locations approved by the appropriate regulatory authority.
	Clearing of vegetation or surface gravel, topsoil salvage, and grading may disturb historically contaminated soils.	If hydrocarbon sheen is observed, implement the mitigative measures presented in EPP Section 23 – Contaminated Soils and Water. If evidence of contamination is present, contact the EI and Construction Manager (CM) immediately.
		During planning, background records will be reviewed for locations of known historical leaks and contamination within a 1 km radius of the Project site.
		Consider soils contaminated if free product is present, the soil is a notably different colour than the surrounding soil (black, shades of gray, blue, and green), hydrocarbon odours are present, or there is sheen on excavation water. Notify the EI and CM immediately.
		If suspected contaminants are encountered, the EI will immediately notify the CM and PEL. Sampling or other investigation may have to be done to determine the type and extent of contamination.
		The PEL is responsible for notifying the appropriate regulatory authorities. The PEL will assist with the investigation and disposal of contaminated materials.
		Separate any soil suspected of contamination from productive topsoil and subsoil. Maintain separate storage piles of each soil. Store soils suspected of contamination within a bermed and lined containment cell (polyethylene sheeting or equivalent). Locate contaminated soil storage piles a minimum of 100 m from any permanent waterbody and in an area that does not have an excessive slope or risk of flooding or as approved by Westcoast. Label and/or install signs at the contaminated stockpiles so the contents (subsoil or topsoil) of each pile can be readily identified.
		Implement measures outlined in the Phase II Assessment for the Project. Contaminated soils will be avoided during decommissioning activities or remediated where warranted.
		Confirm qualified personnel collect (or arrange to have collected) samples and GPS coordinates of each soil sample and stockpile suspected of contamination.

Table 5.3-2. Key Mitigation Measures for Each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in soil productivity (cont'd)	As above	Identify a local licensed landfill able to receive soils if contamination is confirmed by lab analysis. Dispose of soil that does not meet applicable regulatory criteria at a licensed landfill. Obtain waste acceptance at the proposed disposal facilities for each location anticipated to contain contaminated soil and/or groundwater. Wherever practical, have disposal acceptance for all wastes anticipated during construction in place prior to initiation of the Project.
		If immediate direct haul to a disposal site is not practical, develop procedures for temporary storage of contaminated soils.
		Record of the suspected contamination discovery, sampling, mitigation, reporting and any disposal should be documented in detail within the EI daily reports.
	Subsidence due to pipeline deterioration or frost heave may occur over the right-of-way, resulting in drainage issues, causing reduced soil productivity.	Westcoast will conduct PCM following the completion of abandonment activities. The abandonment sites will be assessed for success of reclamation activities and reclamation deficiencies will be recorded and corrected.
		The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils and reclamation success will be identified and records maintained for any remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
	Preferred water conduit where pipe has been abandoned in-place, causing reduced soil productivity from poor drainage or erosion, or as a result of the transportation of contamination.	Westcoast will conduct PCM following the completion of abandonment activities. The abandonment sites will be assessed for success of reclamation activities and reclamation deficiencies will be recorded and corrected.
		The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.

Table 5.3-2. Key Mitigation Measures for Each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in soil productivity (cont'd)	As above	Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions, or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records maintained for any remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contain the complete set of mitigation, including key mitigation listed in this table

5.4 Potential Effect Pathways Not Carried Through for Further Assessment

Potential residual effect pathways related to the soil productivity are expected to be avoided through the implementation of mitigation measures described in Table 5.5-1 and the EPP (Appendix B of this ESA). Westcoast intends to implement minimal surface disturbance construction practices (i.e., limiting ground disturbance to the physical abandonment locations). Physical abandonment activities will be conducted under frozen and non-frozen conditions.

Due to the limited scale and transient nature of physical abandonment activities and the application of mitigation, some residual effects as a result of physical abandonment activities and abandonment in-place are expected to be avoided or would be negligible and are not carried forward for further assessment. The potential residual effect pathways that are expected to be avoided through the implementation of mitigation measures, physical abandonment activities being conducted under both frozen and non-frozen conditions, or both, for:

- change in soil productivity due to:
  - soil compaction, rutting, or pulverization as a result of vehicle and equipment movement and soil handling;
  - localized slumping due to excavation for removal of facilities;
  - increased stoniness in surface horizons as a result of topsoil handling and grading;
  - disturbance of historically contaminated sites as a result of physical abandonment activities; and
  - abandoned pipeline acting as a preferred water conduit reducing soil productivity from poor drainage or erosion, or as a result of the transport of contaminants.

Potential effects that remain following the implementation of mitigation measures are carried forward for further assessment.

5.5 Assessment of Residual Effects on Physical Environment and Soil Productivity

An effect on soil productivity may remain after the implementation of mitigation. The potential residual effects include:

- change in soil productivity due to:
  - loss of topsoil or admixing due to soil handling and storage;
  - soil loss as a result of water or wind erosion; and/or
  - drainage issues as a result of frost heave or soil subsidence.

5.5.1 Change in Soil Productivity

Residual effects on soil productivity due to pipeline abandonment and decommissioning may occur as a result of ground disturbance activities including vegetation clearing, soil handling and storage, and clean-up and reclamation activities.

5.5.1.1 Loss of Topsoil or Admixing Due to Soil Handling and Storage

During physical abandonment activities, it is likely that topsoil and subsoil mixing will occur as a result of soil disturbance. Topsoil and subsoil mixing can alter the mineral composition, textural properties, and structure of soil, therefore affecting soil productivity and the success of vegetation establishment and growth.

Poor clearing practices can lead to topsoil/subsoil mixing; however, effective topsoil salvage, proper storage, and careful handling can limit potentially adverse environmental effects. Selective topsoil salvage, storage, and replacement are recommended to support successful reclamation of all disturbed areas (Pettapiece and Dell 1996).

The area of topsoil to be salvaged along the Project Footprint will be limited to excavation areas required for physical work including removal of pipeline facilities (e.g., risers and tie-ins) and capping or plugging of the existing pipeline. Considering that the Project is located within a forested area, admixing associated with physical abandonment activities can be alleviated over time through natural processes (i.e., in the medium- to long-term); therefore, the residual effect is reversible.

Given the proven effectiveness of the mitigation outlined in Table 5.5-1, and the EPP (Appendix B of this ESA), it is anticipated with a high degree of confidence that the residual effect of a change in soil productivity due to a loss of topsoil or admixing during soil handling and storage will be low in magnitude and reversible (Table 5.6-1).

5.5.1.2 Soil Loss as a Result of Water or Wind Erosion

Disturbed soil will likely result in some minor surface erosion of topsoil until a stable vegetative cover can be established. Soil erosion can reduce soil productivity through subsequent admixing, loss of mineral soil, seed bank, and organic matter.

Based on the results of PCM programs for past projects, issues related to erosion can generally be resolved within 2 to 5 years following final clean-up; however, infrequent, usually minor instances of erosion may persist up to 10 years (i.e., medium-term in duration). Current mitigation measures proposed for the Project are similar to those implemented on previous projects. Consequently, minor surface erosion of topsoil is considered reversible and has a medium-term duration. Given the proven effectiveness of the mitigation outlined in Table 5.5-1 and the EPP (Appendix B of this ESA) to reduce the severity of slumping and erosion, this residual effect is reversible, and of low magnitude (Table 5.6-1).

5.5.1.3 Drainage Issues as a Result of Frost Heave or Soil Subsidence

Frost heave may increase uplift on an abandoned pipeline due to the reduction of heat from the surrounding soil compared to an operating pipeline (PTAC 2016); however, frost heave is generally experienced within the top 120 cm of soil that freezes perennially (Broll and Tarnocai 2020). The pipeline was constructed with a minimum depth of 0.9 m (1.2 m at watercourse crossings). Potential drainage issues due to frost heave will be localized. With the implementation of mitigation measures outlined in subsection 5.3 and the EPP, as well as site-specific repair work, the potential effect is reversible and therefore, not significant.

As a result of abandonment in-place, long-term corrosion or full pipeline collapse may lead to subsequent ground subsidence. Studies indicate any pipeline left is expected to result in long-term corrosion leading to full pipeline collapse and subsequent ground subsidence (Teevens and Robertson 2008; Det Norske Veritas 2010). However, studies conclude that full pipeline deterioration is unlikely along its entire length (NEB 1996; Det Norske Veritas 2010). In addition, the magnitude of ground subsidence for pipelines up to 323.9 mm (12¾ inches) in diameter is negligible and is expected to be within tolerable ranges for pipelines larger than 304 mm (12 inches) in diameter (NEB 1996; Det Norske Veritas 2010).

The Project consists of NPS 20 (508 mm) OD pipe. The likelihood of subsidence due to pipe deterioration or collapse is contingent on pipe size, land use, soil parameters, precipitation, and the rate of pipe deterioration over time (NEB 1996; Det Norske Veritas 2010). However, subsidence due to long-term corrosion or full pipeline collapse is still unlikely and may be localized and intermittent in occurrence (NEB 1996; Det Norske Veritas 2010).

With consideration to the current land use, the potential effect on soil productivity due to subsidence is considered of low magnitude. With the implementation of mitigation measures outlined in subsection 5.3 and the EPP, as well as site-specific repair work, the potential effect is reversible and therefore, not significant.

5.5.1.4 Summary of Residual Effects on Soil Productivity

Residual effects resulting in a change in soil productivity are predicted to be adverse in direction, low in magnitude, localized to the Project Footprint and LSA, medium- to long-term in duration and reversible. With a high degree of confidence, the predicted residual effect on soil productivity is not significant (Table 5.5-1).

5.5.2 Summary of Project Residual Effects

Table 5.5-1 summarizes the significance evaluation of the predicted residual environmental effects of the Project on soil productivity. As Table 5.5-1 notes, there are no situations of a residual environmental effect on soil productivity that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Consequently, it is concluded that the predicted residual effects of the Project on soil productivity are not significant. The residual effects criteria are presented in Table 4.7-1.

Table 5.5-1. Project Residual Effects on Soil Productivity

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context: Duration	Temporal Context: Frequency	Temporal Context: Reversibility	Magnitude	Significance
Change in soil productivity due to loss of topsoil or admixing due to soil handling and storage	Adverse	Project Footprint	Medium- to long-term	Isolated	Reversible	Low	Not significant
Change in soil productivity due soil loss as a result of water or wind erosion	Adverse	LSA	Medium-term	Isolated	Reversible	Low	Not significant
Change in soil productivity due to drainage issues as a result frost heave or soil subsidence	Adverse	Project Footprint	Short to long-term	Occasional	Reversible	Low	Not significant

5.6 Assessment of Cumulative Effects on Physical Environment and Soil Productivity

Existing environmental conditions reflect cumulative effects on the environment from past and present projects and physical activities. Past and present projects and physical activities that have been or are being carried out have influenced the existing conditions for soil productivity (subsection 5.2).

Subsection 4.8 describes other projects and physical activities that may act cumulatively with the Project. Table 5.6-1 identifies potential Project interactions with existing and reasonably foreseeable developments and activities that may have cumulative effects related to soil productivity. Where Project-related residual environmental effects act cumulatively with those from past, present, and reasonably foreseeable future projects and physical activities, a CEA is completed to determine their significance.

Table 5.6-1. Interactions with Potential to Contribute to Cumulative Effects on Soil Productivity

Other Projects	Potential Effects: Change in Soil Productivity Due to Soil Loss or Admixing	Potential Effects: Change in Soil Productivity Due to Localized Erosion
Present Projects, Physical Activity and Land Use		
Forestry	✓	✓
Oil and Gas	✓	✓
Recreation	-	-
Fishing, Hunting, and Trapping	-	-
Transportation	✓	✓

Table 5.6-1. Interactions with Potential to Contribute to Cumulative Effects on Soil Productivity

Other Projects	Potential Effects	
	Change in Soil Productivity Due to Soil Loss or Admixing	Change in Soil Productivity Due to Localized Erosion
Future (Reasonably Foreseeable) Projects and Physical Activities		
Forestry	✓	✓
Oil and Gas	✓	✓
Fishing, Hunting, and Trapping	-	-

Notes:
✓ = A potential interaction with the Project is identified.
- = No potential interaction with the Project is identified.

5.6.1 Changes in Soil Productivity

It is expected that the Project, existing, and reasonably foreseeable developments described in subsection 4.8 have the potential to act cumulatively to result in cumulative changes to soil productivity within the Physical Environment and Soil Productivity LSA.

Existing activities that have resulted in the loss or alteration soil productivity in the Physical Environment and Soil Productivity LSA include forestry activities, oil and gas development, and transportation. Activities typically alter soil productivity through permanent infrastructure and associated access roads, and temporary surface disturbances. Soil handling and potential effects on soil for the Project and reasonably foreseeable developments, including ongoing oil and gas activities, will cumulatively interact with existing conditions to result in cumulative changes in soil productivity within the Physical Environment and Soil Productivity LSA.

However, due to the limited scale of the Project, the predicted cumulative effect on soil productivity resulting from existing activities in combination with the Project and reasonably foreseeable developments is low in magnitude and not significant and is expected to persist at the same level of intensity with or without the Project.

The implementation of the proposed mitigation provided in Table 5.5-1 and the EPP (Appendix B of this ESA) will effectively reduce the Project's contribution to the cumulative change in soil productivity. It is expected that similar measures will be implemented, and environmental and industry guidelines will be followed for existing and reasonably foreseeable developments.

Many oil and gas developments in BC are required to be constructed and operated according to the *EPMR* (*BC Reg. 200/2010*, BC *OGAA*) and the EPMG (BC OGC 2021f), which contain similar measures to the EPP (Appendix B of this ESA). Where provincial or territorial guidelines are not available, the Project will default to industry best practices including guidance according to the CER.

Although total soil disturbance will increase as a result of the Project, the magnitude of the Project-specific contributions of effects is considered to be low as the estimated increase is of limited areal extent. Mitigation measures are to be implemented for soil conservation, which have been proven effective for similar projects. The Project-specific contributions of effects on soil productivity are considered reversible since the increased disturbance of soils associated with the Project is expected to approximate pre-disturbance productivity within 10 years (i.e., medium-term) and beyond (long-term) where drainage issues due to frost heave or subsidence are considered minor and not repaired.

Taking into account the land use, the predicted cumulative effect on soil productivity resulting from existing activities (in combination with the Project and reasonably foreseeable developments) is low in magnitude and not significant. The Project's contribution to the cumulative effect is low in magnitude at the regional scale. No mitigation beyond that already recommended in Table 5.5-1 and the EPP (Appendix B of this ESA) is warranted.

5.6.2 Summary of Residual Cumulative Effects on Physical Environment and Soil Productivity

Table 5.6-2 provides the cumulative effect characterization for each cumulative effect using the criteria defined in subsection 4.8.

Table 5.6-2. Project Cumulative Effects on Soil Productivity

Predicted Cumulative Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Change in Soil Productivity	Adverse	Project Footprint to LSA	Medium to long-term	Occasional	Reversible	Low	Not significant
Contribution from the Project to the cumulative effect	The Project will contribute to the cumulative change in soil productivity. With the proposed mitigation, the Project's contribution to the cumulative effect is of low magnitude at the regional scale and reversible, and short- to extended-term in duration.						Not significant

5.7 Conclusion

As Tables 5.6-1 and 5.6-2 note, there are no situations of a residual effect or cumulative effect that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Therefore, the predicted residual effects and cumulative effects are not significant.

Prediction confidence is high based on the professional judgement of the assessment team, the quality of public information pertinent to the Project area and Project data (which included field data collected for soil conditions), a good understanding of cause-effect relationships related to soil disturbance and soil productivity, and the proven effectiveness of mitigation measures, as demonstrated by existing PCM reports from past similar projects that include soil disturbance in forested areas.

5.8 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures outlined in the EPP (Appendix B of this ESA). Post- abandonment monitoring will occur at locations where physical abandonment activities are conducted. Monitoring methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details on monitoring are described in Section 19 of this ESA, Follow-up and Monitoring.

6. Assessment of Effects on Vegetation

The assessment team conducted studies to establish the existing conditions (i.e., the baseline setting) for vegetation, to determine the potential effects of the Project. The study was based on a review of existing literature, internet searches, consultation and engagement, field surveys, and expert opinion.

6.1 Scope of the Assessment

Vegetation is included in the assessment based on the biophysical elements identified in the *Filing Manual* (CER 2021a). The Project may result in changes to vegetation communities and vegetation species. Therefore, vegetation was selected as a valued component. The scope of the assessment of the effects on vegetation includes vegetation communities, rare vegetation species or rare ecological communities, forest condition, including forest maturity and forest pests, and weeds that have potential to occur in the Project area.

Rare vegetation species and rare ecological communities include:

- federally listed rare species in accordance with the *SARA* and COSEWIC;
- provincially/territorially listed rare species in accordance with the *Species at Risk* (*NWT*) *Act* and the BC *Forest and Range Practices Act* (*FRPA*); and
- provincially/territorially rare species and ecological communities ranked May Be At Risk in accordance with the NWT Conservation Data Centre (NWT CDC) Species General Ranking (Government of the NWT 2021c), on the tracking list of the Yukon Conservation Data Centre (Yukon CDC) (2019a), and on the BC Conservation Data Centre (BC CDC) Red and Blue lists (BC CDC 2021a).

6.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements was used to identify the circumstances and interactions to be considered for the assessment of vegetation for all phases of the Project.

6.1.1.1 Federal

Canadian Energy Regulator Onshore Pipeline Regulations

Abandonment activities will be carried out in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. Companies are responsible for meeting the requirements of the CER *OPRs* to manage safety, security, and environmental protection throughout the entire lifecycle of their facilities, from design, through to construction, operation, and abandonment including protection of soil from contamination, and the preparation of a revegetation strategy to achieve pre-abandonment conditions, keeping erosion control and soil stability as a priority. The buried pipeline left in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

Species at Risk Act

The *SARA* protects species listed as Extirpated, Endangered, and Threatened on Schedule 1 of the Act. The federal Cabinet establishes species included on Schedule 1 based on recommendations by COSEWIC and consultation with government, Indigenous groups, and the public. *SARA* applies to federal lands; however, it may also apply to other lands when provincial protection is deemed inadequate by the federal Minister of the Environment. Prohibitions included in *SARA* make it an offence to kill, harm, harass, capture, or take an individual of a vegetation species listed as Endangered, Threatened, or Extirpated on Schedule 1.

The prohibitions also make it an offence to possess, collect, buy, sell, or trade an individual, or damage/destroy the residence of one or more individuals of a species listed on Schedule 1. Measures to protect and recover a listed species are to be outlined in a Recovery Strategy or Action Plan for Endangered and Threatened species listed on Schedule 1, and a management plan for species listed as Special Concern on Schedule 1.

For Endangered and Threatened species, the Recovery Strategy or Action Plan must identify critical habitat, which is the habitat necessary for the survival or recovery of the species. *SARA* prohibits destruction of any part of critical habitat of Endangered or Threatened species.

Species that were designated at risk by COSEWIC before the creation of *SARA* must be re-assessed according to the criteria of *SARA* before they can be added to Schedule 1. These species are listed on Schedules 2 and 3 and are not yet officially protected by *SARA*.

6.1.1.2 Provincial and Territorial

The Project will comply with applicable territorial and provincial regulatory requirements in NWT, Yukon, and BC and generally follow the intent of provincial and territorial objectives and guidance that may be relevant to the Project. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to vegetation include the following.

<u>Northwest Territories</u>

Northwest Territories Species at Risk Act

The *Species at Risk (NWT) Act* applies to any wild animal or plant species managed by the Government of the NWT, on both public and private lands, including private lands owned under a land claims agreement. The federal *SARA* and the *Species at Risk (NWT) Act* are designed to work in a complementary fashion with other legislation and cooperatively with Indigenous Peoples to protect species at risk and their habitats. By the *Species at Risk (NWT) Act*, the Minister of Environment and Natural Resources is ultimately responsible to prepare and complete recovery strategies for listed Threatened species.

Northwest Territories Conservation Data Centre General Status Ranking

The NWT CDC contributes to an international biodiversity database as part of NatureServe to evaluate and rank the conservation status of species. The NWT General Status Rank identifies in a very general way which species are thought to be secure, which are sensitive and which species may be at risk and require more attention or investigation.

Species with a General Status Rank of “May Be at Risk” (equivalent to the NatureServe S-ranks of S1 to S2) are the highest priority for more detailed assessment by the NWT Species at Risk Committee (NWT SARC) or the COSEWIC. An NWT SARC or COSEWIC status is the result of a detailed assessment of the status of the species and identifies whether or not a species is at risk of becoming extinct. The General Status Rank helps prioritize which new species will be assessed in detail (Government of the NWT 2020a).

“May Be at Risk” Species are not protected by specific legislation; however, application of mitigation to these species is considered a best practice.

Northwest Territories List of Invasive Species of Most Concern

The NWT does not have legislation regarding invasive plants; however, invasive plants known to be of concern within the NWT are listed by NWT ENR in the Invaders in the Northwest Territories brochure (NWT ENR 2020b). Best practices to prevent invasive alien species from spreading are provided by the NWT ENR on their Invasive Alien Species website (NWT ENR 2020c) and include using weed-free soil and certified seed, planting native plants from a local northern seed source, and cleaning equipment.

Northwest Territories Forest Health

The NWT ENR monitors forest health conditions. The most recent Forest Health Report is from 2018 (Government of the NWT 2018a).

<u>Yukon</u>

Yukon *Wildlife Act*

The Yukon *Wildlife Act* list does not include any vegetation species (Government of Yukon 2021e).

Yukon Conservation Data Centre Tracked and Watched Lists

The Yukon CDC tracking list includes the vascular plants that are considered of conservation concern in the Yukon by the Yukon CDC, because they are elements that current information suggests are rare or of conservation concern due to threats to populations or habitats, or documented declines. Information on these plant species is actively tracked in their database (Yukon CDC 2019a).

The Yukon CDC vascular plant watch list includes a list of species for which more information is needed before a conservation status can be determined (Yukon CDC 2019b). Data are collected and entered into the database for retrieval as necessary, but not processed as element occurrences.

Tracked and watch-listed species are not protected by specific legislation; however, application of mitigation to tracked species is considered a best practice.

Yukon High Invasive and High to Medium Invasive Plants

The Yukon does not have legislation regarding invasive plants; however, invasive plants known to be of concern within the Yukon are ranked by the Yukon Invasive Species Council (YISC) and the list of High Invasive and High to Medium Invasive plants on their Invasive Plants by Invasiveness list (YISC 2020a) are of greatest concern. Best practices to control invasive species from spreading are provided by the YISC for each species (YISC 2020b).

Yukon Forest Health

The Yukon Ministry of Energy, Mines and Resources (EMR) monitors forest health conditions. The most recent Forest Health Report is from 2020 (Yukon EMR 2021).

<u>British Columbia</u>

British Columbia *Forest and Range Practices Act*

Species previously listed in the Identified Wildlife Management Strategy, are now listed in the *FRPA*. The goals of the *FRPA* are to minimize the effects of forest and range practices on Identified Wildlife (which includes vegetation and ecological communities), and to maintain their limiting habitats throughout their current ranges and, where appropriate, their historic ranges on Crown land.

British Columbia Conservation Data Centre Red and Blue Lists

The BC CDC assigns a provincial Conservation Status Rank to species and ecosystems according to the NatureServe ranking system. These Conservation Status Ranks are used to set conservation priorities and assign each species and ecosystem to the Red, Blue, or Yellow list. These lists also help to identify species and ecosystems that can be considered for designation as Endangered or Threatened. Red-listed species and ecosystems are at risk of being lost (Extirpated, Endangered, or Threatened). Blue-listed species and ecosystems are of concern because of characteristics that make them particularly sensitive to human activities or natural events.

Red- and Blue-listed species and ecosystems are not protected by specific legislation, however, application of mitigation to these species and ecosystems is considered a best practice. Yellow-listed species and ecosystems are at the least risk of extinction (BC CDC 2021a).

British Columbia *Weed Control Regulation*

The BC *Weed Control Regulation* includes lists of provincial weeds (Schedule A, Part I) and regional weeds (Schedule A, Part II). Provincial weeds are weeds that are designated as Noxious within all regions of BC. Regional weeds are ones that are designated as Noxious within the boundaries of corresponding Regional Districts, as identified in the BC *Weed Control Regulation*.

Noxious weeds must be controlled as per the BC *Weed Control Act.* In addition to the BC *Weed Control Regulation*, the Northern Rockies Invasive Plant Committee outlines disposal methods for invasive plants at the Northern Rockies Landfill (NRRM 2020d).

British Columbia Area-Based Analysis

The BC OGC has developed a process for managing the impacts of oil and gas activities, called area-based analysis (ABA). The Oil and Gas Activity Application Manual (BC OGC 2021b) states that CER projects located within northeast BC must consider the ABA approach. The ABA is a provincial tool designed to help evaluate the impact of oil and gas activities on environmental values, including the Old Forest Value.

British Columbia Old Growth Management Areas

The BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (BC MFLNRORD) established Old Growth Management Areas (OGMAs) in the BC *OGAA* and the EPMG.

Northeast Region Forest Health Strategy 2018-2019

The Northeast Forest Health Strategy provides a framework to coordinate and guide forest health activities within the Timber Salvage Areas (TSAs) of the Northeast Region while ensuring consistency with the existing legislative objectives, the provincial forest health strategies and guidelines, and the Omineca Forest Health Strategy. The Northeast Forest Health Strategy includes a ranking of forest pests and pathogens in the region and management control strategies (BC MFLNRORD 2018b).

6.1.1.3 Other Regulatory Guidance

Northwest Territories

The Dehcho Regional Land Use Plan provides Conformity Requirements (CRs) for Projects to receive authorization to ensure that new land uses approved by the Plan will help to achieve the vision and goals for the region. The Project is located in the Liard Range Special Management Zone (Zone 26), where oil and gas is a permitted use. CRs applicable to Vegetation include:

- **CR No.5**: Identifying important plant gathering areas and developing appropriate mitigation measures to ensure continued access for community use.
- **CR No.18**: Seed mixes used for revegetation will not include invasive plant species (as determined by the NWT ENR) and will include native plant species.
- **CR No.19**: Harvesting of timber for land uses other than forestry will not be permitted unless it can be demonstrated that the loss or waste of timber was reduced, and the local forestry operators or Indigenous groups have been notified so that they can undertake timber recovery.

Yukon

No regional land use plan exists for the Kaska Region.

British Columbia

The Fort Nelson Land and Resource Management Plan (LRMP) includes recommendations to revegetate disturbed areas using local native plant species and to rehabilitate previously disturbed forest land.

6.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding vegetation have been raised.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application and Section 13 of this ESA, Assessment of Effects on TLRU.

Acho Dene Koe First Nation has identified the TLRU LSA as an area important to the exercise of their Aboriginal and Treaty Rights. Liard First Nation use Kaska Traditional Territory for the exercise of TLU activities such as gathering plants and botanical resources for food, ceremonial, clothing, shelter, tools, medicinal and other purposes; and harvesting wood and forest resources for domestic purposes, selling, trading, bartering, and exchanging the products of resource harvesting. Acho Dene Koe First Nation requested replanting of native plant species during reclamation activities and engagement of Elders in developing reclamation plans. Fort Nelson First Nation requested engagement on reclamation plans.

6.1.3 Potential Effects, Pathways, and Effect Indicators

Table 6.1-1 identifies the potential effect pathways of the Project on vegetation during physical abandonment activities, and as a result of abandonment in-place.

Project effects on vegetation may occur within the following land uses: forests, wetlands, watercourse crossings, and shrubby lands. Although effects on vegetation occur across all land uses, effects are primarily concentrated within the forested (including regenerating rights-of-way), wetlands, and shrubland land uses for this Project.

Other negligible to low effects may occur within other land uses but are expected to be similar regardless of abandonment method chosen, or land use, and are not expected to be significant.

Vegetation effects for forested areas are considered in detail in this Section. Vegetation effects in wetlands are considered in detail in Section 8.

Table 6.1-1. Project Activities, Effect Pathways, and Indicators for Vegetation

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in vegetation communities	Physical abandonment activities (e.g., brushing) and removal of aboveground infrastructure will cause a loss or alteration of vegetation (i.e., trees, stumps, brush, and other vegetation).	▪ Forested vegetation communities are cleared or altered ▪ Previously observed rare ecological communities are reduced in size ▪ Late-successional forest is reduced in size ▪ Evidence of forest pest and pathogens ▪ Establishment of vegetation on the disturbance following construction
	Brushing during physical abandonment activities may cause a loss or alteration of rare ecological communities.	
	Abandonment in-place may result in eventual perforation of the pipeline, with the potential transport contaminants from the surrounding environment (e.g., soil contamination), pipeline material (e.g., polyethylene), or residual product to surrounding vegetation.	
Change in vegetation species	Brushing during physical abandonment activities may cause direct loss or alteration of rare vegetation populations.	▪ Previously observed rare plant populations are reduced in size, number, or density ▪ Weed density and distribution increase ▪ Previously unobserved weed species identified
	Transportation of equipment, workers and supplies, brushing, vegetation disposal, mowing, topsoil handling, backfilling, and clean-up activities during physical abandonment activities may indirectly alter vegetation species through the introduction or spread of invasive weed species.	

6.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 6.1-2 describes the remaining spatial boundaries for vegetation and the rationale for choosing them.

Table 6.1-2. Spatial Boundaries for Vegetation

Element	Spatial Boundaries	Rationale
Vegetation	**Vegetation LSA:** A 100-m buffer extending from the edges of the Project Footprint and on both sides of the pipeline centreline (Figure 4.5-1). **Vegetation RSA:** A 1-km buffer extending from the edges of the Project Footprint (Figure 4.5-2).	**Vegetation LSA**: A Vegetation LSA was established to incorporate the area in which Vegetation is most likely to be affected by all phases of the Project. Key considerations used to establish the spatial boundaries of the Vegetation LSA were the expected distance that changes in light, local hydrology, microclimate, dust effects, and other edge effects are expected to extend from a disturbed area. Although existing vegetation composition will only be altered on the Project Footprint, vegetation composition in areas adjacent will be affected by indirect effects resulting from clearing or surface profile alterations that have the potential to alter hydrology and, therefore, vegetation habitat. Vegetation may also be altered as a result of abandoning the pipeline in-place (e.g., transport of contamination) and the LSA is, therefore, extended on both sides of the centreline. The Vegetation LSA spatial boundary was established to ensure a conservative consideration of the distances that these effects are expected to extend. **Vegetation RSA**: The Vegetation RSA was established to incorporate the area where the direct and indirect influence of land uses, and activities could interact within Project-specific effects and may cause cumulative effects on vegetation. Key considerations used to establish the spatial boundaries of the Vegetation RSA included the separation distance used to distinguish one rare plant population from another, which is typically 1 km; the dispersal of non-native, invasive species to or from the Project Footprint; and the physical footprint of the Project within a regional landscape context.

6.1.5 Ecological Context

The Project is predominantly located in an area consisting of forested areas and wetlands. Vegetation concerns are related to vegetation and landscape health, wildlife habitat, and spread of weeds. Project activities have the potential to interact with native vegetation mainly through brushing, grubbing, grading, and revegetation. Issues related to vegetation can be limited in forested areas by reducing the area of disturbance, which is achieved, in this case, by conducting physical abandonment activities on the existing, previously disturbed right-of-way, to the extent practical.

Subject to receipt of regulatory approval, physical abandonment activities are planned to commence in summer 2023 for PM-1, PM-2, PM-3, and PM-4 and in November 2022 for PM-6, PM-7, PM-8, PM-9, and PM-10 under frozen conditions.

6.2 Existing Conditions for Vegetation

6.2.1 Desktop Methods

A desktop review was conducted using satellite imagery, and publicly available land cover mapping (NRCan 2009c) to delineate upland vegetation community distribution along the Project, within a 100 m corridor centered on the Project centreline. Refer to subsection 8.2.1 for the desktop review methods for wetland mapping. Satellite imagery was reviewed at varying scales of approximately 1:2,000 to 1:15,000. Vegetation community categories followed the CER *Filing Manual* Checklist for Guide B – B.2 Table 1 land use categories (CER 2021a).

A literature review was conducted to identify rare vegetation and rare ecological communities with the potential to occur in the territories and BC biogeoclimatic (BGC) zones where the Project is located. Using data available from the NWT CDC, Yukon CDC, BC CDC, COSEWIC, and the Government of Canada, tables of potential rare vascular plants (in the NWT, Yukon, and BC Boreal White and Black Spruce Moist Cool [BWBSmk] BGC subzone) and rare ecological communities in the BWBSmk BGC subzone were compiled.

Weeds of management concern identified in the NWT ENR list of Invasive Species of Most Concern (NWT ENR 2020a), YISC list of High Invasive and High to Medium Invasive plants on their Invasive Plants by Invasiveness list (YISC 2020a), and BC *Weed Control Regulation* were reviewed prior to the commencement of the vegetation survey.

A literature review of current forest condition was conducted to identify likely locations of old forest and recent forest health concerns. The BC MFLNRORD establishes legal and non-legal OGMAs under the BC *OGAA* and the *EPMR* (BC MFLNRORD 2021a,b). The BC OGC establishes ABA Old Forest Value areas from the Vegetation Resource Inventory based on stand type and age (BC OGC 2021c). OGMAs and ABA Old Forest Value areas on the Project Footprint and in the vicinity of the Project Footprint were reviewed.

6.2.2 Field Survey Methods

Jacobs conducted a vegetation survey from August 4 to 5, 2021 focusing on areas where physical abandonment activities (e.g., brushing, soil handling) will occur.

6.2.3 Overview

Desktop Results

The Pointed Mountain Pipeline crosses the Liard Upland Mid-Boreal Ecoregion in the Taiga Ecological Region (Ecosystem Classification Group 2007) and the Liard Range Ecoregion in the Cordillera Ecological Region of the NWT (Ecosystem Classification Group 2010), the La Biche River Boreal Low Subzone of the Yukon (Environment Yukon 2017), and the BWBSmk BGC subzone of BC (DeLong et al. 2011).

The Project encounters approximately 109.5 ha (97.6 percent of the Project Footprint) of native land cover (including regenerating pipeline right-of-way that is shrub land cover and forest land cover, and wetlands), and approximately 2.7 ha (2.4 percent of the Project Footprint) of anthropogenic land cover (generally cleared areas adjacent to permanent disturbances that are dominated by tame/agronomic graminoid and herbaceous vegetation species, or disturbances that are maintained clear of vegetation).

There are three species with federal conservation status known to occur in the NWT (Government of Canada 2021a):

- hairy braya (*Braya pilosa*, listed as Endangered by COSEWIC and *SARA*, and listed as Threatened by the *Species at Risk [NWT] Act*)
- Mackenzie hairgrass (*Deschampsia mackenzieana*, listed as Special Concern by COSEWIC and *SARA*)
- Nahanni aster (*Symphyotrichum nahanniense*, listed as Special Concern by COSEWIC and *SARA*)

None of these species at risk are known to occur in the range of the Project (Government of the NWT 2020b).

In the NWT, there is an occurrence of a territorially listed species, Raup's willow (*Salix raupii*, May Be At Risk), within 5 km of the Pointed Mountain Pipeline (Government of the NWT 2013), located approximately 3.1 km east of the Project Footprint between PM-1 and PM-2. This species can occur in disturbed areas and may be present in the Vegetation RSA.

There are five vegetation species with federal conservation status known to occur or likely to occur in the Yukon (Government of Canada 2021a):

- Baikal sedge (*Carex sabulosa*, listed as Special Concern by COSEWIC and *SARA*)
- spiked saxifrage (*Micranthes spicata*, listed as Special Concern by COSEWIC and *SARA*)
- Yukon draba (*Draba yukonensis*, listed as Special Concern by COSEWIC, not listed *SARA*)
- Yukon podistera (*Podistera yukonensis*, listed as Special Concern by COSEWIC and *SARA*)
- Yukon wild buckwheat (*Eriogonum flavum* var. *aquilinum*, listed as Special Concern by COSEWIC and *SARA*)

None of these species at risk are known to occur in the range of the Project (Yukon CDC 2019c).

In the Yukon, there are a number of tracked plant observations within 5 km of the Pointed Mountain Pipeline (Yukon CDC 2019c) including:

- northern water plantain (*Alisma triviale*, S1)
- great northern aster (*Canadanthus modestus*, S2S3)
- northern mudwort (*Limosella aquatica*, S2S3)
- ostrich fern (*Matteuccia struthiopteris*, S1S2)
- Siberian polypody (*Polypodium sibiricum*, S2)
- Selkirk's violet (*Viola selkirkii*, S2)

These or other tracked vegetation species may be present in the study area.

No vegetation species with federal conservation status (i.e., listed as Endangered, Threatened, or Special Concern) by *SARA* or COSEWIC, or with provincial conservation status in the *FRPA*, are known to occur within the Fort Nelson Forest District and BWBSmk BGC subzone in which the Pointed Mountain Pipeline is located (BC ENV 2021a).

Within 5 km of the Pointed Mountain Pipeline in BC, there is one occurrence of the rare ecological community balsam poplar - white spruce/mountain alder - red-osier dogwood (*Populus balsamifera - Picea glauca/Alnus incana - Cornus sericea*, S3, Blue-listed) located approximately 1.7 km southwest of PM-9 (BC ENV 2021b). This community, or other Red- or Blue-listed communities of vegetation species may be present in the study area.

The NWT ENR lists white and yellow sweet-clover, creeping thistle, and awnless (smooth) brome as the invasive plants of most concern (NWT ENR 2020a). Some of these species have previously been included in reclamation seed mixes and may be present on the Project Footprint. NWT ENR requests that observations of invasive species be reported.

The YISC lists 24 High Invasive and High to Medium Invasive plants on their Invasive Plants by Invasiveness list (YISC 2020a) that are of greatest concern. The YISC requests that observations of invasive species be reported. These include:

- alfalfa
- common tansy
- creeping thistle
- crested wheatgrass
- European bird cherry
- field sow-thistle
- meadow goat's-beard
- narrow-leaved hawksbeard
- oxeye daisy
- perennial sow-thistle
- quack grass
- red fescue
- Russian leafy spurge
- scentless chamomile
- Siberian peashrub
- smooth brome
- smooth sow-thistle
- spotted knapweed
- tall hawkweed
- tatarian honeysuckle
- tufted vetch
- white sweet-clover
- yellow lucerne
- yellow sweet-clover

The BC Alien Invasive Plant Site database reports two occurrences of the Noxious plant, scentless chamomile within 150 m of the Project (BC MFLNRORD 2021c).

The Project components do not encounter any legal or non-legal OGMAs in BC (BC MFLNRORD 2021a,b). There are no old forest ABA value locations associated with the existing right-of-way (BC OGC 2021c).

The Project is within the Dehcho administrative region of the NWT, which recently reported the following forest pests: aspen serpentine leafminer, eastern larch beetle, gray willow leaf beetle, spruce budworm, willow blotch leafminer, western balsam bark beetle, and white-spotted sawyer beetle (Government of the NWT 2018a). Forest pests and pathogens recently reported in the Yukon include: northern spruce engraver beetle, aspen serpentine leafminer, eastern spruce budworm, spruce needle rust, and pine needle cast (Yukon EMR 2021).

Forest pests and pathogens of moderate importance recently reported in the Northeast Region of BC include: mountain pine beetle, spruce beetle, aspen leaf miner, comandra blister rust, stalactiform blister rust, western gall rust, and poplar and willow borer (BC MFLNRORD 2018b). The Project is within the Fort Nelson TSA where the current forest health strategy for mountain pine beetle and spruce beetle is to monitor (BC MFLNRORD 2018b).

Field Survey Results

Field surveys focused on sites where physical abandonment activities will take place along the Pointed Mountain Pipeline. Vegetation present at the sites that will be disturbed (i.e., brushed) includes the following.

- PM-1 in the NWT is within a regenerating forest dominated by a combination of trembling aspen, white spruce, balsam poplar and black spruce. There are also shrub, cleared, and disturbed land covers at this site.
- PM-2 in the NWT is within a regenerating forest dominated by a combination of trembling aspen, white spruce, balsam poplar and black spruce. There is also cleared land cover at this site.

- PM-3 in the NWT is within a shrub land cover due to clearing for construction and maintenance of the pipeline.
- PM-4 in the NWT is within a shrub land cover due to beaver activity and clearing for construction and maintenance of the pipeline.
- PM-6 in the Yukon is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There is also disturbed land cover at this site.
- PM-7 in the Yukon is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There are also disturbed and wetland land covers at this site.
- PM-8 in BC is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There is also wetland land cover at this site.
- PM-9 in BC is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There is also disturbed land cover at this site.
- PM-10 in BC is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There are also disturbed and wetland land covers at this site.

No rare vegetation species or rare ecological communities were observed.

Two invasive weed species designated Most Concern, white sweet-clover and yellow sweet-clover, were observed at PM-1 in the NWT. Additional invasive weed species were observed at this site that are not designated species in the NWT but are designated as Highly Invasive in the adjacent Yukon: perennial sow-thistle; annual hawksbeard; and oxeye daisy. Invasive weed species were associated with existing disturbance and infrastructure.

Three invasive weed species designated as Highly Invasive were observed at PM-6: smooth brome, perennial sow-thistle, and white sweet-clover. Two invasive weeds species designated as Highly Invasive were observed at PM-7: perennial sow-thistle and annual hawksbeard. Invasive weed species were associated with existing disturbance and infrastructure.

One Regionally Noxious plant species is in the adjacent Peace River Regional District, oxeye daisy, was observed at both PM-9 and PM-10 in BC and associated with existing disturbance and infrastructure. Note that oxeye daisy is Regionally Noxious in the adjacent Peace River Regional District and not in the Northern Rockies Regional District that the Project is located within. No Provincially Noxious or Northern Rockies Regional District Noxious weeds were observed.

No evidence of forest pests or pathogens was observed during field work. No late-successional forest was observed during field work.

6.3 Project Interactions with Vegetation

Table 6.3-1 identifies the Project components that may interact with vegetation to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 6.6. A justification for no interaction is provided following Table 6.3-1.

Table 6.3-1. Project Interactions with Vegetation

Project Activities	Potential Effects	
	Change in Vegetation Communities	Change in Vegetation Species
Pointed Mountain Pipeline		
Physical Abandonment	✓	✓
Abandonment In-place	✓	-

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

6.3.1 Project Interactions Scoped Out of Further Considerations

6.3.1.1 Change in Vegetation Species

Following physical abandonment activities, the pipeline rights-of-way are not anticipated to present a change in vegetation species, since no further physical work is required once the pipeline is left in-place.

6.4 Mitigation

Westcoast intends to implement minimal surface disturbance construction practices (i.e., leaving organic soils, root layers and seed source undisturbed) where suitable conditions allow. This technique will reduce potential adverse effects on vegetation by limiting ground disturbance to the physical abandonment locations, so the vegetated root mat and seedbed is left intact. Physical abandonment activities will be conducted under non-frozen conditions for PM-1 through PM-4 and under frozen conditions for PM-6 through PM-10.

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on vegetation. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Table 6.4-1 identifies these key mitigation measures for each effect pathway identified for Project components. Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons.

Table 6.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation
Change in Vegetation Communities	Physical abandonment activities (e.g., brushing) and removal of aboveground infrastructure will cause a loss or alteration of vegetation (i.e., trees, stumps, brush, and other vegetation).	Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit brushing to the minimum necessary to safely complete the work.
		Store salvaged trees and shrubs on the side of the Project Footprint in a manner such that they do not dry out before replanting during restoration.
		Fell bordering trees onto the cleared Project Footprint to prevent damaging existing property, pipelines, adjacent trees and brush, and avoid marked sensitive environmental resources.
		Fallen or leaning trees are not permitted to be left in-place or leaning off the Project Footprint.
		In general, when constructing in wetland areas, up to 30 cm of topsoil (organic layer) will be stripped from the excavation area and stockpiled separate from trench spoil to preserve the native seed stock.
		Seed permafrost areas in the winter following construction (i.e., dormant seeding, in non-frozen and snow-free conditions) to promote rapid revegetation of disturbed areas. Reseed in the spring, if warranted.
		Use only Common No. 1 or Canada Certified No. 1 seed in reclamation seed mixes and ensure seed certificates of analysis are provided to Westcoast. Westcoast Environment will review seed certificates of analysis when: any other seed grade is proposed for reclamation projects, or a custom seed mix is used per third-party requirement. Seeding should occur as soon as practical after final cleanup, as weather and soil conditions permit.
		Do not seed mineral wetlands or peatlands.
		Reclaim disturbed areas following abandonment activities. Reclamation and restoration measures may include natural regeneration (particularly in shrubby and graminoid wetlands or wetland fringes) or active restoration methods, such as site preparation, conifer seedling planting and access control.
	Brushing during physical abandonment activities may cause a loss or alteration of rare ecological communities.	During pre-construction surveys, environmental features (e.g., rare plants) will be identified and either flagged, fenced off or signage will be erected prior to construction activities.
		Table 1 of the EPP provides site-specific vegetation feature mitigation, including but not limited to: regulatory permits and approvals; rare plants; weeds and, timing of vegetation clearing; and timing of construction.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit brushing to the minimum necessary to safely complete the work.

Table 6.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation
Change in Vegetation Communities (cont'd)	Brushing during physical abandonment activities may cause a loss or alteration of late-successional forest	During pre-construction surveys, environmental features (e.g., rare plants) will be identified and either flagged, fenced off or signage will be erected prior to construction activities.
		Table 1 of the EPP provides site-specific vegetation feature mitigation, including but not limited to: regulatory permits and approvals; rare plants; weeds and, timing of vegetation clearing; and timing of construction.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit brushing to the minimum necessary to safely complete the work.
	Physical abandonment activities (e.g., brushing) and removal of aboveground infrastructure will cause an introduction or spread of forest pests and pathogens	Fell bordering trees onto the cleared Project Footprint to prevent damaging existing property, pipelines, adjacent trees and brush, and avoid marked sensitive environmental resources.
		Fell all trees damaged during construction activities immediately. Do not postpone felling of damaged trees until cleanup. Do not fell danger trees that are deemed wildlife trees or culturally modified trees without consultation with the appropriate subject matter expert.
		Clearing of merchantable timber is not anticipated for this Project.
		Where clearing and brushing is required, disposal of non-merchantable timber and slash will occur by burning, mowing, chipping, grinding, and/or hauling offsite to a disposal facility. Material retained for rollback and chip/mulch material, as well as the location of its storage and use, will be in accordance with applicable regulatory requirements.
	Abandonment in-place may result in eventual perforation of the pipeline, with the potential transport of contaminants from the surrounding environment (e.g., soil contamination), pipeline material (e.g., polyethylene) or residual product to surrounding vegetation.	The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils and reclamation success will be identified and records will be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.

Table 6.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation
Change in Vegetation Species	Brushing during physical abandonment activities may cause direct loss or alteration of rare vegetation populations.	During pre-construction surveys, environmental features (e.g., rare plants) will be identified and either flagged, fenced off, or signage will be erected prior to construction activities.
		Table 1 of the EPP provides site-specific vegetation feature mitigation, including, but not limited to: regulatory permits and approvals; rare plants; weeds and, timing of vegetation clearing; and timing of construction.
	Transportation of equipment, workers and supplies, brushing, vegetation disposal, mowing, topsoil handling, backfilling, and cleanup activities during physical abandonment activities may indirectly alter vegetation species through the introduction or spread of invasive weed species.	Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit brushing to the minimum necessary to safely complete the work.
		To prevent the introduction of undesirable species along the pipeline right-of-way due to construction activities, all equipment, including mats, are required to be cleaned and free of soil or vegetative debris prior to arriving onsite.
		Monitor the topsoil piles and other soil piles for weed growth frequently during the growing season. Implement weed control measures on topsoil piles, if warranted (EPP Section 5 – Controlling Spread of Undesirable Species).
		Verify absence of weed seeds, and that all seed certificates of analysis are submitted to Westcoast Environment prior to seed purchase.

6.5 Potential Effect Pathways Not Carried Through for Further Assessment

The following potential residual effects are expected to be avoided through the implementation of mitigation measures, and subsequently not carried through for further assessment.

- Change in vegetation communities due to:
  - a loss or alteration of rare ecological communities during physical abandonment activities;
  - a loss or alteration of late-successional forest during physical abandonment activities;
  - introduction or spread of forest pest or pathogens; and/or
  - abandonment in-place transporting contaminants from the surrounding environment, pipeline material or residual product.
- Change in vegetation species due to:
  - a loss or alteration of rare vegetation populations during physical abandonment activities.

6.6 Assessment of Residual Effects on Vegetation

An effect on vegetation may remain after the implementation of mitigation measures. The potential residual effects of the Project include:

- Change in vegetation communities due to the loss or alteration of native vegetation; and/or
- Change in vegetation species due to weed introduction or spread of weeds.

6.6.1 Change in Vegetation Communities

Residual effects on vegetation communities due to physical abandonment activities may occur as a result of clearing, transportation of workers and equipment, vegetation brushing, soil handling, and cleanup and reclamation activities. It is likely that native vegetation will be directly and indirectly altered within the Vegetation LSA.

6.6.1.1 Change to Composition of Native Vegetation

Brushing of vegetation along the existing rights-of-way will limit the alteration of native vegetation and facilitate natural regeneration following physical activities. Areas prone to erosion will be seeded with an appropriate native seed mix or cover crop, to reduce invasive plant species from establishing in these areas. The magnitude of the effect on native vegetation during physical abandonment activities will be reduced by the implementation of the proposed mitigation and reclamation measures outlined in Table 6.4-1 and the EPP (Appendix B of this ESA). The change to composition of native vegetation as a result of physical abandonment activities is limited to the Vegetation LSA and is reversible to pre-activity or equivalent conditions and of low magnitude (Table 6.6-1).

Following physical abandonment activities, the timeline for reclamation to equivalent land capability depends on the communities altered. The rates of regeneration will depend on physical abandonment activities techniques, soil type, elevation, aspect, slope, plant species, and presence of invasive plants. Equivalent land capability will be assessed following cleanup and reclamation activities. The alteration of native vegetation from existing conditions will cease upon completion of physical abandonment activities since ongoing operation and maintenance of the pipeline rights-of-way is not required. It is expected that each successional stage of forest development will serve to contribute to different aspects of ecosystem services, such as providing habitat for certain wildlife and rare vegetation species and contributing to biodiversity.

The assessment of the magnitude of predicted effect on native vegetation is based on a qualitative understanding informed by regulatory guidelines, an understanding of the ecological and land use context, previous environmental assessments approved under provincial and federal environmental regulatory processes, previous PCM results, and the professional experience of the assessment team.

Vegetation loss as a result of brushing will be limited in extent and is expected to regenerate to current conditions relatively quickly (i.e., in the medium-term) following physical abandonment activities. Removal of infrastructure and reclamation of disturbed areas are expected to have a positive effect that will increase vegetation regeneration.

6.6.1.2 Summary of Residual Effects Resulting in a Change in Vegetation Communities

Residual effects resulting in a change in vegetation communities due to a change in composition of native vegetation during physical abandonment activities is predicted to be adverse in direction, medium-term in duration, and reversible. However, the overall residual effect altering vegetation is considered positive. Per the *Filing Manual* (CER 2021a), a significance determination is only necessary for adverse residual effects. Significance is not rated for the anticipated positive effect on vegetation (Table 6.6-1).

6.6.2 Change in Vegetation Species

Residual effects on vegetation species during Project activities may occur if weeds are introduced or spread.

6.6.2.1 Weed Introduction and Spread

In general, non-native and invasive species are most prevalent where the ground has been disturbed by anthropogenic activity (e.g., previously disturbed rights-of-way, facility sites). The introduction and spread of non-native and invasive species have an adverse effect, particularly where they occur at a high-density on the landscape and exert competitive pressure on native vegetation communities.

Physical abandonment activities may introduce or spread weeds in areas where vehicles and equipment travel to the Project Footprint. Control of weeds in winter is important and seen as a preventative measure ahead of growth in early spring. With the conclusion of physical activities along the rights-of-way, fewer vectors for weed introduction and spread will be present.

Mitigation measures outlined in Table 6.4-1 will be implemented during physical abandonment activities. Weed introduction is difficult to control and may persist on disturbed and natural landscapes even if mitigation measures are implemented and will be short- to medium-term in duration. The predicted residual effect of weed introduction and spread is isolated in frequency and reversible to pre-activity or equivalent conditions, and of low magnitude. There is a good understanding of cause-effect relationships and sufficient information pertinent to the Project area to conclude with a high degree of confidence that the predicted effects will be not significant (Table 6.6-1).

6.6.2.2 Summary of Residual Effects Resulting in a Change in Vegetation Species

Residual effects resulting in a change in vegetation species as a result of the introduction or spread of weeds are predicted to be adverse in direction, short to medium-term in duration and reversible. With a high degree of confidence, the predicted residual effect on vegetation species is not significant (Table 6.6-1).

6.6.3 Summary of Project Residual Effects

Table 6.6-1 summarizes the significance evaluation of the predicted residual environmental effects of the Project on vegetation. As Table 6.6-1 notes, there are no situations of a residual environmental effect on vegetation that is irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Consequently, it is concluded that the predicted residual effects of the Project on vegetation are not significant. The residual effects criteria are presented in Table 6.6-1.

Table 6.6-1. Project Residual Effects on Vegetation

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context: Duration	Temporal Context: Frequency	Temporal Context: Reversibility	Magnitude	Significance
Change in Composition of Native Vegetation Following Physical Abandonment Activities	Positive	Vegetation LSA	Not Applicable (N/A) – positive effects are not characterized further				
Weed Introduction and Spread	Adverse	Vegetation RSA	Short- to medium-term	Isolated	Reversible	Low	Not significant

6.7 Assessment of Cumulative Effects on Vegetation

Existing environmental conditions reflect cumulative effects on the environment from past and present projects and physical activities. Past and present projects and physical activities that have been or are being carried out have influenced the existing conditions for vegetation (subsection 6.2). Subsection 4.8 of this ESA describes other projects and physical activities that may act cumulatively with the Project.

Table 6.7-1 identifies potential Project interactions with existing and reasonably foreseeable developments and activities that may have cumulative effects related to vegetation. Where Project-related residual environmental effects act cumulatively with those from past, present, and reasonably foreseeable future projects and physical activities, a CEA is completed to determine their significance.

Table 6.7-1. Interactions with Potential to Contribute to Cumulative Effects on Vegetation

Other Projects	Potential Effects: Changes in Vegetation Species
Present Projects, Physical Activity and Land Use	
Forestry	✓
Oil and Gas	✓
Recreation	✓
Fishing, Hunting, and Trapping	✓
Transportation	✓
Future (Reasonably Foreseeable) Projects and Physical Activities	
Forestry	✓
Oil and Gas	✓
Fishing, Hunting and Trapping	✓

Note:

✓ = A potential interaction with the Project is identified.

6.7.1 Changes in Vegetation Species

Weeds typically establish in areas that have been previously disturbed such as existing oil and gas facility sites. Existing activities in the Vegetation RSA that have resulted in ground disturbance and the potential introduction and spread of weeds include oil and gas activities and the creation and maintenance of transportation infrastructure (e.g., resource and winter roads). Physical abandonment activities are expected to act cumulatively with existing activities to cause weed introduction and spread within the Vegetation RSA. In the RSA, no provincial spatial data are available for the presence and abundance of weeds.

Ongoing weed control efforts by existing operators, the Project and other reasonably foreseeable developments are anticipated to maintain the cumulative effect associated with the presence and abundance of weeds to low magnitude levels. The recommended weed-related mitigation outlined in subsection 6.4 will reduce the potential for cumulative effects. Existing operators and reasonably foreseeable developments within the Vegetation RSA are expected to manage weeds as legislated by the BC *Weed Control Regulation* and as discussed in numerous industry guidelines (NWT ENR 2020b; YISC 2020b; NRRM 2020d; Government of BC 1985; NEB 2016). No additional weed mitigation beyond the Project-specific mitigation already recommended in Table 6.4-1 and the EPP (Appendix B of this ESA) are deemed to be warranted.

The magnitude of the cumulative effect regarding a change in vegetation species is considered low in the Vegetation RSA. The Project is predicted to have a limited incremental contribution to the cumulative effects causing the introduction or spread of weeds in the Vegetation RSA, considering the small Project Footprint and minimal amount of brushing to be conducted. The Project's contribution to the cumulative effect is reversible. No mitigation beyond the Project-specific mitigation already recommended in Table 6.4-1 and the EPP (Appendix B of this ESA) is warranted.

6.7.2 Summary of Residual Cumulative Effects on Vegetation

Table 6.7-2 provides the cumulative effect characterization for each cumulative effect using the criteria defined in subsection 4.8.

Table 6.7-2. Project Cumulative Effects on Vegetation

Predicted Cumulative Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Change in Vegetation Species	Adverse	RSA	Medium-term	Isolated	Reversible	Low	Not significant
Contribution from the Project to the Cumulative Effect	The Project may result in changes to vegetation species; however, with the proposed mitigation, the Project's contribution to the cumulative effect is of low magnitude at the regional scale and reversible.						Not significant

6.8 Conclusion

As Table 6.6-1 and 6.7-2 note, there are no situations of a residual effect or cumulative effect that are irreversible and of high magnitude, or reversible however long-term in duration and of high magnitude. Therefore, the predicted residual effects and cumulative effects are not significant.

Prediction confidence for the remaining effects is high based on results of past PCM, professional judgement, the quality of publicly available literature, Project data, field surveys, and the past effectiveness of proposed mitigation measures.

6.9 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). Post-abandonment monitoring will occur at locations where physical abandonment activities are conducted.

Plant species composition and growth are considered as factors in the vegetation assessment. In forested areas, establishing plant cover is evaluated based on emerging desirable vegetation (e.g., early successional species consistent with the surrounding vegetation community) and the presence or absence of Noxious weeds. Monitoring methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details on are described in Section 19 of this ESA, Follow-up and Monitoring.

7. Assessment of Effects on Aquatic Resources

The assessment team conducted studies to establish the existing conditions (i.e., the baseline setting) for aquatic resources from which the potential effects of the Project can be determined. The study was based on existing literature, internet searches, consultation and engagement, surveys, and expert opinion.

7.1 Scope of the Assessment

Water quality and quantity and fish and fish habitat, collectively referred to as aquatic resources, are included in this assessment based on the biophysical and socio-economic elements identified by the *Filing Manual* (CER 2021a). Pathways regarding changes to the quality or quantity of water, including surface water (e.g., watercourses, riparian areas, or other natural and artificially-made bodies of water) and groundwater (e.g., springs, aquifers, or water wells) were considered. Pathways resulting in changes to fish and fish habitat were also considered.

Wetland function has the potential to influence surface water quality (Section 8, Assessment of Effects on Wetlands). Water quality also has potential fish and fish habitat effects.

Potential effects resulting from accidents or malfunctions during Project activities are considered in Section 16.

7.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements and Table A-3 – Filing Requirements for Socio-economic Elements were used to identify the circumstances and interactions to be considered for the assessment of aquatic resources for all phases of the Project.

7.1.1.1 Federal

Canadian Energy Regulator *Onshore Pipeline Regulations*

Abandonment activities will be carried out in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. Companies are responsible for meeting the requirements of the CER *OPRs* to manage safety, security, and environmental protection throughout the entire lifecycle of their facilities, from design, through to construction, operation, and abandonment including regard for contamination and protection of waterbodies.

If water infiltrates the pipeline, the potential exists for that water to carry contaminants to some point of exit, and the point of exit could be a wetland or waterbody. The buried pipeline left in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

Canadian Navigable Waters Act

The *CNWA* protects navigation on scheduled waters, as well as navigable waters that are not currently listed. At present, 189 waterways, including oceans, lakes, and rivers, are listed on the schedule to the Act. The *CNWA* introduces a process to notify the public and to help resolve conflicts related to works on navigable waters that are not on the schedule.

The CER is responsible for reviewing projects with respect to navigation and navigation safety, as per the MOU between Transport Canada and the NEB (CER 2020b).

Fisheries Act

Pipeline removal or abandonment activities that have the potential to impact fish or fish habitat will be constructed and operated in compliance with the federal *Fisheries Act.* The *Fisheries Act* requires projects to avoid the death of fish or HADD of fish habitat, unless authorized by the DFO, Minister of Fisheries and Oceans, and the Canadian Coast Guard. Without authorization from DFO, the *Fisheries Act* prohibits any work, undertaking, or activity that results in the death of fish or HADD to fish habitat. The *Fisheries Act* defines HADD to fish or fish habitat as "any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat's capacity to support one or more life processes of fish" (DFO 2019a).

The *Fisheries Act* also has provisions that:

- prohibit the deposition of deleterious substances into waters used by fish;
- ensure the safe passage of fish;
- require flow of water and passage of fish; and
- require water intakes and diversions to have a fish guard or fish screen.

DFO has introduced measures to facilitate its review process by allowing proponents to assess if projects near water require DFO review (DFO 2019b). The review includes the identification of Measures to Protect Fish and Fish Habitat. If a project can incorporate all measures, DFO review is not required.

DFO review may also not be required if a project's activities are covered under a COP provided by DFO. COPs specify procedures, practices, or standards for avoiding the death of fish or HADD of fish habitat for the specific activities covered by the COP (DFO 2021) and consider the requirements for mitigating any residual effects caused by the activity. However, if residual effects are anticipated, even after applying avoidance and mitigation strategies, then DFO review is recommended. Regardless of whether a project's activities are included in the DFO standards and codes, proponents are still required to avoid causing death of fish or HADD of fish habitat by providing mitigation such as those described in the Measures to Protect Fish and Fish Habitat (DFO 2019b).

Through the establishment of interagency agreements, the CER (formerly the NEB) is responsible for assessing the Project under the federal *Fisheries Act*. A MOU between DFO and the NEB was established in December 2013, outlining the responsibilities of the NEB with respect to the review of project impacts to fish and fish habitat under the fisheries protection provisions of the *Fisheries Act* (CER 2020a). The MOU is still in effect and the CER will continue to assess Project applications and determine if mitigation strategies are needed to reduce or prevent impacts to fish or fish habitat.

7.1.1.2 Provincial and Territorial

The Project will comply with applicable provincial and territorial regulatory requirements in NWT, Yukon, and BC and generally follow the intent of provincial and territorial objectives and guidance that may be relevant to the Project. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to aquatic resources are detailed as follows.

Northwest Territories *Waters Act* and Northwest Territories *Water Regulations*

Industrial undertakings including oil and gas activities require a Water Licence for water use. Activities that fall under water use include oil and gas exploration, watercourse crossings, flood control, diversions, and deposit of waste (Mackenzie River Water Board 2003). The MVLWB is responsible for water licensing for authority for unsettled claims areas. *Waters Regulations* do not differentiate between types of waterbodies. Please refer to subsection 8.1.1.2 of this ESA for requirements for activities, such as temporary disturbance or for pipeline removal.

Yukon *Waters Act* and Yukon *Waters Regulation*

Under the Yukon *Waters Act*, the Yukon Water Board regulates water use, both direct and indirect (Yukon Water Board 2021). Direct water use includes water withdrawal such as for hydrostatic testing or for winter roads, and indirect water use includes watercourse crossings and diversions. Within the *Waters Regulation* a watercourse means “a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches” (Government of Yukon 2003b). A Water Licence is required for direct and indirect water use. Watercourse as defined by the *Waters Regulation* includes all wetland types. Please refer to subsection 8.1.1.2 of this ESA for requirements for activities in wetlands, such as temporary disturbance or for pipeline removal.

<u>British Columbia</u>

British Columbia Oil and Gas Commission

The BC OGC has authority to issue specific provincial approvals for pipeline activities regulated under the *CER Act*, including approvals under the *Water Sustainability Act* (*WSA)*, which includes provisions related to disturbance of watercourses and streams (BC OGC 2021b). Although the Project is not regulated by the BC *OGAA*, the BC OGC will consider the *EPMR* in its review of CER applications.

British Columbia *Water Sustainability Act*

Approval is required from the BC OGC to make Changes In and About a Stream under the *WSA*. Common Changes In and About a Stream include the construction, maintenance, and removal of pipeline/watercourse crossings and crossing structures. Short-term water use for applications such as hydrostatic testing or water withdrawals for winter crossings also require approval from the BC OGC.

Changes In and About a Stream refer to:

- any modification to the nature of the stream, including any modification of the land, vegetation, and natural environment of a stream or the flow of water in a stream; and
- any activity or construction within a stream channel that has or may have an impact on a stream or stream channel.

The *WSA* applies to activities on both Crown and private lands. As part of the application process for Changes In and About a Stream, *EPMR*-defined riparian classifications should be provided for streams, wetlands, and lakes and proponents should provide a document (e.g., an environmental management plan) describing the conformance of their proposed activities with each of the BC government's environmental objectives in the *EPMR* (BC OGC 2021e).

British Columbia *Water Sustainability Regulation*

Under the *WSA*, the *Water Sustainability Regulation* sets out the statutory requirements for the issuance of licences or approvals for the diversion, use, or storage of surface water or groundwater, and for making Changes In and About a Stream. The definition of stream under the *WSA* is broad, and includes watercourses, wetlands, lakes, and other aquatic features including:

a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the stream channel of the stream has been modified; or

b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland, or glacier, whether or not usually containing water, including ice, but does not include an aquifer. (Government of BC 2021a)

British Columbia *Water Environmental Protection and Management Regulation*

Under the BC *OGAA*, the *EPMR* establishes the BC government's environmental objectives. The BC government's environmental objectives related to riparian values are pertinent to the conservation of wetlands, lakes, and streams, and they focus on avoiding activities within these ecosystems and the surrounding riparian areas, while allowing for certain exceptions.

The EPMG provides a list of Planning and Operational Measures (POMs) that should be met for works occurring in designated Riparian Management Areas (RMAs) associated with wetlands, lakes, and streams, if these areas cannot be avoided (BC OGC 2021f). RMAs are defined as transitional areas adjacent to wetlands, lakes, or streams, where there is a distinct shift in vegetation from aquatic to upland communities, and they consist of a Riparian Reserve Zone (RRZ) and a Riparian Management Zone (RMZ) (BC OGC 2021f). The widths of RRZs and RMZs are dependent upon the *EPMR*-defined riparian class of the stream, wetland, or lake.

Where avoidance as specified in the *EPMR* is not practical, a justification to the BC OGC may be required under the provincial approval processes within the CER framework. The *EPMR* applies to Crown land and does not apply to private land or to subsurface oil and gas activities associated with an operating area (including pipeline corridors) (BC OGC 2021f).

However, the BC OGC will consider the *EPMR* and associated BC government's environmental objectives in its review of provincial authorizations for CER-regulated pipeline projects (e.g., the approval for Changes In and About a Stream under the *WSA*) (BC OGC 2021a), and it is recommended to apply appropriate mitigation measures for RMAs on private and Crown lands to meet the standards of the *EPMR*. The CER may also consider direction under the *EPMR* in its evaluation of applications.

7.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding aquatic resources have been raised. Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application.

7.1.3 Potential Effects, Pathways, and Effect Indicators

Table 7.1-1 identifies the potential effect pathways of the Project on aquatic resources during physical abandonment activities, and as a result of abandonment in-place.

Effects on aquatic resources are generally limited to the watercourse crossing land use.

Table 7.1-1. Project Activities, Effect Pathways, and Indicators for Aquatic Resources

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in surface water quality and quantity	Increased erosion on the Project Footprint due to vegetation brushing and vehicle and equipment crossings (e.g., ice bridges, snow fills) may increase sediment concentrations and transport in surface water.	▪ Surface water quality parameters (e.g., total suspended solids)
	Physical abandonment activities on land adjacent to waterbodies may result in changes in natural flow patterns.	▪ Natural drainage (flow or volumes)
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to transport contaminants from the surrounding environment (e.g., soil contamination), pipeline material (e.g., polyethylene) or residual product into surface waters.	▪ Transport of contaminants in surface water
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to alter natural drainage patterns.	▪ Ground subsidence ▪ Movement or ponding of water ▪ Natural drainage (flow or volumes)
	Water withdrawal for icing access roads is anticipated to be sourced from existing borrow pits and watercourses (e.g., the Liard River) and may cause an increase in sediment concentration and reduction in water level.	▪ Surface water quantity and recharge
Change in groundwater quality and quantity	Disturbance to physical hydraulic properties of soil and parent material above or below the water table due to grading and backfilling may cause changes in ground water quality.	▪ Transport of contaminants to groundwater ▪ Groundwater flowing to the surface
	Compaction of soils due to vehicle and equipment crossings could reduce permeability of materials along the groundwater flow path and may result in a rise in the groundwater table to the extent that ground to surface flooding occurs.	
Change in fish and fish habitat	Brushing for vehicle and equipment crossings will lead to alteration of riparian habitat from within the Project Footprint.	▪ Area of riparian habitat disturbance ▪ Transport of contaminants
	Vehicle and equipment crossings, and runoff and erosion can introduce fine sediment to watercourses.	
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to transport contaminants.	
	Water withdrawal for icing access roads is anticipated to be sourced from existing borrow pits and watercourses and pumping may cause harm to fish.	▪ Fish entrainment or impingement
	Water withdrawal for icing access roads is anticipated to be sourced from existing borrow pits and watercourses and pumping may cause inter-basin transfer of invasive aquatic organisms.	▪ Transport of invasive aquatic organisms to other waterbodies

7.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 7.1-2 describes the remaining spatial boundaries for aquatic resources and the rationale for choosing them.

Table 7.1-2. Spatial Boundaries for Aquatic Resources

Element	Spatial Boundaries	Rationale
Water Quality and Quantity	**Aquatics LSA:** A 100-m buffer extending from the Project Footprint and extended to a minimum of 300 m downstream at all defined watercourse crossings (Figure 4.5-1). At drainages, the Aquatics LSA consists of the area extending 100 m upstream at each crossing location to a minimum of 100 m downstream. **Aquatics RSA:** A 10-km buffer extending from the Project Footprint (Figure 4.5-2).	**Aquatics LSA**: The Aquatics LSA on land (i.e., not at watercourses or drainages) is defined as the area likely to be affected by direct disturbance during all phases of the Project to incorporate the potential effects that may extend off the Project Footprint. At watercourses and drainages, the upstream limit was established to account for potential Project-related activities that may affect Water Quality and Quantity and Fish and Fish Habitat beyond the Project Footprint upstream. **Aquatics RSA**: The Aquatics RSA was selected based on the potential for the Project to have population level effects that extend beyond the boundaries of the Aquatics LSA. The Aquatics RSA is the area where the direct and indirect influence of other activities could interact with the Project and may cause cumulative effects on Water Quality and Quantity and Fish and Fish Habitat.

7.1.5 Ecological Context

Surface water quality could be compromised through the introduction of suspended sediments or contaminants (e.g., due to erosion from vegetation clearing) into a watercourse or drainage during physical activities. The sensitivity of a watercourse or drainage to suspended sediments depends on the water use by people and animals. Watercourses used for domestic purposes and watercourses or drainages that support fish populations are more sensitive. The resilience of a watercourse or drainage depends on several factors, including channel morphology, substrate composition, water depths, and flow velocity and discharge at a given crossing location. Watercourses and drainages are resilient to construction impacts provided that habitat, and hydrological and biogeochemical functions are not permanently altered.

Two sections of pipe have been removed: a section exposed by the Kotaneelee River was removed in 2016 and a section exposed by the La Biche River was removed and replaced in 2006. All Project watercourse crossings will be abandoned in-place to avoid unnecessary environmental disturbances. There are no known remaining areas of existing pipeline exposure associated with the Pointed Mountain Pipeline.

Abandonment activities are anticipated to begin in November 2022 under frozen conditions for PM-6 to PM-10 and summer for PM-1 to PM-4. Existing crossings (e.g., road bridges) or helicopters will be used to move physical abandonment activities equipment and vehicles across watercourses where practical; however, temporary vehicle crossings in frozen conditions such as snowfills or ice bridges may be used to cross watercourses, where appropriate, to access the Project Footprint. Equipment and vehicles typically cross drainages by snow/ice fill if the drainage is sufficiently frozen. No open water temporary vehicle and equipment crossing are planned in the summer. No new permanent vehicle and equipment crossings are proposed.

Over time, the abandoned pipeline may corrode, and eventual perforation may influence surface water quality or quantity through the creation of a water conduit. The water conduit has the potential to change water quality through the transportation of contaminants, either existing contamination along the route (e.g., from historical operations) or as a result of contaminants derived from the pipeline coating or change water quantity due to pooling or movement of water. Residual contaminants may reach an aquifer or the surface and flow into a waterbody; however, pipeline corrosion is known to be localized and takes decades to occur.

As a result of abandonment in-place, long-term corrosion or full pipeline collapse may lead to subsequent ground subsidence. Studies indicate any pipeline left in-place is expected to result in long-term corrosion leading to full pipeline collapse and subsequent ground subsidence (Teevens and Robertson 2008; Det Norske Veritas 2010).

However, studies conclude that full pipeline deterioration is unlikely along its entire length (NEB 1996; Det Norske Veritas 2010). In addition, the magnitude of ground subsidence for pipelines up to 323.9 mm in diameter is negligible and is expected to be within tolerable ranges for pipelines larger than 304 mm in diameter (NEB 1996; Det Norske Veritas 2010). Therefore, it is not anticipated there would be enough ground subsidence on a scale to cause a change in drainage patterns or groundwater flow.

It is reasonable to assume that the pipeline will eventually fill with subsoil and/or water and may affect surface water. Empty pipelines crossing a watercourse may become buoyant if control mechanisms are not installed or existing ones fail (i.e., fall off). Metals released from the pipeline body are generally not considered a potential environmental risk in terms of the degradation of pipe material (Det Norske Veritas 2010) and the pipeline is not anticipated to create enough preferential flow along the entire right-of-way to transport contaminants from pipeline material (e.g., polyethylene). Additionally, the Pointed Mountain Pipeline was previously cleaned of all residual product, coated with corrosion inhibitor, and physically isolated from any sources of upstream pressure prior to deactivation.

The Project interactions and potential effects are a function of the watercourse and fish habitat characteristics, as well as the planned crossing methods. Watercourses crossed by the Pointed Mountain Pipeline contain a variety of fish species of Indigenous and recreational importance. Overwintering habitat is often limiting for fish in temperate climates where waterbodies are ice-covered for several months or more. Fish frequently concentrate in large, deep, isolated pools during this period.

Physical abandonment activities will be conducted under both open water and frozen conditions. Instream activities are not anticipated for the completion of physical abandonment activities. Access will avoid any instream work and will be conducted using existing roads, helicopter, and ice bridges/snowfills. Water withdrawal for icing access roads is anticipated to be sourced from existing borrow pits and other large sources to be determined prior to construction along the Pointed Mountain Pipeline. Water withdrawal for the ice bridge across the Liard River will occur at a nearby location on the Liard River.

7.2 Existing Conditions for Water Quality and Quantity

7.2.1 Methods

Potential watercourses or larger open water areas crossed by the existing pipeline right-of-way were identified via desktop using satellite imagery (Esri 2016), as well as hydrology layers from topographic maps, BC Habitat Wizard (TRIM dataset) (Government of BC 2021a) and the GeoYukon Interactive Mapping Application (Government of Yukon 2021f).

Specific aquifer information is typically limited in non-agricultural areas. The Liard River Basin Transboundary Aquifer Assessment was utilized for aquifer information in the NWT and Yukon (Palmer 2020). The available aquifer data were also reviewed on Habitat Wizard for BC (Government of BC 2021a).

Springs can also indicate areas that are sensitive to disturbance and wells can indicate were groundwater use or monitoring may occur.

No well or spring data for NWT or spring data for the Yukon were found. In the Yukon, well data are available through the Water Well Registry online map (Yukon Water Resources Branch 2021). In BC, the Ground Water Wells and the Drinking Water Sources dataset (BC MOE 2008; BC MFLNRO 2010a) were used for wells and the Licensed Springs dataset (BC MFLNRO 2010b) were used for springs. For BC, the Provincial Groundwater Observation Well Network was also reviewed for any monitoring wells (Government of BC 2021d).

Fish presence was determined using and the various BC databases: Habitat Wizard (Government of BC 2021a), EcoCat Ecological Reports Catalogue (Government of BC 2021b), the Fish Inventories Data Queries (Government of BC 2021c) and the Yukon Fisheries Information Summary System (FISS) and Fish Sampling Atlas (Community Mapping Network 2021). A literature review was also completed to identify any other fisheries studies and information.

7.2.2 Overview

The fish community for the Pointed Mountain Pipeline includes coolwater and coldwater species and spring/summer/fall spawners. Generally, most of the watercourses identified by desktop review appear to be low gradient, poorly defined, and may lack habitat potential for sportfish (e.g., bull trout [*Salvelinus confluentus*], Arctic grayling [*Thymallus arcticus*], and northern pike [*Esox lucius*]).

A notable exception is the La Biche River, which supports a diverse fish community and is expected to provide high quality fish habitat. The approximately 1.8 km length along the Pointed Mountain Pipeline to the north of Fisherman Lake (Sites WC-P-32 to WC-P-43) is a complex network of open water and small streams; therefore, the entire area may have fish habitat potential. An ice bridge crossing will also be installed on the Liard River in BC which also supports a diverse fish community.

Bull trout (Western Arctic) are federally listed as Special Concern under *SARA* and COSEWIC (Government of Canada 2021a). For BC, bull trout, goldeye (*Hiodon alosoides*), and inconnu (*Stenodus leucichthys*) are Blue-listed which indicates they "have characteristics that make them particularly sensitive or vulnerable to human activities or natural events" (BC ENV 2021b). Arctic cisco are Red-listed and the "lists flags them as being at risk and requiring investigation" (BC ENV 2021b). Bull trout are also listed as Sensitive by the NWT (Working Group on General Status of NWT Species 2016). Dolly Varden (Western Arctic) are also federally listed as Special Concern under *SARA* and COSEWIC (Government of Canada 2021a), however are only documented in the headwaters of the Liard River basin and are unlikely to be present at the Liard River ice bridge location (some historical records may be bull trout) (McPhail 2007).

The Yukon CDC maintains a list of animal species where more information is needed, however there is some concern over their conservation (Yukon CDC 2019a). Bull trout, flathead chub (*Platygobio gracilis*), and spoonhead sculpin (*Cottus ricei*) are on the Yukon watch list and are documented to occur in the La Biche River (Government of BC 2021b).

Timing windows for potential instream work is variable depending on the province or territory where work will be conducted, however commonly speak to the presence of spring and fall spawners.

- For the NWT, all potential watercourses have a restricted activity period (RAP) of August 15 to July 15 (DFO 2013).
- For the Yukon, all potential watercourses have a Least Risk Window of June 15 to September 1 RAP of September 2 to June 14) (DFO 2014).

- For BC, all potential watercourses along the Project have a Least Risk Window of July 15 to August 15 (RAP of August 16 to July 14) for the Northeast Region (BC MFLNRORD 2016a).

7.2.2.1 Pointed Mountain Pipeline

There are 43 watercourses crossed by the Pointed Mountain Pipeline based on a desktop review, including the La Biche River, unnamed tributaries to the La Biche River, unnamed tributaries to the Kotaneelee River, and unnamed tributaries to Fisherman Lake River (Table 7.1-3, Appendix C). The original Pointed Mounted Pipeline route crosses the Kotaneelee River; however, this segment of pipeline was previously removed. The La Biche River crossing, which was previously exposed, was replaced via horizontal directional drill. An ice bridge will be constructed across the Liard River in BC to access the physical abandonment sites in Yukon and BC.

Surface Water

The Pointed Mountain Pipeline is located in a muskeg setting with many poorly defined watercourses and fens commonly occurring along the existing pipeline right-of-way. The Pointed Mountain Pipeline and access crossings are all located within the Liard River Basin. The La Biche River and Kotaneelee River are direct tributaries to the Liard River. Fisherman Lake has an unnamed outflow on the southern end of the lake that flows into the Liard River.

The Liard River Basin is a transboundary watershed with headwaters in the southern portion of the Yukon. The Liard River flows southeast across the BC border then northward across the NWT border to where it eventually meets the confluence with the Mackenzie River. The Liard River Basin area is approximately 275,000 square kilometres (km^2) and is the ninth largest in Canada (Mackenzie River Water Board 2003).

Fish documented in the La Biche River include Arctic grayling, bull trout, flathead chub, longnose sucker (*Catostomus catostomus*), mountain whitefish (*Prosopium williamsoni*), slimy sculpin (*Cottus cognatus*), spoonhead sculpin, walleye [(*Sander vitreus*), and white sucker (*Catostomus commersoni*) (Government of BC 2021b,c,d). Information was not found for Fisherman Lake; however, based on the size and connectivity to other waterbodies, it is presumably fish-bearing.

Fish documented in the Liard River include Arctic cisco (*Coregonus autumalis*), Arctic grayling, bull trout, burbot (*Lota lota*), chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*Oncorhynchus keta*), Dolly Varden (*Salvelinus malma*), finescale dace (*Phoxinus neogaeus*), flathead chub, goldeye, inconnu, lake chub (*Couesius plumbeus*), lake trout (*Salvelinus namaycush*), lake whitefish (*Coregonus clupeaformis*), longnose dace (*Rhinichthys cataractae*), longnose sucker (*Catostomus catostomus*), mountain whitefish, northern pearl dace (*Margariscus margarita*), northern pike (*Esox lucius*), pygmy whitefish (*Prosopium coulterii*), rainbow trout(*Oncorhynchus mykiss*), round whitefish (*Prosopium cylindraceum*), slimy sculpin, spoonhead sculpin, trout-perch (*Percopsis omiscomaycus*), walleye and white sucker (Government of BC 2021b,c,d; McPhail 2007).

Chinook salmon are a vagrant historical record in the Liard River and unlikely to occur with any regularity in the Liard River (McLeod and O'Neil 1983). The Liard River is also notable for having a small and possibly sporadic chum salmon run from the Beaufort Sea (McLeod and O'Neil 1983). This is the only anadromous salmonid species noted to occur historically with some regularity within the Mackenzie River basin (of which the Liard River is a part of) (McLeod and O'Neil 1983). Dolly Varden are present in the upper Liard River basin, although some historical records indicate that these are likely bull trout from when the two char were considered the same species (McPhail 2007).

No information was available for the watercourses crossed by the pipeline route on the Yukon FISS and Fish Sampling Atlas (Community Mapping Network 2021). No additional fisheries information was found from the Yukon or the NWT, as information is limited. The Project crosses tributaries of the Kotaneelee River system in the NWT where bull trout (Special Concern under *SARA*) are also known to occur (Stewart et al. 2007). Stewart et al. noted that stream resident populations of bull trout are likely present in the Kotaneelee River system. Stream resident populations indicate they are non-migratory and inhabit spawning tributaries year-round (Stewart et al. 2007).

Physical abandonment activities (e.g., vegetation brushing, excavation, isolation, backfilling) along the Pointed Mountain Pipeline will occur at four locations in the NWT, two locations in the Yukon, and three locations in BC. Based on a desktop review, there are no watercourses located within 30 m of these sites (Table 2.4-1). An ice bridge will be constructed over the Liard River to access physical abandonment sites in Yukon and BC.

Groundwater Quality and Quantity

In BC, groundwater is a valuable resource as a drinking water source and provides base flow in many streams (Government of BC n.d.). Groundwater discharge into streams is important for the survival of many fish populations during low flow and winter (Government of BC n.d.). Aquifers, which hold groundwater, are sensitive to contamination and the degree depends on the land use, depth, overlaying materials and permeability. Groundwater wells provide access to the water stored underground in aquifers and also are used to monitor groundwater (Government of BC n.d.).

The Liard River Basin Transboundary Aquifer Assessment compiled a large amount of groundwater information for the Yukon and NWT portions of the Liard River Basin (Palmer 2020). The purpose of the document was to identify potential aquifers, assess their vulnerability to existing land use and recommend future research. Within the Project RSA, the assessment identified potential Type 1 potential surficial aquifers along the La Biche River and Kotaneelee River valleys. Type 1 are the most common surficial aquifer type and are predominantly found along creek and river valleys. They are often composed of well sorted sand/gravel as they originate from deposition of materials from flowing water. These aquifers are hydrologically connected with surface waters and contain permeable materials; therefore, they may be vulnerable to groundwater contamination. Otherwise, the assessment indicates the majority of the Project RSA was considered to have low surficial aquifer potential, however, the assessment also acknowledges data gaps.

In BC, the Groundwater Observation Well Network program collects, interprets, and reports information about the ground water quantity and chemistry, however, no information is available for the Project RSA as there are no monitoring wells (Government of BC 2021a). Aquifer intrinsic vulnerability data are available on BC Habitat Wizard for the majority of the pipeline route other than the northern most 700 m within BC (Government of BC 2021a). Intrinsic vulnerability incorporates only hydrogeologic characteristics alone (not land use or potential nature of contaminants) and the pipeline route crosses areas of low to moderate class vulnerability (Government of BC 2021a). No other aquifer data are found for BC for the Project RSA (Government of BC 2021a).

No wells or springs were found within 50 m of the Pointed Mountain Pipeline in the NWT, Yukon, or BC (BC MOE 2008; BC MFLNRO 2010a,b; Government of BC 2021d; Yukon Water Resources Branch 2021).

Table 7.2-1. Watercourses Crossed by the Pointed Mountain Pipeline

Potential Watercourse (WC) Name[a]	Site Number	Province/ Territory	Restricted Activity Period[c]	Universal Transverse Mercator (UTM) Zone	UTM Easting	UTM Northing	Fish Species Previously Documented[c]	Notes
Unnamed tributary to Fisherman Lake	WC-01	NWT	August 15 to July 15	11	454397	6695300	No fish sampling documented	Area has abundant open water, potential fish habitat throughout. Points are where imagery shows the most open water.
Unnamed tributary to Fisherman Lake	WC-02	NWT	August 15 to July 15	11	454339	6695053	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-03	NWT	August 15 to July 15	11	454315	6694952	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-04	NWT	August 15 to July 15	11	454295	6694914	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-05	NWT	August 15 to July 15	11	454258	6694880	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-06	NWT	August 15 to July 15	11	454217	6694828	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-07	NWT	August 15 to July 15	11	454201	6694791	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-08	NWT	August 15 to July 15	11	454199	6694751	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-09	NWT	August 15 to July 15	11	454182	6694301	No fish sampling documented	

Table 7.2-1. Watercourses Crossed by the Pointed Mountain Pipeline

Potential Watercourse (WC) Name[a]	Site Number	Province/ Territory	Restricted Activity Period[c]	Universal Transverse Mercator (UTM) Zone	UTM Easting	UTM Northing	Fish Species Previously Documented[c]	Notes
Unnamed tributary to Fisherman Lake	WC-10	NWT	August 15 to July 15	11	454177	6694191	No fish sampling documented	As above
Unnamed tributary to Fisherman Lake	WC-11	NWT	August 15 to July 15	11	454172	6694104	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-12	NWT	August 15 to July 15	11	454152	6693756	No fish sampling documented	
Unnamed tributary to Fisherman Lake	WC-13	NWT	August 15 to July 15	11	454116	6693305	No fish sampling documented	-
Unnamed tributary to Fisherman Lake	WC-14	NWT	August 15 to July 15	11	453483	6691236	No fish sampling documented	-
Unnamed tributary to Fisherman Lake	WC-15	NWT	August 15 to July 15	11	453441	6691102	No fish sampling documented	-
Unnamed tributary to Fisherman Lake	WC-16	NWT	August 15 to July 15	11	452367	6688889	No fish sampling documented	-
Unnamed tributary to Fisherman Lake	WC-17	NWT	August 15 to July 15	11	451604	6687484	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-18	NWT	August 15 to July 15	11	450360	6685109	No fish sampling documented	-

Table 7.2-1. Watercourses Crossed by the Pointed Mountain Pipeline

Potential Watercourse (WC) Name[a]	Site Number	Province/ Territory	Restricted Activity Period[c]	Universal Transverse Mercator (UTM) Zone	UTM Easting	UTM Northing	Fish Species Previously Documented[c]	Notes
Unnamed tributary to the Kotaneelee River	WC-19	NWT	August 15 to July 15	11	450149	6684705	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-20	NWT	August 15 to July 15	11	450106	6684622	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-21	NWT	August 15 to July 15	11	449010	6682248	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-22	NWT	August 15 to July 15	11	448443	6681002	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-23	NWT	August 15 to July 15	11	446762	6678798	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-24	NWT	August 15 to July 15	11	446423	6677622	No fish sampling documented	No blue line but obvious gully from imagery and topography lines
Unnamed tributary to the Kotaneelee River	WC-25	NWT	August 15 to July 15	11	446243	6676578	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-26	NWT	August 15 to July 15	11	445515	6673774	No fish sampling documented	-
Unnamed tributary to the Kotaneelee River	WC-27	NWT	August 15 to July 15	11	443905	6670521	No fish sampling documented	-

Table 7.2-1. Watercourses Crossed by the Pointed Mountain Pipeline

Potential Watercourse (WC) Name[a]	Site Number	Province/ Territory	Restricted Activity Period[c]	Universal Transverse Mercator (UTM) Zone	UTM Easting	UTM Northing	Fish Species Previously Documented[c]	Notes
La Biche River (backwater)	WC-28	Yukon	September 2 to June 14	11	442068	6667821	Arctic grayling, bull trout, flathead chub, longnose sucker, mountain whitefish, slimy sculpin, spoonhead sculpin, walleye and white sucker.	Possible backwater area from the La Biche River, could be good rearing habitat
La Biche River	WC-29	Yukon	September 2 to June 14	11	442009	6667516	Arctic grayling, bull trout, flathead chub, longnose sucker, mountain whitefish, slimy sculpin, spoonhead sculpin, walleye and white sucker.	Pipe replaced already occurred
La Biche River (side channel)	WC-30	Yukon	September 2 to June 14	11	441987	6667296	Arctic grayling, bull trout, flathead chub, longnose sucker, mountain whitefish, slimy sculpin, spoonhead sculpin, walleye and white sucker.	La Biche River side channel
Unnamed tributary to the La Biche River	WC-31	Yukon	September 2 to June 14	11	441690	6664453	No fish sampling documented	Access along right-of-way
Unnamed tributary to the La Biche River	WC-32	Yukon	September 2 to June 14	11	440960	6661076	No fish sampling documented	Access along right-of-way
Unnamed tributary to the La Biche River	WC-33	Yukon	September 2 to June 14	11	440455	6660538	No fish sampling documented	Access along right-of-way
Unnamed tributary to the La Biche River	WC-34	Yukon	September 2 to June 14	11	438688	6659613	No fish sampling documented	Access along right-of-way
Unnamed tributary to the La Biche River	WC-35	Yukon	September 2 to June 14	11	437187	6658837	No fish sampling documented	Access along right-of-way

Table 7.2-1. Watercourses Crossed by the Pointed Mountain Pipeline

Potential Watercourse (WC) Name[a]	Site Number	Province/ Territory	Restricted Activity Period[c]	Universal Transverse Mercator (UTM) Zone	UTM Easting	UTM Northing	Fish Species Previously Documented[c]	Notes
Unnamed tributary to the La Biche River	WC-36	Yukon	September 2 to June 14	11	435456	6656150	No fish sampling documented	Access along right-of-way
Unnamed tributary to the La Biche River	WC-37	Yukon	September 2 to June 14	11	433535	6652930	No fish sampling documented	Access along right-of-way
Unnamed tributary to the La Biche River	WC-38	Yukon	September 2 to June 14	11	433166	6652376	No fish sampling documented	Potential fish habitat in beaver pond, not a blue line
Unnamed tributary to the La Biche River	WC-39	BC	August 16 to July 14	11	432962	6651964	No fish sampling documented	Access along right-of-way. Watershed code 210-319000-15200-64400
Unnamed tributary to the La Biche River	WC-40	BC	August 16 to July 14	11	432628	6650928	No fish sampling documented	Access along right-of-way. No watershed code
Unnamed tributary to the La Biche River	WC-41	BC	August 16 to July 14	11	432416	6650236	Arctic grayling, finescale dace, longnose sucker and slimy sculpin	Access along right-of-way. Watershed Code 210-319000-15200
Unnamed tributary to the La Biche River	WC-42	BC	August 16 to July 14	11	432002	6648885	No fish sampling documented	Access along right-of-way. Watershed code 210-319000-13000-76800-1566
Unnamed tributary to the La Biche River	WC-43	BC	August 16 to July 14	11	431971	6648798	No fish sampling documented	Access along right-of-way. Watershed code 210-319000-13000-76800

Table 7.2-1. Watercourses Crossed by the Pointed Mountain Pipeline

Potential Watercourse (WC) Name[a]	Site Number	Province/ Territory	Restricted Activity Period[c]	Universal Transverse Mercator (UTM) Zone	UTM Easting	UTM Northing	Fish Species Previously Documented[c]	Notes
Liard River	WC-Access-1	BC	August 15 to July 15	11	452946	6640067	Arctic cisco, Arctic grayling, bull trout, burbot, chinook salmon, chum salmon, Dolly Varden, finescale dace, flathead chub, goldeye, inconnu, lake chub, lake trout, lake whitefish, longnose dace, longnose sucker, mountain whitefish, northern pearl dace, northern pike, pygmy whitefish, rainbow trout, round whitefish, slimy sculpin, spoonhead sculpin, trout-perch, walleye and white sucker[d]	Ice bridge crossing for access off right-of-way
Unnamed tributary to the La Biche River	WC-Access-2	BC	August 15 to July 15	11	432002	6648813	No fish sampling documented	Access off right-of-way

Notes:

[a] Potential watercourses were identified by desktop review and a field visit would need to confirm if defined bed and banks and fish habitat potential are present.

[b] RAPs are from BC MFLNRORD 2016a and DFO 2013, 2014. BC and Yukon implement least risk windows when instream work can occur, for the purposes of this table the timing has been presented as when work should not occur for consistency. RAPs assume defined bed and banks and fish presence. Aquatic habitat assessments in the field, if warranted for any ground disturbance work, could clarify whether a RAP is applicable (e.g., if no fish habitat potential exists at a given site). If fieldwork confirms that a site is a non-classified drainage and/or lacks fish habitat potential, the RAP may not apply and there would be no timing restrictions in regard to fish.

[c] From McPhail 2007 and the various BC databases: Habitat Wizard (Government of BC 2021a), EcoCat Ecological Reports Catalogue (Government of BC 2021b) and the Fish Inventories Data Queries (Government of BC 2021c). Locations with no fish documented have not been sampled/lack any inventory data and should be assumed to be fish-bearing unless fieldwork is conducted.

[d] Chinook salmon are a vagrant historical record in the Liard River and unlikely to occur with any regularity in the Liard River (McLeod and O'Neil 1983). Dolly Varden are present in the upper Liard River basin, although some historical records are likely bull trout from when the two char were considered the same species (McPhail 2007).

7.3 Project Interactions with Aquatic Resources

Table 7.3-1 identifies the Project components that may interact with aquatic resources to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 7.6. A justification for no interaction is provided following Table 7.3-1 in subsection 7.3.1.

Table 7.3-1. Project Interactions with Aquatic Resources

Project Activities	Potential Effects			
	Change in Surface Water Quality	Change in Surface Water Quantity	Change in Groundwater Quality or Quantity	Change in Fish Habitat
Pointed Mountain Pipeline				
Physical Abandonment Activities	✓	✓	-	✓
Abandonment in-place	✓	-	-	✓

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

7.3.1 Project Interactions Scoped Out of Further Consideration

7.3.1.1 Change in Surface Water Quality or Quantity

For abandonment in-place, it is unlikely that pipeline degradation will create a sudden collapse down to the pipeline installation depth, and any subsidence that does occur is expected to be localized and intermittent (Det Norske Veritas 2010). Therefore, the alteration of natural drainage patterns with the potential to change in surface water quantity once the pipeline is abandoned in-place is not anticipated.

7.3.1.2 Change in Groundwater Quality and Quantity

There are no watercourses located within 30 m of the physical abandonment locations; therefore, a change in groundwater quality during physical abandonment activities is not anticipated.

Abandoning the pipeline in-place is not anticipated to divert enough water to reduce areas of recharge or impact groundwater quality or quantity in the event a water conduit is created.

7.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on aquatic resources. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons. Table 7.4-1 identifies these key mitigation measures for each effect pathway identified for Project components.

Table 7.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in surface water quality and quantity	Increased erosion on the Project Footprint due to vegetation brushing and vehicle and equipment crossings (e.g., ice bridges, snowfills) may increase sediment concentrations and transport to surface water during physical abandonment activities.	Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		Project Footprint.
		Ensure avoidance of scalping the vegetation layer when clearing snow from areas not intended to have topsoil salvage (e.g., frozen right-of-way access areas).
		If wind or water erosion is evident during construction, all necessary equipment and personnel should be made available to control the erosion (as determined by the EI/PEL).
		Where the risk of erosion is severe, consider the use of mulch matting (in accordance with applicable regulatory requirements) or tackifier to stabilize soil.
		Subject to restrictions, water may be drawn from local sources, such as lakes, streams, and private or municipal wells for construction activities (e.g., freezing in of access areas). Before any taking of water, review with the EI/PEL conditions of any applicable permitting or agreements. Requirements vary by jurisdiction, and compliance will be verified before any taking of water.
		Ensure to withdraw water used for vehicle and equipment crossings from the same drainage basin.
		Water will only be withdrawn from Westcoast-approved sources and in accordance with applicable permits.
		Use existing watercourse vehicle crossings, where practical.
		If temporary vehicle crossing structures are not in place, install mats at watercourse crossings to prevent fording watercourses prior to installation. If fording is necessary, appropriate permits and/or notifications will be in place prior to fording.
		Avoid grading, if practical, when constructing bridge, fill, or ford crossings. Where grading is necessary, ensure grading does not conflict with Approval Conditions and reduce the amount of grading conducted. Ensure that no excavation of the streambed occurs during installation of the vehicle crossing unless approved by the appropriate regulatory authority.

Table 7.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in surface water quality and quantity (cont'd)	As above	Install temporary ECDs (e.g., silt fences) within 24 hours of backfilling the wetland crossing. Ensure silt fences have been installed properly, are solid and filter fabric is tight (EPP Figure 3, Installing Silt Fence).
		Once vehicle crossing structures are removed, restore and stabilize streambeds, streambanks, and other disturbed areas.
		Remove vehicle crossing structures at watercourses prior to spring break-up, unless otherwise approved by the appropriate regulatory authority. Restore and stabilize streambeds, streambanks and other disturbed areas following removal of vehicle crossing structures. If vehicle crossings are needed for access to complete seeding during final cleanup, they can be replaced after spring break-up.
		Recontour and stabilize banks and approach slopes, and install berms, cross ditches and/or silt fences at any location where runoff from the Project Footprint may flow into a watercourse (EPP Figure 4, Cross Ditches and Berms, EPP Figure 3, Installing Silt Fence, and EPP Section 18 – Watercourse Crossing and Construction General Requirements).
		The Westcoast CM (or designate) will complete the final selection of vehicle crossing method in consultation with the EI and, when necessary, the appropriate regulatory authority. Existing bridges should be used whenever practical.
		Except for clearing-related and bridge installation equipment, fording of waterways will not be permitted.
		Remove crossing structures and associated debris, where practical, prior to freeze-up (for summer construction) and prior to break-up (for winter construction).
	Physical abandonment activities on land adjacent to waterbodies may result in changes in natural flow patterns.	Salvage and store peat separately from the underlying mineral material and replace in order such that the peat material remains on the surface to ensure that future drainage through the shallow peat material is not impeded.
		Place topsoil in distinct piles above the average annual high-water mark in a manner that does not block drainage or runoff, construction activities, or replacement of grade material or spoil, and prevents erosion and siltation.

Table 7.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in surface water quality and quantity (cont'd)	As above	Regrade areas with vehicle ruts, erosion gullies, or where excavation areas have settled.
		Equipment bridges will be designed to withstand the maximum foreseeable flow of the stream without causing restriction or pooling.
		Snow fill crossings should be notched prior to de-mobilization to facilitate drainage flows during melt conditions.
		Remove crossing structures and associated debris, where practical, prior to freeze-up (for summer construction) and break-up (for winter construction).
		Recontour the wetland and restore surface drainage patterns to as close to pre-construction profile as practical.
		Recontour and restore areas to pre-construction grades and drainage patterns.
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to transport contaminants into surface waters.	The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records will be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
Change in fish and fish habitat	Brushing for vehicle and equipment crossings will lead to alteration of riparian habitat within the Project Footprint.	If temporary vehicle crossing structures are not in place, install mats at watercourse crossings to prevent fording watercourses prior to installation. If fording is necessary, appropriate permits and/or notifications will be in place prior to fording.
		Avoid grading, if practical, when constructing bridge, fill or ford crossings. Where grading is necessary, ensure grading does not conflict with Approval Conditions and reduce the amount of grading conducted. Ensure that no excavation of the streambed occurs during installation of the vehicle crossing unless approved by the appropriate regulatory authority.

Table 7.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in fish and fish habitat (cont'd)	As above	Maintain low growing vegetation or a vegetated ground mat within the buffer zone of watercourses to the extent practical by walking, storing material, or constructing over the undisturbed areas.
		Ensure that no excavation of the streambed occurs during installation of the vehicle crossing unless approved by the appropriate regulatory authority.
		Flag the edge of the riparian buffer zone before any site disturbance activities in the vicinity of a watercourse occurs.
		Ensure temporary workspace does not encroach within the vegetated buffers of the watercourse. If additional temporary workspace is required, this should be communicated to the EI and PEL prior to initiation of construction activities, as additional approval may be required based on permit conditions.
	Vehicle and equipment crossings, and runoff and erosion can introduce fine sediment to watercourses.	Store salvaged trees and shrubs on the side of the Project Footprint in a manner such that they do not dry out before replanting during restoration.
		Seed disturbed banks and riparian areas with an approved native seed mixture and/or cover crop, as directed by the EI(s) or designate(s), if disturbed by vehicle and equipment crossings or water withdrawal activities. The EI(s) or designate(s) will determine onsite whether other restoration methods need to be applied to stabilize banks (e.g., soil wraps, brush layers, and matting)
		Reduce grading within the 10 m buffer of undisturbed vegetation on the banks of watercourses and wetlands, unless otherwise approved by the appropriate regulatory authority. Grading within 10 m of the watercourse or wetland, if approved, may be appropriate if completion of this activity results in a reduced erosion and sedimentation risk. If grading within the buffer, install temporary sediment barriers to prevent sediment from flowing into the watercourse or wetland (EPP Figure 3, Installing Silt Fence).
		Except for clearing-related and bridge installation equipment, fording of waterways will not be permitted (i.e., hydrovac or other equipment are not permitted to ford waterways prior to bridge placement). A single pass across waterbodies prior to bridge installation is allowable for these units, unless restricted by applicable permits.
		In addition, any fill material required (e.g., clean gravel, cobble, and riprap) for stabilization and reclamation will be sourced and approved by the EI/PEL prior to the commencement of construction activities.
		The EI will approve appropriate seeding procedures to ensure even distribution of appropriate species in each mix.

Table 7.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in fish and fish habitat (cont'd)	As above	Operate all equipment in a manner that prevents deleterious substances from entering the watercourse. Ensure that all material placed within the wetted perimeter of a watercourse is not toxic to aquatic species.
		Cease work immediately if sediment-laden water or other deleterious substances are entering a watercourse.
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to transport contaminants.	The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions, or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records will be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
		The intake hose will be suspended off the waterbody bottom and equipped with a suitable screen, or equivalent device, to prevent fish uptake.
	Water withdrawal for icing access roads is anticipated to be sourced from existing borrow pits as well as the Liard River and watercourses and pumping may cause harm to fish.	During withdrawal, adequate waterbody flow rates and/or depth levels will be maintained to protect aquatic life and allow for downstream use. The volume and rate of withdrawal will be recorded to comply with applicable permit conditions and/or agreements. In addition, abide by instream RAPs when working in fish-bearing waterbodies, as outlined in Table 3 of the EPP.
		Follow the DFO guidelines for water withdrawal from the Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater (DFO 2020a). Intakes must have a maximum screen size of 2.54 mm, be at least 30 cm off the river bottom and the intake velocity should not exceed 0.035 m/s as per the DFO End-of-Pipe Screen Size Tool (DFO 2021)
		Use only clean ice and snow for the construction or maintenance of the ice bridge.
		Source and use water from the same basin.

Table 7.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in fish and fish habitat (cont'd)	Water withdrawal for icing access roads is anticipated to be sourced from existing borrow pits and watercourses and pumping may cause inter-basin transfer of invasive aquatic organisms.	Refer to the regional standard for decontamination of all equipment and follow protocols for work in or near water. Rough/fine cleaning standards and equipment cleaning logs are summarized in Appendix B of the EPP.

7.5 Potential Effect Pathways Not Carried Through for Further Assessment

The following potential residual effect pathways are expected to be avoided through the implementation of mitigation measures (Table 7.4-1).

- Change in surface water quality due to:
  - increased erosion on the Project Footprint due to vegetation brushing and vehicle and equipment crossings (e.g., ice bridges, snowfills) may increase sediment concentrations and transport to surface water during physical abandonment activities;
  - physical abandonment activities resulting in changes in natural flow patterns;
  - abandonment in-place resulting in eventual perforation, creating a water conduit with the potential to transport contaminants into surface waters; and/or
  - water withdrawal for ice bridge construction resulting in potential sedimentation.
- Changes to fish and fish habitat due to:
  - brushing for vehicle and equipment crossings will lead to alteration of riparian habitat from within the Project Footprint;
  - vehicle and equipment crossings introducing fine sediment to watercourses;
  - the abandoned pipeline transporting contaminants as a result of eventual perforation;
  - water withdrawal during physical abandonment activities causing harm to fish; and/or
  - water withdrawal during physical abandonment activities causing inter-basin transfer of invasive aquatic organisms.

7.6 Conclusion

After the implementation of mitigation measures listed in Table 7.4-1 and the Project-specific EPP (Appendix B of this ESA), no residual effects on aquatic resources are anticipated.

7.7 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the EPP (Appendix B of this ESA). Westcoast's methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details are described in Section 19 of this ESA, Follow-up and Monitoring.

8. Assessment of Effects on Wetlands

The assessment team conducted studies to establish the existing conditions (i.e., the baseline setting) for wetlands from which the potential effects of the Project can be determined. The study was based on a review of existing literature, internet searches, consultation and engagement, imagery review, field studies and surveys, and expert opinion.

8.1 Scope of the Assessment

Wetlands are included in this assessment based on the biophysical elements identified in the *Filing Manual* (CER 2021a). The Project has the potential to impact wetlands in terms of habitat, hydrological, and biogeochemical functions. Therefore, wetlands were selected as a valued component.

Wetlands are defined as "…land that is saturated with water long enough to promote wetland or aquatic processes as indicated by poorly-drained soils, hydrophytic (water-loving) vegetation, and various kinds of biological activity which are adapted to a wet environment" (NWWG 1988).

This definition encompasses a wide range of ecosystems that vary in surface water permanence, hydrophytic vegetation communities, and hydric soil composition and include bogs, fens, marshes, swamps, and shallow open waters.

8.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements, was used to identify the circumstances and interactions to be considered for the assessment of wetlands.

8.1.1.1 Federal

Canadian Energy Regulator *Onshore Pipeline Regulations*

Abandonment activities will be carried out in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. Companies are responsible for meeting the requirements of the CER *OPRs* to manage safety, security, and environmental protection throughout the entire lifecycle of their facilities, from design, through to construction, operation, and abandonment including regard for contamination and protection of wetland systems.

If water infiltrates the pipeline, the potential exists for that water to carry any residual contaminants left in the abandoned pipeline to some point of exit, and the point of exit could be a wetland. The buried pipeline left in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

Federal Policy on Wetland Conservation

The principal legislation related to the protection of wetlands at a federal level is provided in the FPWC. The objective of the FPWC (Government of Canada 1991) is to promote conservation of Canada's wetlands to sustain their ecological and socio-economic functions. The Project is located primarily on provincial or territorial Crown land, with 600 m of the Pointed Mountain Pipeline being on private land owned by NRM. Westcoast will apply the intent of the No Net Loss of wetland function to the entire Project extent.

8.1.1.2 Provincial and Territorial

The Project will comply with applicable provincial and territorial regulatory requirements in the NWT, the Yukon, and BC and generally follow the intent of provincial and territorial objectives and guidance that may be relevant to the Project. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to wetlands are described as follows.

Northwest Territories

Northwest Territories *Waters Act* and *Waters Regulations*

In the NWT, the primary legislation that contains provisions related to wetlands includes the *Waters Act* and *Waters Regulations*. The definition of a watercourse is interpreted to include wetlands as described in the NWT *Waters Regulations* as:

> "a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches."

Licences for activities with the potential to adversely affect watercourses (i.e., wetlands), and the criteria under which they are required, are summarized in Schedule H, Licensing Criteria for Agricultural, Conservation, Recreational and Miscellaneous Undertakings, of the regulations. The types of activities listed in Schedule H of the NWT *Waters Regulations* are equivalent to those listed in Schedule 5 of the Yukon *Waters Regulation*; however, the criteria are not identical. A licence may be required for direct water use, watercourse crossings (including pipelines, bridges, and roads), watercourse training (including channel and bank alterations, spurs, culverts, erosion control and, artificial accretion), flood control, diversion, alteration of flow or storage by means of dams or dikes, and deposit of waste.

However, depending on the extent of the activity and the nature of the watercourse (i.e., wetland), a licence is not always required. For example, a licence is not required for a watercourse crossing if the watercourse is less than 5 m in width, measured at the high-water mark, at the crossing location. Similarly, a license is not required for channel and bank alteration if the watercourse is less than 5 m in width at the point of alteration, or it is an intermittent watercourse, or if less than 100 m^3 of material is being removed or placed and the cross-sectional area of the watercourse is not significantly changed at the point of alteration, or the channel and bank alteration involves in-filling of a watercourse with no inflow or outflow and with a surface area of less than 0.5 ha.

Similar to above, this exemption for licence requirements may or may not apply to a wetland, depending on the proposed activity. Types of abandonment activities within wetlands that may trigger a water licence requirement include watercourse (i.e., wetland) crossings and deposit of waste (i.e., potential sedimentation during excavation within wetlands) and new temporary access through wetlands. The requirement for a licence is determined by self-assessing whether triggers under the regulation as described above are met based on activities being conducted for the Project.

The MVLWB is responsible for issuing water licences in the area of the Mackenzie Valley where the Project is located. Through consultation with the MVLWB and Westcoast (Potten et al. pers. comm. 2021), it was confirmed that where abandonment activities occur exclusively within the pipeline right-of-way a water licence would not be required as that is under the jurisdiction of the CER. Abandonment activities that occur outside of the pipeline right-of-way (e.g., new temporary access within a wetland) would require a water licence and associated land use permit. The timeline for the MVLWB to issue a water licence is approximately 42 days (or 2.5 months) (Potten et al. pers. comm. 2021).

Yukon Territory

Yukon *Waters Act* and *Waters Regulations*

In the Yukon, the primary legislation that contains provisions related to wetlands includes the *Waters Act* and accompanying *Waters Regulation* as regulated under the *Yukon Environmental and Socio-economic Assessment Act* (*YESAA*). The definition of a watercourse is interpreted to include wetlands as described in the Yukon *Waters Regulation* as:

> "a natural watercourse, body of water or water supply, whether usually containing water or not, and includes groundwater, springs, swamps, and gulches."

If abandonment activities occur within a wetland, *YESAA* requirements, in addition to water licence requirements, will likely be triggered, depending on the activity assessed through Schedule 5 of the *Waters Regulation*. As requirements will depend on a specific activity, the Yukon Water Board will review and confirm if any of the triggers are met that require *YESAA* approval in instances where a self-assessment determines that a water licence is required (Beckerton pers. comm. 2021).

Licences for industrial activities with the potential to affect watercourses (i.e., wetlands), and the criteria under which they are required, are summarized in Schedule 5, Licensing Criteria for Industrial Undertakings, of the regulation. A licence may be required for direct water use, watercourse crossings (including pipelines, bridges, and roads), watercourse training (including channel and bank alterations, artificial accretion, spurs, culverts, docks, and erosion control), flood control, diversion, alteration of flow or storage by means of dams or dikes, and deposit of waste.

However, depending on the extent of the activity and the nature of the watercourse (i.e., wetland), a licence is not always required. For example, a licence is not required for a watercourse crossing if the watercourse is less than 5 m in width, measured at the high-water mark, at the crossing location. Similarly, a licence is not required for channel and bank alteration if:

- the watercourse is less than 5 m in width at the point of alteration;
- it is an intermittent watercourse; or
- less than 100 m^3 of material is being removed or placed and the cross-sectional area of the watercourse is not significantly changed at point of alteration.

These exemptions for licence requirements may or may not apply to a wetland, depending on the proposed activity.

Types of abandonment activities within wetlands that may trigger a water licence requirement include watercourse (i.e., wetland) crossings and deposit of waste (i.e., potential sedimentation during excavation within wetlands). The requirement for a licence is determined by self-assessing whether triggers under the regulation as described above are met based on activities being conducted for the Project.

The Yukon Water Board is responsible for issuing water licences (Government of Yukon 2021g). Consultation with this board is recommended to confirm that a licence under the *Waters Act* will be required for Project activities with the potential to impact wetlands. *YESAA* decision document is required in order to receive water licence approval from the Yukon Water Board. A 10-day public notice is required during the water licence approval process, and application timelines are approximately 6 months to receive approval (Beckerton pers. comm. 2021).

The Yukon does not currently have wetland-specific legislation; however, the Yukon Water Strategy and Action Plan (Government of Yukon 2014) calls for the development of a policy to manage the territory's wetlands, and engagement on this policy is currently underway (Government of Yukon 2021h).

British Columbia

British Columbia *Water Sustainability Act* and *Water Sustainability Regulation*

The *WSA* is the principal law for managing the diversion and use of water resources in BC. Under the *WSA*, the *Water Sustainability Regulation* sets out the statutory requirements for the issuance of licences or approvals for the diversion, use, or storage of surface water or groundwater, and for making Changes In and About a Stream. The definition of stream under the *WSA* is broad, and includes watercourses, wetlands, lakes, and other aquatic features including:

a) a natural watercourse, including a natural glacier course, or a natural body of water, whether or not the stream channel of the stream has been modified; or

b) a natural source of water supply, including, without limitation, a lake, pond, river, creek, spring, ravine, gulch, wetland, or glacier, whether or not usually containing water, including ice, but does not include an aquifer. (Government of BC 2014)

For CER-regulated projects, the BC OGC has authority to issue an approval for Changes In and About a Stream (including wetlands and lakes) in accordance with Section 11 of the *WSA*. Changes In and About a Stream refer to:

- any modification to the nature of the stream, including any modification of the land, vegetation, and natural environment of a stream or the flow of water in a stream; or
- any activity or construction within a stream channel that has or may have an impact on a stream or stream channel. (Government of BC 2014)

The *WSA* applies to activities on both Crown and private lands. As part of the application process for Changes In and About a Stream, *EPMR*-defined riparian classifications should be provided for streams, wetlands and lakes, and proponents should provide a document, such as an environmental management plan, describing the conformance of their proposed activities with each of the BC government's environmental objectives in the *EPMR* (BC OGC 2021f).

British Columbia *Environmental Protection and Management Regulation*

Under the BC *OGAA*, the *EPMR* establishes the BC government's environmental objectives. The BC government's environmental objectives related to riparian values are pertinent to the conservation of wetlands, lakes, and streams, and they focus on avoiding activities within these ecosystems and the surrounding riparian areas, while allowing for certain exceptions.

The EPMG provides a list of POMs that should be met for works occurring in designated RMAs associated with wetlands, lakes, and streams, if these areas cannot be avoided (BC OGC 2021f). RMAs are defined as transitional areas adjacent to wetlands, lakes, or streams, where there is a distinct shift in vegetation from aquatic to upland communities, and they consist of a RRZ and a RMZ (BC OGC 2021f). The widths of RRZs and RMZs are dependent upon the *EPMR*-defined riparian class of the stream, wetland, or lake. For wetlands, the *EPMR* emphasizes avoidance of W2 wetlands (i.e., wetlands 0.25 ha to 5 ha in size), except to facilitate a crossing of the wetland, as per section 5(iii).

Furthermore, avoidance of wetland RRZs is recommended, except to facilitate a crossing of the wetland, as well as RMZs, except to facilitate a crossing of the wetland, or if there will be no material adverse effects on fish and wildlife habitat, biodiversity, water values, and the ability of the RMZ to protect the RRZ, as per Sections 5(V) and 5(VI). Where avoidance as specified in the *EPMR* is not practical, a justification to the BC OGC may be required under the provincial approval processes within the CER framework.

Wetlands in the Wetland LSA were assigned riparian classes according to the *EPMR*. The riparian class of a wetland determines the width of its RRZ, RMZ, and RMA, which can be used to guide avoidance, minimization, mitigation, and restoration activities related to these ecosystems. Table 8.1-1 provides a summary of wetland riparian classification which is based on wetland size and BC BGC unit.

The *EPMR* applies to Crown land and does not apply to private land or to subsurface oil and gas activities associated with an operating area (including pipeline corridors) (BC OGC 2021f). However, the BC OGC will consider the *EPMR* and associated BC government's environmental objectives in its review of provincial authorizations for CER-regulated pipeline projects (e.g., the approval for Changes In and About a Stream under the *WSA*) (BC OGC 2019a), and it is recommended to apply appropriate mitigation measures for RMAs on private and Crown lands to meet the standards of the *EPMR*. The CER may also consider direction under the *EPMR* in its evaluation of applications.

Table 8.1-1. Wetland Riparian Classification and Associated Riparian Management Areas

Wetland Riparian Class	Description	RMA (m)	RRZ (m)	RMZ (m)
W1	Wetland is > 5 ha in size, or if located in the BWBSmw1/BWBSmw2[a] BGC subzone, 5 ha to 1,000 ha in size.	50	10	40
W2	Wetland is 0.25 ha to 5 ha in size.	30	10	20
W3	Wetland is > 1,000 ha in size and is located in the BWBSmw1/BWBSmw2 BGC subzone.	0	0	0
Unclassified	Wetland is < 0.25 ha in size.	N/A	N/A	N/A

Source: Adapted from the *EPMR* (*BC Reg. 200/2010;* BC OGC 2021f).

Note:

[a] Variant 1 and 2 of the Moist Warm (mw) subzone of the Boreal White and Black Spruce (BWBS) zone (DeLong et al. 2011).

British Columbia Area-Based Analysis

The BC OGC has developed a process for managing the impacts of oil and gas activities, called ABA. The Oil and Gas Activity Application Manual (BC OGC 2021b) states that CER projects located within northeast BC will consider the ABA approach. The ABA Tool applies a designation (or status) to RRZs based on a measure of riparian intactness within the Water Management Basin where they are located. Where development and cumulative impacts have reached or exceeded pre-defined thresholds, riparian areas within the basin are assigned an ABA status of Enhanced Management or Regulatory Policy, otherwise a status of Normal is applied (BC OGC 2018). For activities that will impact an RRZ with Enhanced Management or Regulatory Policy status that is located on Crown land, a mitigation hierarchy of "avoid, minimize, mitigate, and restore" will be followed (BC OGC 2018) and the BC OGC requires an ABA-specific mitigation plan to address construction practices. ABA does not apply to private land, meaning that the BC OGC does not require an ABA-specific mitigation plan for works in these areas. The component of the Project located in BC crosses provincial Crown land, and the status of the Lower Liard River Water Management Basin is "Normal" (BC OGC 2021c), therefore these additional ABA measures will not be required for the Project.

8.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding wetlands have been raised.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no concerns regarding wetlands, specifically, have been raised.

Members of Acho Dene Koe First Nation participated in the wetland surveys conducted for the Project.

8.1.3 Potential Effects, Pathways and Effect Indicators

Table 8.1-2 identifies the potential effect pathways of the Project on wetlands during physical abandonment activities, and as a result of abandonment in-place. Project effects on wetlands will only occur in the wetlands land use areas. Effects to wetlands will not occur in other land use types.

Table 8.1-2. Project Activities, Effects Pathways and Indicators for Wetlands

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in Wetlands	Vegetation brushing, grading, and topsoil salvage during abandonment activities may alter wetland habitat function by disrupting vegetation composition and structure, fragmenting nesting, and foraging habitat for wildlife, and altering wetland successional trajectory and type.	▪ Success of vegetation re-establishment ▪ Presence of invasive or undesirable vegetation species ▪ Vegetation structure and composition
	Grading, excavation, and backfilling, during abandonment activities may alter wetland hydrological function by disrupting vertical and horizontal water flow patterns and altering surface water permanency.	▪ Presence of natural contours ▪ Presence of surface water or channelized flow ▪ Localized drying or ponding of water
	Vegetation brushing, topsoil salvage, grading, excavation, and backfilling during abandonment activities may alter wetland biogeochemical function by reducing water quality and altering the sequestration, storage, cycling, and release of carbon and other nutrients.	▪ Clarity of surface waters ▪ Sediment accumulation ▪ Soil condition (e.g., evidence of compaction, rutting, or admixing) ▪ Indicators related to habitat and hydrological function
	Abandonment in-place may result in the eventual breakdown of TLPs or perforation of the pipeline, and creation of a preferred water conduit to transport water, materials, or residual contaminants that may alter wetland function.	▪ Vegetation density and vigour ▪ Clarity of surface waters ▪ Presence/health of aquatic animals in wetlands with surface water ▪ Initial drying or ponding of water and subsequent change in vegetation ▪ Substrate structure/composition
	Abandonment in-place may result in a buoyant pipeline, altering wetland habitat function in the long-term.	▪ Observation of exposed pipeline

8.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure, and temporary workspace. Table 8.1-3 describes the remaining spatial boundaries for wetlands and the rationale for choosing them.

Table 8.1-3. Spatial Boundaries for Wetlands

Element	Spatial Boundaries	Rationale
Wetlands	**Wetlands LSA:** A 100-m buffer extending from the Project Footprint (Figure 4.5-1). **Wetlands RSA:** A 10-km buffer extending from the Project Footprint (Figure 4.5-2).	**Wetlands LSA:** The Wetlands LSA incorporates the area in which wetlands are most likely to be affected by potential temporary disturbance due to all phases of the Project. The Wetlands LSA encompasses the distance at which wetland vegetation is predicted to be directly affected by all phases of the Project and includes wetlands adjacent to the Project Footprint, which may be susceptible to hydrological, habitat, and biogeochemical alteration. While most Project effects are expected to be localized on the Project Footprint, the Wetlands LSA aligns with the Vegetation LSA, since changes in vegetation (i.e., species or communities) are expected to be a gauge of the effects on wetland function. **Wetlands RSA:** The Wetlands RSA incorporates the area in which other land uses could interact with wetlands in the Wetlands LSA and have the potential to be directly, indirectly, or cumulatively affected by the potential temporary disturbance due to all phases of the Project. The Wetlands RSA aligns with the Aquatics RSA, since hydrology is the overall driver for both wetlands and aquatic ecosystems.

8.2 Existing Conditions for Wetlands

8.2.1 Desktop Review Methods

A desktop review was conducted using satellite imagery, the BC Freshwater Atlas (BC MFLNRORD 2018c), a preliminary Yukon wetland mapping layer (Government of Yukon 2021e), and the preliminary Canadian Wetland Inventory map (Amani et al. 2019), to determine wetland class and distribution along the Project, within a 100 m buffer extending out from the Project Footprint. Satellite imagery was reviewed at varying scales of approximately 1:2,000 to 1:15,000 and was interpreted using key indicators (e.g., geomorphology, surficial hydrology, and vegetation type and cover).

Each wetland crossing associated with the Project was delineated independently and assigned a unique crossing ID, despite the vast majority of wetland crossings being connected to other crossings. This approach was taken because most wetland systems crossed by the study area are expansive regional complexes, and delineation of the full extent of each wetland system was not practical.

Wetlands were classified according to the Canadian Wetlands Classification System (CWCS) (NWWG 1997). For wetlands in BC, the riparian class was determined as per the *EPMR* (*BC Reg. 200/2010*).

8.2.2 Wetland Survey Methods

A helicopter overflight was conducted along the access and pipeline right-of-way. Helicopter-assisted ground-based wetland assessments were conducted from August 4 to 5, 2021 at all ten locations (PM-1 to PM-10) where physical abandonment activities will occur.

During the field surveys, wetland classes and delineations identified during the desktop review were confirmed or refined, as warranted, and information was collected on wetland location, vegetation, hydrology, substrate (peat or mineral), habitat, and existing disturbance.

As required by the *Filing Manual* (CER 2021a), and to support the validity and accuracy of baseline information, formal record-keeping practices to store survey data as well as wetland spatial information for future reference have been followed.

8.2.3 Overview

Wetland regions in Canada are defined by wetland ecosystems that develop in locations with similar topography, hydrology, and nutrient regime. The Project is located within the Continental High Boreal Subregion of the Boreal Wetland Region and the Central Rocky Mountain Wetland Region of the Mountain Wetland Region. Characteristic Continental High Boreal wetlands consist of treed bogs and fens on broad flats and in confined basins. Swamp and marsh wetlands can be found in agricultural areas as well as along edges of some streams and lakes. Peat depth for Continental High Boreal wetlands averages 2 to 3 m (Energy, Mines and Resources Canada 1986).

Central Rocky Mountain wetlands within the Rocky Mountain Wetland Region. Characteristic Central Rocky Mountain wetlands include bogs and fens. Peat accumulation is typically less than 1 m (Energy, Mines and Resources Canada 1986). ECCC considers areas of the country with active or anticipated expansion of land use development, including portions of the NWT, the Yukon, and northern BC where the Project is located, to have the potential for wetland loss or degradation of “low” to “none” (Lynch-Stewart et al. 1996). Further details on the existing and reasonably foreseeable developments in the Wetlands RSA and their potential to contribute to cumulative effects on wetland function are provided in subsection 8.7.

A substantial proportion of the Pointed Mountain Pipeline crosses wetlands and, therefore, wetlands may be encountered during abandonment activities. However, the disturbances associated with abandonment activities are anticipated to be temporary in nature, and not cause a permanent loss of wetland area. Temporary wetland disturbances are acceptable within the applicable federal, provincial, and territorial regulatory frameworks, if avoidance of wetlands is employed where practical, and otherwise, proper mitigation is applied, approvals are obtained, and PCM is implemented to verify wetland recovery.

Water displacement may occur as a result of eventual corrosion and perforation of the pipeline where wetlands are located along the existing right-of-way with the potential for draining wetlands, or conversely, flooding other wetland areas along the right-of-way. Over time, the abandoned pipeline may corrode, and eventual perforation may influence wetlands through the creation of a water conduit resulting in an accumulation of water being deposited near wetlands. The water conduit also has the potential to change water quality through the transportation of contaminants, either existing contamination along the route (e.g., from historical operations) or due to contaminants derived from the pipeline epoxy coating. Residual contaminants may reach a wetland; however, pipeline corrosion is known to be localized and takes decades to occur.

It is not anticipated that the existing pipeline will create preferential flow along the entire right-of-way (Pipeline Abandonment Steering Committee 1996; Det Norske Veritas 2010; AMEC 2017) that could lead to wetland drainage or flooding; however, it is reasonable to assume that the pipeline will eventually fill with subsoil and water, creating the potential transport of contaminants. Pipelines left in-place may become buoyant within a wetland. Frost heave may increase uplift on an abandoned pipeline due to the reduction of heat from the surrounding soil compared to an operating pipeline (PTAC 2016).

The distribution of wetlands within 30 m of the physical abandonment locations is shown on the ESIS (Appendix C of this ESA).

8.2.3.1 Regional Wetland Characterization

Northwest Territories

The territorial abundance of wetlands in the NWT is estimated to be about 20 percent of the land cover (DUC 2018).

The Project components in the NWT are located within the Liard Upland Mid-Boreal Ecoregion in the Taiga Ecological Region (Ecosystem Classification Group 2007) and the Liard Range Ecoregion in the Cordillera Ecological Region of the NWT (Ecosystem Classification Group 2010). Less than five percent of the total area pf the Liard Upland Mid-Boreal Ecoregion is covered by water. The undulating terrain limits wetlands in area. In the Liard Range Ecoregion, there are few lakes and wetlands, common in broad valley bottoms, include shore and floating sedge fens and black spruce fens (Ecosystem Classification Group 2007, 2010). Local abundance and distribution of wetlands are summarized in subsection 8.2.3.4.

Yukon

The territorial abundance of wetlands in the Yukon is not known, as complete wetland mapping has not been conducted to understand the extent of wetland habitat, especially large complexes such as peatlands. Small, isolated wetlands and wetland complexes are found throughout the province and with the majority of wetlands are concentrated over areas of continuous permafrost (Government of Yukon 2020b).

The Project components in the Yukon are located within the La Biche River Boreal Low Subzone of the Yukon (Environment Yukon 2017). Soils are comprised of extensive till, glaciolacustrine, and fluvial deposits. Lowland plains and river valleys are below about 900 m (Environment Yukon 2017).

Local abundance and distribution of wetlands are summarized in subsection 8.2.3.4.

British Columbia

The provincial abundance of wetlands in BC is estimated to be about 5.6 percent of the land cover (Wetland Stewardship Partnership 2009).

The Project components in BC are located in the BWBSmk BGC zone of BC. Wetlands are abundant (greater than 5 percent of landscape) in the BWBSmk subzone. Due to the cool climate and low rates of decomposition in the BWBS zone, peat-forming wetlands such as bogs are most common, however fens, swamps, and less frequently marshes are found near more hydrologically dynamic sites (DeLong et al. 2011).

Local abundance and distribution of wetlands are summarized in subsection 8.2.3.4.

8.2.3.2 Characteristic Wetland Functions

Wetlands have been recognized as vital ecosystems that provide important benefits to the environment, society, and economy (Government of Canada 1991). Wetland function can be described as natural processes that occur within a wetland ecosystem that can be broadly grouped as habitat functions, hydrological functions, and biogeochemical functions. Wetland functions include trapping and storing sediment, water, and carbon, recharging aquifers, filtering water, dissipating energy of waves/flowing water, maintaining plant and animal biodiversity, and contributing to primary production (Ambrose et al. 2009).

Furthermore, wetlands provide natural habitat for many animals for all or portions of their lifecycles (DUC and FMWSI 2018; NWWG 1988; Welsch et al. 1995). Not all wetlands perform all functions, and wetland function can vary by wetland type, landscape position, and site-specific characteristics (DUC and FMWSI 2018; Hanson et al. 2008; NWWG 1988; Welsch et al. 1995).

In general, bogs and fens (i.e., peatlands) have the greatest capacity to store carbon, because a portion of the carbon they sequester is trapped in peat, rather than being decomposed and released back to the atmosphere. Bogs and fens also have a unique ability to store water above the gravitational water table (in peat pore space).

Marshes play an important role in the protection of shorelines and improvement of surface water quality, as their dense emergent vegetation serves to dissipate high-energy water flows and accelerate sedimentation rates, reducing bank erosion and surface water turbidity. Marshes, shallow water wetlands, and swamps provide surface water storage and are known to reduce the potential for flooding on the landscape, when present in sufficient quantity, because they trap runoff and storm water, moderating its input to lakes and rivers. Shallow water wetlands and marshes are also recognized for the critical habitat they provide for waterfowl during nesting, rearing, molting, staging, and migration.

Swamps, which are characterized by woody vegetation that can include trees, snags (i.e., standing trees that are dead or partially dead), and shrubs, provide excellent cover for wildlife in general, as well as unique habitat for cavity-nesting waterfowl, and ideal forage for ungulates when willows are abundant. Swamps also protect shorelines and improve water quality when present as riparian systems associated with rivers and lakes.

8.2.3.3 Wetland Conservation Areas and Significant Wetlands

The Project does not cross any designated wetland conservation areas (Bird Studies and Nature Canada 2004-2010; Bureau of the Convention on Wetlands 2016; ECCC 2019a, 2020b; WHSRN 2019; DUC 2018).

Within 10 km of the Pointed Mountain Pipeline in BC, there are two occurrences of the rare ecological community balsam poplar - white spruce/mountain alder - red-osier dogwood (*Populus balsamifera - Picea glauca/Alnus incana - Cornus sericea*, S3, Blue-listed) (BC ENV 2020). This community, or other Red- or Blue-listed communities of vegetation species may be present in the RSA.

8.2.3.4 Wetland Results Summary

A total of 64 wetlands were identified along the Pointed Mountain Pipeline, with a total area of approximately 34 ha within the pipeline footprint (approximately 29 percent of the pipeline footprint). Wetland classes encountered include swamps, fens, bogs, shallow water, and marshes. Six of the wetlands crossed are located in BC and will require an approval for Changes In and About a Stream if encountered by physical abandonment activities.

Furthermore, the RMA of any W2 riparian class wetland is recommended to be avoided (except to facilitate a crossing, or if no material adverse effects to the RMZ or RRZ will result; further details provided under the *EPMR*, subsection 8.1.1.2). In the NWT, 35 wetlands are crossed and 23 are crossed in the Yukon. Water licensing requirements under the NWT *Waters Regulation* and the Yukon *Waters Regulation* will be continually self-assessed prior to Project activities commencing and licences will be obtained as required.

Table 8.2-1 provides a summary of the wetland classifications, length, and area for wetlands encountered by the Pointed Mountain Pipeline.

There are three wetlands located within physical abandonment infrastructure sites; one in the Yukon and two in BC. Wetlands located at physical abandonment locations include a graminoid marsh identified at PM-7, a graminoid marsh at PM-8 and a graminoid marsh at PM-10. Wetlands cover approximately 0.1 ha of physical abandonment activities sites in the NWT, approximately 9 ha in the Yukon and approximately 3 ha in BC. Physical abandonment activities (e.g., vegetation brushing, excavation, isolation, backfilling), and access where wetlands are encountered are provided in the EPP (Appendix B) and are shown on the ESIS (Appendix C).

Table 8.2-1. Summary of Wetland Types Crossed by the Pointed Mountain Pipeline Route

CWCS Wetland Class[a, b]	Number of Wetlands	Approximate Length Crossed (km)[c]	Percent Length of Pipeline Footprint Crossed[d] (%)[d]	Approximate Wetland Area Within Pipeline Footprint (ha)[c,]	Percent Wetland Area of Pipeline Footprint (%)[d]
Treed Bog	2	1.00	1.8	2.11	1.8
Treed Fen	21	8.50	15.7	16.22	13.9
Shrub Fen	4	0.29	0.5	0.53	0.5
Graminoid Fen	3	0.69	1.3	1.26	1.1
Treed Swamp	20	3.79	7.0	6.72	5.8
Shrub Swamp	3	0.19	0.4	0.32	0.3
Graminoid Marsh	5	0.20	0.4	1.46	1.3
Shallow Open Water	6	2.43	4.5	5.30	4.6
Total	**64**	**17.09**	**31.6**	**33.92**	**29.3**

Notes:

[a] Wetlands included are crossed by the Pointed Mountain Pipeline right-of-way.

[b] Wetlands were classified according to the CWCS (NWWG 1988, 1997) for the purposes of summarizing the data.

[c] Wetland lengths and areas are approximate and indicate where the wetland intersects the Pointed Mountain Pipeline right-of-way (permanent right-of-way and temporary workspace).

[d] Approximate total footprint length = 54.24 km. Approximate total footprint area = 116.41 ha. Percentages are approximate due to rounding.

8.3 Project Interactions with Wetlands

Table 8.3-1 identifies the Project components that may interact with wetlands to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effect in subsection 8.6.

Table 8.3-1. Project Interactions with Wetlands

Project Activities	Potential Effects
	Change in Wetlands
Pointed Mountain Pipeline	
Physical Abandonment Activities	✓
Abandonment in-place	✓

Notes:
✓ = A potential interaction with the Project is identified.
- = No potential interaction with the Project is identified.

8.4 Mitigation

Where wetlands cannot be avoided during physical abandonment activities, Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on wetlands. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons. Table 8.4-1 identifies these key mitigation measures for each effect pathway identified for Project components.

Table 8.4-1. Key Mitigation Measures for Wetlands

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in wetlands	Vegetation brushing, grading, and topsoil salvage during abandonment activities may alter wetland habitat function by disrupting vegetation composition and structure, fragmenting nesting and foraging habitat for wildlife, and altering wetland successional trajectory and type.	Identify the start and end points of the wetland and limit disturbance or encroachment beyond the delineated access.
		Clearly identify the boundaries of sensitive resource areas, waterbodies, wetlands, key Wildlife Areas, or areas with special requirements along the construction disturbance area, as required.
		Use frost packing, snow or ice, geotextile for access through wet areas.
		Limit access through wetlands to vehicles/equipment necessary for wetland construction.
		Implement the use of the following measures to reduce the potential for compaction and/or rutting: ▪ Use of construction matting ▪ Planning activities around daily temperature fluctuations ▪ Monitoring dewatering requirements ▪ Soil compaction relief following completion of activities
		If wind or water erosion is evident during construction, all necessary equipment and personnel should be made available to control the erosion (as determined by the EI/PEL).
		Do not seed mineral wetlands or peatlands.

Table 8.4-1. Key Mitigation Measures for Wetlands

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in wetlands (cont'd)	As above	In general, when constructing in wetland areas, up to 30 cm of topsoil (organic layer) will be stripped from the excavation area and stockpiled separate from spoil to preserve the native seed stock.
		Following work completion, backfilling of wetland disturbance areas will take place promptly, or as approved by the EI. Wetlands will be restored as near as practical to pre-construction conditions and reasonable attempts will be made to return the subsoil to its pre-construction density.
		If required, replant salvaged trees/shrubs along the disturbed margin(s) of the wetland as instructed by EI.
		Limit access through wetlands to vehicles/equipment necessary for wetland construction.
	Grading, excavation, and backfilling, during abandonment activities may alter wetland hydrological function by disrupting vertical and horizontal water flow patterns and altering surface water permanency.	Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		In general, when constructing in wetland areas, up to 30 cm of topsoil (organic layer) will be stripped from the excavation area and stockpiled separate from spoil to preserve the native seed stock.
	Vegetation brushing, topsoil salvage, grading, excavation, and backfilling during abandonment activities may alter wetland biogeochemical function by reducing water quality and altering the sequestration, storage, cycling, and release of carbon and other nutrients.	Identify the start and end points of the wetland and limit disturbance or encroachment beyond the fenced, staked or flagged access. Use frost packing, snow or ice, geotextile for access through wet areas.
		Do not fertilize within 30 m of a wetland or watercourse.
		When working in or near a wetland, install a temporary sediment barrier (e.g., silt fence, silt curtain) at the edge of the construction disturbance area to eliminate the flow of sediment from clean spoil piles and disturbed areas into nearby wetlands.
		Daily inspection of the temporary ECDs adjacent to or in watercourses and wetlands is required and repairs are to be completed before the end of each working day.
		Implement the use of the following measures to reduce the potential for compaction and/or rutting: ▪ Use of construction matting ▪ Planning activities around daily temperature fluctuations ▪ Monitoring dewatering requirements ▪ Soil compaction relief following completion of activities
		▪ If wind or water erosion is evident during construction, all necessary equipment and personnel should be made available to control the erosion (as determined by the EI/PEL).

Table 8.4-1. Key Mitigation Measures for Wetlands

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in wetlands (cont'd)	As above	Install temporary ECDs (e.g., silt fences) within 24 hours of backfilling the wetland crossing. Ensure silt fences have been installed properly, are solid and filter fabric is tight (EPP Figure 3, Installing Silt Fence).
		The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
	Abandonment in-place may result in the eventual breakdown of TLPs or perforation of the pipeline and creation of a preferred water conduit to transport water, materials, or residual contaminants that may alter wetland function.	Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records will be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
		The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
	Abandonment in-place may result in a buoyant pipeline, altering wetland habitat function in the long-term.	Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records will be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
		Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions, or social and public concerns.

8.5 Potential Effect Pathways Not Carried Through for Further Assessment

The following potential residual effects are expected to be avoided through the implementation of mitigation measures and are subsequently not carried through for further assessment.

- Change in wetlands due to:
  - abandonment in-place resulting in the eventual breakdown of TLPs or perforation of the pipeline and creation of a preferred water conduit to transport water, materials, or residual contaminants.

Potential residual effects that remain following the implementation of mitigation measures are carried forward for further assessment.

8.6 Assessment of Residual Effects on Wetlands

An effect on wetlands may remain after the implementation of mitigation. The potential residual effects include:

- change in wetlands due to the alteration of wetland habitat function from vegetation brushing, grading, and topsoil salvage at isolation locations, and from the abandoned pipeline being left in-place;
- change in wetlands due to the alteration of wetland hydrological function from grading, excavation and backfilling, and from the abandoned pipeline being left in-place; and
- change in wetlands due to the alteration of wetland biogeochemical function by vegetation clearing, topsoil salvage, grading, excavation, and backfilling.

8.6.1 Change in Wetlands

Residual effects on wetlands may occur as a result of activities such as vegetation brushing, topsoil salvage, grading, excavation, and backfilling, as described herein. The Project is not anticipated to result in permanent loss of wetland area or function, as these activities cause temporary disturbances from which wetlands are proven to recover when mitigation and best practices are implemented.

8.6.1.1 Change in Wetlands Due to the Alteration of Habitat Function

An alteration of wetland habitat function from vegetation brushing, grading, and topsoil salvage during physical abandonment of the pipeline may occur as a result of disrupting vegetation composition and structure and altering wetland successional trajectory and type. Wetland sensitivity to disturbance can be described in terms of hydraulic connectivity and resiliency of vegetation (Hill and Devito 1997; Trettin et al. 1997).

Wetlands that are most sensitive to disturbance are those that are hydrologically isolated and have vegetation that is not resilient. Trees and shrubs are less resilient than herbaceous species (e.g., grasses and forbs) since they take longer to regenerate due to woody biomass. Consequently, in treed and shrub wetlands, changes in plant community composition and structure resulting from physical activities may be apparent for a longer period of time than in herbaceous-dominated systems like marshes (Van Dyke et al. 1994).

Furthermore, tree and shrub removal often result in an increased soil moisture regime, which may cause wetlands to return to a previous successional state (i.e., an alteration of wetland type). The increased growth of early successional species may result in an increase in plant diversity following tree removal, which can lead to an alteration of wetland structure (Shem et al. 1993; Van Dyke et al. 1994). Commonly, wooded wetlands revert to wetter sedge dominant wetlands following an increase in groundwater level, which was previously suppressed by transpiration and water uptake by trees (Lee and Boutin 2006).

Non-woody or herbaceous-dominated wetlands (e.g., marshes and graminoid riparian areas surrounding shallow open waters) are more resilient to changes in successional status resulting from vegetation removal than shrubby or wooded wetlands, as herbaceous vegetation cover is generally well-established within 1 to 3 years after alteration (i.e., long-term duration of the residual effect) (Santillo 1993; Shem et al. 1993; Van Dyke et al. 1994).

With proper physical abandonment methods and mitigation (i.e., profile contours returned and the appropriate protection and use of existing seedbanks), these adverse effects can be successfully reduced. Zimmerman and Wilkey (1992) studied the effects of construction activities on wetland vegetation at multiple sites 10 to 30 years after construction using indicators such as species composition. The study found that adjacent natural wetland areas were not altered in habitat type when the proper construction and mitigation were carried out (i.e., wetland contours and elevations matched offsite). No non-native plant species invaded natural areas, and the right-of-way increased in diversity.

Additional studies support natural regeneration of wetland vegetation after disturbance (Shem et al. 1993; Van Dyke et al. 1994). Shem et al. assessed four locations where pipeline construction had occurred in wetlands. Natural regeneration was implemented at three of the sites and seeding and fertilizer was used at one site on the disturbed portion of the right-of-way. It was found 1 year after construction that many plant species re-established at disturbed sites where natural regeneration was allowed. These sites also had more plant species coverage and less bare soil, when compared to the site where seeding occurred (Shem et al. 1993).

Van Dyke et al. found that diverse vegetation communities can re-establish at disturbed sites as a result of the germination of species in the seedbank and the migration of species from surrounding undisturbed areas. Proper salvage and handling of wetland substrate during construction, along with the return of wetland contours to pre-construction profiles, were found to be important components in natural regeneration. Seeding disturbed wetland areas did not accelerate vegetation establishment (Van Dyke et al. 1994).

Wetland soils and organic deposits have large seedbeds, containing propagules of viable native species that are adapted to local conditions. These propagules have greater establishment success than those that are new to the area and introduced via planting or seeding. In conjunction with the seedbed re-establishment vegetation in the area of the disturbance, plant species from adjacent natural areas also encroach and establish on the disturbed portion of the right-of-way.

Natural regeneration, as opposed to seeding, along with proper recontouring, is recommended for all wetlands disturbed during physical abandonment activities. Therefore, minimizing surface disturbance in the wetland to maintain vegetated root mat and seedbed allows for increased chances of wetland habitat function recovery on disturbed areas of the right-of-way (Shem et al. 1993; Van Dyke et al. 1994).

PCM at wetlands along pipeline projects in similar settings has shown that mitigation implemented during physical activities (e.g., allowing natural regeneration) are effective in reducing adverse effects on wetland habitat function and ecosystems have proven to be resilient. This has been demonstrated by the absence of environmental issues related to vegetation re-establishment and the presence of invasive or undesirable vegetation species in comparable wetland ecosystems by the end of the monitoring period.

Pipelines abandoned in-place may become exposed once the pipe is purged of product and if buoyancy controls are no longer effective (Canadian Energy Pipeline Association 2007). Pipe exposure, and subsequent recovery activities may impact water quality and disturb wetlands, including use of wetland habitat by wildlife. Frost heave may increase uplift on an abandoned pipeline due to the reduction of heat from the surrounding soil compared to an operating pipeline (PTAC 2016); however, longer sections of pipe that are abandoned, compared to shorter sections, are less affected by frost heave. Additionally, positive changes in habitat function may occur over time as a result of pipeline abandonment as infrastructure belowground deteriorates. For example, shrubby or wooded wetlands disturbed during initial pipeline construction that is not allowed to regrow along the centreline during the life of the pipeline due to operation and maintenance will be allowed to naturally revegetate and re-establish on the right-of-way.

The predicted residual effect is considered low magnitude and reversible. The duration of the predicted residual effect is considered medium- to long-term. Within the LSA, the frequency of the predicted residual effect is considered isolated (as a result of physical abandonment activities) to occasional (as a result of abandonment in-place). There is a good understanding of cause-effect relationships and sufficient information pertinent to the Project area to conclude with a high degree of confidence that the predicted residual effect of alteration of wetland habitat function is not significant (Table 8.6-1).

8.6.1.2 Change in Wetlands Due to the Alteration of Hydrological Function

An alteration of hydrological function from disrupting vertical and horizontal water flow patterns and altering surface water permanency may occur as a result of physical abandonment activities and leaving the pipeline in-place.

Physical activities have the potential to cause direct changes to the hydrological flow (i.e., surface or groundwater flow) of a wetland by impeding natural flow through the wetland. Physical activities can also cause indirect changes to wetland hydrology, when the removal of woody vegetation leads to an increased soil moisture regime, localized to the right-of-way, as discussed under alteration of wetland habitat function. These alterations are an interruption to the natural hydrological regime.

Underground pipelines, whether operating or abandoned in-place, may impede natural flow. Vertical and horizontal water movements in wetlands can be disrupted by any berm-like structure. Linear disturbances to wetlands (e.g., pipelines left in-place) may impound water, resulting in flooding upstream and drying downstream (Olson and Doherty 2012). Drying on the downslope face in treed wetlands (i.e., wooded swamps and fens) can increase tree productivity, water demand, and evapotranspiration, which facilitates further drying (Baisley 2012).

In mineral wetlands (e.g., marshes and some shallow open waters), this type of disturbance (i.e., drying downstream due to flow impedance, improper contouring, soil admixing, or raised seedbanks) may also result in increases in productivity of drought-tolerant wetland plant species (e.g., grass, sedge, and rush species). This may lead to increases in water demand, which leads to further drying. This compounded drying can result in permanent alteration of peatland and mineral wetland hydrological regimes, overall wetland function, and potentially vegetative cover (e.g., wooded wetland to forest, or marsh to wet meadow or moist grassland) (Baisley 2012; Sherwood 2012).

On the upstream side, increased saturation from impounded water can result in the loss of trees and other woody vegetation, while allowing the establishment of emergent vegetation in treed wetlands (e.g., wooded swamps and fens) (Baisley 2012). Alternatively, in riparian areas with emergent vegetation, increased inundation may result in a decrease in emergent vegetation, and an increase in aquatic vegetation and open water characteristics. Prolonged impoundment may convert a wooded wetland to a marsh wetland and a more seasonal wetland into a permanent shallow water wetland (Baisley 2012). Among the most important considerations for limiting disturbances to hydrological function is assuring that the restoration of pre-construction elevations and contours is achieved (Gartman 1991; Shem et al. 1993; Van Dyke et al. 1994), and that there is no unnatural impedance to flow.

Alteration of wetland hydrological function during physical abandonment activities in the form of drying or ponding is not anticipated to occur during the Project's temporary disturbances, due to the implementation of appropriate mitigation measures, such as construction during frozen conditions, and the maintenance of hydrology. Additionally, mitigation to prevent drainage of wetlands will prevent long-term hydrological changes, and because activities are restricted to the Project Footprint, they should not affect larger scale hydrological flow patterns that influence the supply of water to wetlands. Short-term direct disturbances to wetlands during abandonment activities, such as excavation, are anticipated to cause some alteration of hydrological function. These short-term disturbances will be mitigated by using techniques that reduce terrain disturbances and soil structure damage. Indirect alteration of wetland hydrological function in wetlands with woody vegetation may persist longer (i.e., long-term).

PCM at wetlands along pipeline projects in similar settings has shown that mitigation implemented during construction (e.g., re-establishing pre-construction contours) are effective in reducing adverse effects on wetland hydrological function and wetlands have proven to be resilient.

This has been demonstrated by the absence of environmental issues related to unnatural drying, ponding, or channelized flow of water in comparable wetland ecosystems by the end of the PCM period.

Over time, the abandoned sections of pipeline may corrode and eventually result in perforations within the pipe. Although it is not anticipated that the existing pipeline will create preferential flow along the entire right-of-way considering the relatively small diameter of pipe, these perforations could potentially create conduits which may divert surface water or shallow groundwater and reduce recharge to both surface water bodies and deeper groundwater resources, including wetlands. Water diversion as a result of the pipeline becoming a preferred water conduit is a possible event in the long-term.

The predicted residual effect is considered low magnitude and reversible. The duration of the predicted residual effect is considered short to long-term. Within the LSA, the frequency of the predicted residual effect is considered isolated (as a result of physical abandonment activities) to occasional (as a result of abandonment in-place). There is a good understanding of cause-effect relationships and sufficient information pertinent to the Project area to conclude with a high degree of confidence that the predicted residual effect of alteration of wetland hydrological function is not significant (Table 8.6-1).

8.6.1.3 Change in Wetlands Due to the Alteration of Biogeochemical Function

An alteration of biogeochemical function as a result of reducing water quality and altering the sequestration, storage, cycling, and release of carbon and other nutrients may occur. Changes in wetland hydrological regime and plant community composition/structure on the Project Footprint can directly and indirectly affect wetland biogeochemical function.

Potential adverse effects on biogeochemical function are primarily related to water quality (e.g., turbidity), carbon storage, and overall biogeochemical cycling. Maintenance of wetland hydrology is critical to the preservation of soil biogeochemical cycles that occur under varying degrees of saturation. Biological decomposition of organic matter in soils, and release of stored carbon, is controlled by the rate of microbial respiration, which is influenced by detrital composition, temperature, and saturation (i.e., oxygen availability).

Microbes preferentially use oxygen; however, under anaerobic, saturated conditions, the rate and type of respiration is altered (McLatchey and Reddy 1998). In addition, the heat capacity of saturated soils is higher than that of dry soils. Therefore, maintenance of wetland hydrology ensures that cool conditions are prevalent and slow decomposition rates characteristic of wetland substrates occur, favouring the storage of carbon. The removal of vegetation, particularly canopy-forming trees and shrubs, can reduce shade, also affecting substrate temperature.

Activity in or near wetlands during physical abandonment activities may result in an increased sediment supply and the turbidity of surface waters affecting the biogeochemical function of the wetland. In case of an oxygen decrease, particularly in the water column but also in the soil boundary layer, wetland biogeochemical function may be altered and harm to aquatic organisms can occur. However, given the implementation of sedimentation control mitigation (e.g., silt fencing) and physical activities during frozen conditions, the likelihood of alteration in this manner resulting from the Project is reduced.

Indirectly, the hydrological regime can impact biogeochemical function by altering wetland habitat function. Decreases in the water table position can increase tree productivity rates. This may decrease the quality of litter deposited in the soil and increase nutrient turnover rates. This can change understory community composition as a result of nutrient and light limitations and soil processes (e.g., decomposition rates). It may also stimulate changes in the wetland hydrological regime through increased transpiration and interception by root systems (Baisley 2012; Kotowska 2012; Laiho et al. 2003).

PCM at wetlands along pipeline projects in similar settings has shown that mitigation implemented during physical activities (e.g., re-establishing pre-construction contours) are effective in reducing adverse effects on wetland biogeochemical function and wetlands have proven to be resilient. This has been demonstrated by the absence of environmental issues related to sediment introduction, water turbidity, or compaction, rutting, and admixing of soil/substrate in comparable wetland ecosystems by the end of the PCM period.

The predicted residual effect is considered low magnitude and reversible. The duration of the predicted residual effect is considered short to long-term. Within the LSA, the frequency of the predicted residual effect is considered isolated. There is a good understanding of cause-effect relationships and sufficient information pertinent to the Project area to conclude with a high degree of confidence that the predicted residual effect of alteration of wetland biogeochemical function is not significant (Table 8.6-1).

8.6.2 Summary of Project Residual Effects

Table 8.6-1 summarizes the significance evaluation of the predicted residual environmental effects of the Project on wetlands. As Table 8.6-1 notes, there are no situations of a residual environmental effect on wetlands that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Consequently, it is concluded that the predicted residual effects of construction and operations of the Project on wetlands are not significant.

Table 8.6-1. Project Residual Effects on Wetlands

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Alteration of Habitat Function	Adverse	Wetlands LSA	Medium- to long-term	Isolated to occasional	Reversible	Low	Not significant
Alteration of Hydrological Function	Adverse	Wetlands LSA	Short- to long-term	Isolated to occasional	Reversible	Low	Not significant
Alteration of Biogeochemical Function	Adverse	Wetlands LSA	Short- to long-term	Isolated	Reversible	Low	Not significant

8.7 Assessment of Cumulative Effects on Wetlands

Subsection 4.8 describes other projects and physical activities that may act cumulatively with the Project. Table 8.7-1 identifies potential Project interactions with existing and reasonably foreseeable developments and activities that may have cumulative effects related to wetlands.

Where Project-related residual environmental effects act cumulatively with those from past, present, and reasonably foreseeable future projects and physical activities, a CEA is completed to determine their significance.

Table 8.7-1. Interactions with Potential to Contribute to Cumulative Effects on Wetlands

Other Projects	Potential Cumulative Effects
	Change in Wetlands
Present Projects, Physical Activity and Land Use	
Forestry	✓
Oil and Gas	✓
Recreation	✓
Fishing, Hunting and Trapping	✓
Transportation	✓
Future (Reasonably Foreseeable) Projects and Physical Activities	
Forestry	✓
Oil and Gas	✓
Fishing, Hunting, and Trapping	✓

Note:
✓ = A potential interaction with the Project is identified.

8.7.1 Change in Wetlands

Wetlands in the Wetlands RSA are likely to have some level of existing anthropogenic disturbance, either direct or indirect, considering the ongoing oil and gas infrastructure and operations, as well as forestry activities, modifying the natural landscape extensively. Other land uses in the Wetlands RSA include recreation, natural resource harvest (e.g., hunting), and transportation infrastructure (e.g., roads). Such anthropogenic activities cause surface disturbances that alter vegetation, soil structure or contours, and groundwater or surface water, potentially impacting wetland habitat, and hydrological and biogeochemical functions. Roads and certain types of oil and gas facilities can cause permanent contributions to cumulative effects on wetland function, while other disturbances cause temporary contributions (e.g., pipeline construction, temporary vehicle access).

ECCC considers areas of the country with active or anticipated expansion of land use development, including portions of NWT, Yukon, and northern BC where the Project is located, to have the potential for “low” to “none” wetland loss or degradation (Lynch-Stewart et al. 1996). Therefore, past loss of wetlands is a possibility; however, industry-standard BMPs and policies (e.g., FPWC [Government of Canada 1991], *EPMR* Guidelines [BC OGC 2021f], *WSA* [Government of BC 2014], the *Waters Act* and the *Waters Regulation* [Government of Yukon 2003b], the *Waters Act* and the *Waters Regulation* [Government of the NWT 2021b]) prioritize avoiding disturbance to wetlands where practical, and otherwise guide practices for reducing the extent and severity of wetland disturbance through minimization, mitigation, and restoration.

These practices and policies apply to many of the existing and ongoing developments in the Wetlands RSAs and are expected to be applied to reasonably foreseeable developments, reducing cumulative effects on wetland function. With the adoption of industry-standard BMPs for wetland conservation, wetland disturbance from most ongoing and reasonably foreseeable developments is likely temporary in nature and localized to only a portion of affected wetlands.

The most severe result of such disturbances is likely to be a change in wetland type, constituting a change in wetland function until the disturbance ceases and the natural successional trajectory of the wetland continues. In instances where an ongoing or reasonably foreseeable development or activity may result in permanent disturbance of wetlands, it is anticipated that wetland replacement would be conducted where warranted, complying with provincial and federal legislation as appropriate and preventing a net loss in wetland function.

In context, the cumulative effect on wetland function in the Wetlands RSA is considered to be within federal, provincial, and territorial regulatory standards, and the Project's contribution to cumulative residual effects on wetland function is considered to be a minor incremental change.

With the implementation of avoidance and minimization techniques, the cumulative effect of change in wetlands resulting from temporary disturbances in the Wetlands RSA (associated with existing, ongoing, and reasonably foreseeable developments, as well as Project activities) is anticipated to be adverse in direction, localized to the Wetlands RSA, long-term in duration, reversible, and low magnitude (as it is within regulatory standards).

The Project is anticipated to contribute to the cumulative residual effect of change in wetlands. This contribution, however, is localized to the Wetlands LSA and reversible, and is therefore, considered to be incremental compared to the cumulative residual effects resulting from existing, ongoing, and reasonably foreseeable developments in the Wetlands RSA, and within environmental/regulatory standards.

8.7.2 Summary of Residual Cumulative Effects on Wetlands

Table 8.7-2 provides the cumulative effect characterization for each cumulative effect using the criteria defined in Section 4.

Table 8.7-2. Project Cumulative Effects on by Project Component

Predicted Cumulative Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Change in Wetlands							
Cumulative Effect	Adverse	Wetlands LSA	Long-term	Occasional	Reversible	Low	Not significant
Contribution from the Project to the cumulative effect	The Project will contribute to cumulative effects on wetlands. Contributions are anticipated to be localized to the Wetlands LSA, and with the implementation of proposed mitigation, the Project's contribution to the cumulative effect is low magnitude at the regional scale and reversible.						

8.8 Conclusion

As Table 8.6-1 and 8.7-2 note, there are no situations of a residual environmental effect on wetlands that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. The magnitude of the predicted residual effects is low to medium in magnitude, as No Net Loss of wetland function is anticipated to result from the Project; the intentions of the FPWC, the *WSA,* the *Waters Act,* and *Waters Regulation* for the Yukon and the NWT will be met. Therefore, the predicted residual effects and cumulative effects are not significant.

Prediction confidence is high based on the professional judgement of the assessment team, the quality of public information pertinent to the Project area and Project data (which included field data collected at wetlands), a good understanding of cause-effect relationships related to wetland disturbance and recovery, and the proven effectiveness of mitigation measures, as demonstrated by existing PCM reports from past similar projects that include temporary wetlands disturbance.

8.9 Monitoring and Follow-up

An EI will be onsite during Project activities to monitor for compliance with regulatory commitments and mitigation measures as outlined in the EPP (Appendix B of this ESA). Wetlands within the physical abandonment locations will be monitored during abandonment activities and assessed for alterations to, and recovery of, wetland function, and to validate the effectiveness of mitigation measures. Westcoast's methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details on are described in Section 19, Follow-up and Monitoring.

9. Assessment of Effects on Wildlife and Wildlife Habitat

The assessment team conducted studies to establish the existing conditions (i.e., baseline setting) for wildlife and wildlife habitat from which the potential effects of the Project can be determined. The assessment of effects on wildlife and wildlife habitat was based on a review of existing literature, internet searches, consultation and engagement, field surveys, and expert opinion.

9.1 Scope of the Assessment

Wildlife and wildlife habitat are included in this assessment based on the biophysical elements identified in the *Filing Manual* (CER 2021a). Because the Project has the potential to result in the loss or alteration of wildlife habitat or changes in wildlife movement and may result in an increase in wildlife mortality risk, wildlife and wildlife habitat was selected as a valued component. The scope of the assessment of the effects on wildlife and wildlife habitat includes the broad range of wildlife species and habitats that are expected to occur in the Project area and considers species at risk and species with special conservation status with potential to interact with the Project.

Species at risk are those species listed federally on Schedule 1 of the *SARA* or by COSEWIC. Species of special conservation status include those with provincial or territorial conservation designations, including species designated as Endangered or Threatened under the BC *Wildlife Act* and Endangered or Threatened under the *Species at Risk (NWT) Act*. The Yukon does not have territory-specific species at risk legislation (other than the *SARA* being applied to federal lands).

9.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements was used to identify the circumstances and interactions to be considered for the assessment of the wildlife and wildlife habitat and Species at Risk or Species of Special Status for all phases of the Project.

9.1.1.1 Federal

Species at Risk Act

The *SARA*, *S.C. 2002, c. 29*, protects species listed as Extirpated, Endangered, and Threatened on Schedule 1 of the Act, and critical habitat (if applicable) for those species. Species included on Schedule 1 are established by the federal Cabinet and are based on recommendations by the COSEWIC and consultation with the government, Indigenous groups, and the public. *SARA* applies to federal lands; however, it may also apply to other lands when provincial protection is deemed inadequate by the Minister of the Environment.

SARA also applies to all lands in Canada for Schedule 1 bird species listed in the *MBCA*. Prohibitions under Section 32 of *SARA* make it an offence to kill, harm, harass, capture, or take an individual of a species listed on Schedule 1 as Endangered, Threatened, or Extirpated. The prohibitions identified under Section 33 also make it an offence to possess, collect, buy, sell, or trade an individual, or damage/destroy the residence (e.g., a nest or den) of one or more individuals of a species listed on Schedule 1. The prohibitions do not apply to species listed as Special Concern on Schedule 1. Section 58 of *SARA* prohibits the destruction of any part of critical habitat of any Endangered, Threatened, or Extirpated species (if a Recovery Strategy has recommended the reintroduction of the species into the wild in Canada) that is located on federal lands or on all lands for aquatic or migratory bird species.

Migratory Birds Convention Act

The *MBCA* is legislation aimed at protecting migratory birds, eggs, and nests. Industry will implement avoidance guidelines to make proactive avoidance and mitigation decisions that will reduce the risk of incidental take of migratory birds, nests, and eggs, to ensure compliance with the *MBCA* (ECCC 2017a). Incidental take occurs when death/harm to a bird or destruction/disturbance of nests or eggs occurs as a result of human activities not directed at birds/nests/eggs. It is not possible to obtain a permit for incidental take; violators can face prosecution. Mitigation measures require implementation to minimize the risk of incidental take. The risk of incidental take increases during the primary nesting period for migratory birds, and within complex habitats that support higher diversity or abundance of nesting birds. Project activities should occur outside of the migratory bird nesting periods, where practical.

ECCC provides guidance on nesting periods of migratory birds for nesting zones across Canada (ECCC 2019b). ECCC nesting zone calendars illustrate the proportion of migratory bird species that are estimated to be actively nesting (referred to as nesting intensity) on a given date for wetland, forest, and open habitats throughout the year.

The *MBCA* does not protect all birds. Grouse, hawks, owls, eagles, falcons, and crows are some of the birds that do not fall under the *MBCA*. Provincial legislation across Canada typically offers protection to these species.

Canadian Energy Regulator *Onshore Pipeline Regulations*

Abandonment activities will be carried out in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. Companies are responsible for meeting the requirements of the CER *OPRs* to manage safety, security, and environmental protection throughout the entire lifecycle of their facilities, from design, through to construction, operation and abandonment including regard for contamination. The buried pipeline left in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

9.1.1.2 Provincial and Territorial

The Project will comply with applicable provincial and territorial regulatory requirements in NWT, Yukon, and BC and generally follow the intent of provincial and territorial objectives and guidance that may be relevant to the Project. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to wildlife and wildlife habitat include the following.

Northwest Territories

Northwest Territories Wildlife Act

The NWT ENR enforces the NWT *Wildlife Act* and considers any proposed regulatory amendments to the *Wildlife Act*. The *Wildlife Act* and regulations were developed using a collaborative approach with the *Wildlife Act* Working Group, which has representatives from Indigenous groups, governments, renewable resources boards, and the Stakeholders Wildlife Act Advisory Group. Following implementation of the new Act, NWT ENR committed to develop future regulations under the *Wildlife Act* in a similar collaborative manner.

New regulations to protect wildlife in the NWT came into force under the *Wildlife Act* on July 1, 2019. Known as Phase 2 regulations, they are the second set of major regulatory amendments to the Act, and the result of 3 years of extensive consultation and collaboration with Indigenous governments and organizations, renewable resources boards, hunters, industry and tourism groups, as well as the public. The responsibility for the conservation of wildlife in the NWT is shared by the Government of Canada, the Government of the NWT, the Tlicho Government, and wildlife co-management boards.

Regulations in the *Wildlife Act* of note include:

- Raptor nests may not be intentionally destroyed, even if unoccupied.
- Destruction or removal of raptor nests may be authorized where required with a Wildlife General Permit, which can be obtained at no cost from NWT ENR.
- Developers requiring a Wildlife Management and Monitoring Plan (WMMP) will need to have it approved by the Minister of NWT ENR. These WMMPs are binding and enforceable. An approved WMMP will be required for development activities that are likely to result in significant disturbance or pose a threat of harm to wildlife, cause substantial damage to wildlife habitat, or significantly contribute to cumulative impacts on wildlife or habitat. Generally, a WMMP is usually only required for large-scale projects.

Northwest Territories Species at* Risk *(NWT) Act

In 2009, the Government of the NWT passed the *Species at Risk* (*NWT*) *Act,* which helps fulfill the NWT commitment under the National Accord to provide effective protection of species at risk that are managed by the territory. The *Species at Risk* (*NWT*) *Act* sets out the processes to assess, list, protect and recover species at risk specifically for the NWT. The *Species at Risk* (*NWT*) *Act* applies to any wild animal or plant species managed by the Government of the NWT. It applies on both public and private lands, including private lands owned under a land claims agreement.

The *Species at Risk* (*NWT*) *Act* and the federal *SARA* are designed to work in a complementary fashion with others legislation and cooperatively with Indigenous Peoples to protect species at risk and their habitats.

Yukon Territory

Yukon Wildlife Act

While the Yukon does not have territory-specific species at risk legislation (other than the *SARA* being applied to federal lands), the Yukon *Wildlife Act* (Regulations Section 5) lists several species as "specially protected" including:

- cougar
- gyrfalcon
- peregrine falcon
- trumpeter swan

Territorial Co-management Boards and Committees

The Yukon and the NWT have implemented in their wildlife legislation the provisions of comprehensive land claims agreements in matters related to wildlife, notably with respect to the co-management boards or committees established under the agreements. The NWT *Wildlife Act* states that the Act will be interpreted and applied in a manner consistent with the Inuvialuit Final Agreement, the Gwich’in Comprehensive Land Claim Agreement, and the Sahtu Dene Métis Comprehensive Land Claim Agreement. The Yukon’s *Wildlife Act* also acknowledges that it is subject to the Inuvialuit Final Agreement, which applies in the North Slope; however, the Pointed Mountain Pipeline is not located within the North Slope.

British Columbia

British Columbia Wildlife Act

The BC *Wildlife Act* protects all vertebrate wildlife species (i.e., mammals, birds, amphibians, and reptiles) from direct harm except as allowed under regulation (e.g., legal hunting and trapping). A species may be legislated as Endangered or Threatened under the *Wildlife Act* by the Lieutenant Governor in Council (Government of BC 2021f). Under Section 34 of the *Wildlife Act*, a person commits an offence if, except as allowed by regulation, they possess, take, injure, molest, or destroy a bird or its egg, the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron or burrowing owl, or any bird nest that is occupied by a bird or its egg.

In BC, the BC CDC assigns each species to either a Red, Blue, or Yellow list to help identify the level of concern about their risk and to set conservation priorities. Red- and Blue-listed species are not protected by specific legislation; however, these lists help to identify species that can be considered for designation as Endangered or Threatened under the BC *Wildlife Act*. Any species that is at risk of being lost (e.g., Extirpated, Endangered, or Threatened) is assigned to the Red list. Species that are of Special Concern are assigned to the Blue list, while Species of Least Risk are assigned to the Yellow list (BC CDC 2021b).

9.1.1.3 British Columbia Oil and Gas Commission

The *EPMR*, which is associated with the *BC OGAA*, contains provisions and guidance related to the protection of wildlife and minimizing disturbance to wildlife habitat. Although the Project is not regulated by the *BC OGAA*, the BC OGC will consider the *EPMR* in its review of CER applications.

9.1.1.4 British Columbia Area-Based Analysis

The Oil and Gas Activity Application Manual (BC OGC 2021b) states that CER projects located within northeast BC will consider the ABA approach. The ABA is a provincial tool designed to help evaluate the impact of oil and gas activities on environmental values, including Wildlife Areas. Analysis of recent development in Wildlife Habitat Areas (WHAs) showed increasing pressure on several small WHAs established for the protection of Identified Wildlife, including fisher, Connecticut warbler, and the black-throated green warbler. All sectors of industry are expected to avoid these smaller WHAs, as they are established to protect edge sensitive species. ABA monitors cumulative impacts to environmental values (e.g., wildlife and wildlife habitat) to allow for the improved consideration of landscape-level effects in decision-making.

9.1.1.5 British Columbia *Forest and Range Practices Act*

The goals of the *FRPA* are to minimize the effects of forest and range practices on Identified Wildlife and to maintain their limiting habitats throughout their current ranges and, where appropriate, their historic ranges on Crown land.

9.1.1.6 Other

Wildlife BMPs are guidelines that help development projects meet necessary legislation, regulations, and policies related to wildlife. Additional regulatory guidance applicable to the Project includes provincial BMPs such as A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia (BC MFLNRO 2014), the Best Management Practices for Amphibian and Reptile Salvages in British Columbia (BC MFLNRORD 2016b), and Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia (BC MOE 2013).

9.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding wildlife and wildlife habitat have been raised.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. Acho Dene Koe First Nation expressed interest in wildlife habitat potentially affected by the Project and requested that helicopters adhere to height and landing restrictions associated with protection of wildlife such as maintaining a distance aboveground and not landing when wildlife are present at a location. Acho Dene Koe First Nation also indicated that caribou are important to the community and requested information on how industry has changed wildlife behaviour on the landscape. A representative of Acho Dene Koe First Nation commented that caribou have not been observed in the Project area in recent years and suitable habitat is scarce, as other wildlife (e.g., bison) have utilized the Pointed Mountain Pipeline right-of-way.

9.1.3 Potential Effects, Pathways, and Effect Indicators

Table 9.1-1 identifies the potential effect pathways of the Project on wildlife and wildlife habitat, including species at risk and related habitat, during physical abandonment activities and as a result of abandonment in-place.

Project effects on wildlife may occur within the following land uses: watercourse crossings, wetlands, forested and shrubby lands: Although effects on wildlife occur across all land uses, potential effects are primarily concentrated within the forested and shrubland land uses for this Project.

Other negligible to low effects may occur within other land uses but are expected to be similar regardless of abandonment method chosen, or land use, and are not expected to be significant.

Table 9.1-1. Project Activities, Effect Pathways and Indicators for Wildlife and Wildlife Habitat

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Loss or alteration of wildlife habitat	Brushing of vegetation and ground disturbance during abandonment activities will alter wildlife habitat.	▪ Habitat disturbance (land cover classes, provincially identified habitats, designated critical habitat for species at risk) ▪ Reduced habitat quality or effectiveness within a ZOI ▪ Important wildlife habitat features identified in the Project Footprint or within recommended buffer distances ▪ Transportation of contaminants to soil and vegetation or surface water
	Sensory disturbance caused by noise and activity during abandonment activities may reduce habitat effectiveness, causing habitat loss or alteration within a ZOI.	
	Depending on the reclamation and active habitat restoration techniques implemented, suitable microsites for vegetation establishment will be created (e.g., through site preparation or use of woody debris) and natural vegetation species will be established through seedling planting or natural regeneration.	
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to transport contaminants to wildlife habitat.	
	Abandonment in-place may result in a buoyant pipeline, potentially altering wetland habitat function in the long-term.	▪ Observation of exposed pipeline

Table 9.1-1. Project Activities, Effect Pathways and Indicators for Wildlife and Wildlife Habitat

<table>
<tr><th>Potential Effect</th><th>Project Activities and Effect Pathways</th><th>Effects Indicators</th></tr>
<tr><td>Change in wildlife movement</td><td>Open excavations for isolation, excavated soil piles, material storage, and snow berms from ploughed access during abandonment activities may create temporary barriers to movement of winter-active terrestrial wildlife species.</td><td>▪ The duration of barriers to wildlife movement</td></tr>
<tr><td rowspan="5">Increased wildlife mortality risk</td><td>Traffic from transportation of Project personnel and equipment, and movement of equipment and machinery on the Project Footprint during abandonment activities may increase the risk of wildlife collisions.</td><td rowspan="4">▪ The overlap of activities with sensitive periods for wildlife (e.g., breeding season for migratory birds)
▪ Important wildlife habitat features that may be occupied during abandonment, and are identified in the Project Footprint or within recommended buffer distances</td></tr>
<tr><td>Human-wildlife conflict, such as attraction of wildlife to work sites during abandonment activities may result in the need for removal or destruction of the animal.</td></tr>
<tr><td>Open excavations at isolation locations may increase mortality risk for some species that may become trapped.</td></tr>
<tr><td>Vegetation brushing, ground disturbance and water withdrawal for abandonment activities scheduled during sensitive periods for wildlife may increase the risk of wildlife mortality through disturbance of occupied habitats.</td></tr>
<tr><td>Changes in soil contours at excavation areas required for physical abandonment activities may create artificial ponding of water following the completion of backfilling, which may create breeding areas that become population sinks for some amphibians (e.g., ponded areas dry out before larvae completely develop).</td><td>▪ Creation of artificial ponds</td></tr>
<tr><td>Change in habitat, movement, and mortality risk for boreal caribou</td><td>The Project activities and potential effect pathways identified in this table for wildlife and wildlife habitat, with the exception of those specific to amphibians.</td><td>▪ The effects indicators identified in this table for wildlife and wildlife habitat, with the exception of the creation of artificial ponds.</td></tr>
</table>

9.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 9.1-2 describes the remaining spatial boundaries for wildlife and wildlife habitat, including species at risk, and the rationale for choosing them.

Table 9.1-2. Spatial Boundaries for Wildlife and Wildlife Habitat

Element	Spatial Boundaries	Rationale
Wildlife and Wildlife Habitat	**Wildlife and Wildlife Habitat LSA:** A 1-km buffer extending from the Project Footprint. **Wildlife and Wildlife Habitat RSA:** A 15-km buffer extending from the Project Footprint.	**Wildlife and Wildlife Habitat LSA:** The Wildlife LSA was established to incorporate the area where there is reasonable potential for Project-specific effects to occur. The Wildlife LSA considers the wildlife species expected to interact with the Project, the effect pathways, and available information on wildlife sensitivity to disturbance (e.g., ZOIs and setback distances). **Wildlife and Wildlife Habitat RSA:** The Wildlife RSA was established to incorporate the area where the direct and indirect influence of other land uses, and activities could interact within Project-specific effects and may cause cumulative effects on wildlife with relatively large home ranges.

9.1.5 Ecological Context

Wildlife and wildlife habitat include all wildlife species, including wildlife species at risk, and potentially suitable habitat. Physical abandonment activities will be confined to existing disturbance footprints, including the existing right-of-way and shared temporary workspace on adjacent third-party dispositions.

The Pointed Mountain Pipeline right-of-way traverses a variety of potential wildlife habitat types and provincially or federally delineated species ranges requiring consideration across provincial and territorial jurisdictions. The NWT, Yukon, and BC maintain lists of wildlife species, management areas, and species' ranges that are of conservation concern. BC and the NWT also assign species to lists to help identify the level of concern about their risk and to set conservation priorities. The presence of wildlife species and wildlife habitats of conservation concern were documented during desktop reviews and field surveys.

9.2 Existing Conditions for Wildlife and Wildlife Habitat

A summary of the wildlife and wildlife habitat study methods and results of the desktop review and field surveys is provided as follows. Information on the existing conditions for wildlife and wildlife habitat was compiled from a combination of desktop data review and field surveys.

9.2.1 Desktop Methods

Primary sources of information that were reviewed included:

- *SARA* Public Registry (Government of Canada 2021b)
- Canadian Species at Risk (COSEWIC 2019)

- List of Endangered and Threatened Species Currently Listed Under BC's *Wildlife Act* and Other Species Assessed by the Endangered Species Conservation Committee
- Provincial wildlife mapping (BC CDC 2021c)
- Parks and Protected Areas (BC CDC 2021c)
- BC OGC Application Management System Wildlife Values (BC OGC 2021f)
- Important Bird Areas (Bird Studies and Nature Canada 2004-2010)
- National Wildlife Areas and Migratory Bird Sanctuaries (ECCC 2019a, 2021b)
- Western Hemisphere Shorebird Reserves (WHSRN 2019)
- Ramsar Wetlands (Bureau of the Convention on Wetlands 2016)
- Provincial and territorial records of wildlife occurrences (BC CDC 2021c; Government of the NWT 2021g; Yukon CDC 2019d)
- General Nesting Periods of Migratory Birds in Canada (ECCC 2018)
- Ducks Unlimited Canada Wetland Inventory Map (DUC 2018)

9.2.2 Field Survey Methods

Wildlife fieldwork was conducted using aerial and ground-based surveys along the Project Footprint (i.e., cut and cap locations, access) from August 4 to 5, 2021, and consisted of a reconnaissance-level wildlife survey, wildlife feature search, and wildlife habitat assessment. The purpose of the wildlife fieldwork was to assess and describe the existing conditions for wildlife by identifying wildlife and wildlife habitat based on visual sightings and signs (e.g., tracks, scat, markings) and identifying wildlife features (e.g., dens, mineral licks, stick nests) that could potentially be affected by the Project.

9.2.3 Overview

9.2.3.1 Desktop Results

The Pointed Mountain Pipeline crosses the Liard Upland Mid-Boreal Ecoregion in the Taiga Ecological Region (Ecosystem Classification Group 2007) and the Liard Range Ecoregion in the Cordillera Ecological Region of the NWT (Ecosystem Classification Group 2010), the La Biche River Boreal Low Subzone of the Yukon (Environment Yukon 2017), and the BWBSmk BGC subzone of BC (DeLong et al. 2011); these areas are home to a variety of wildlife species, including wood bison, moose, black bear, boreal caribou, gray wolf, beaver and other furbearers, as well as songbirds, game birds, and water birds. Hunting, fishing, and trapping occur within all of these regions.

The Pointed Mountain Pipeline does not cross designated parks, National Wildlife Areas, or Migratory Bird Sanctuaries (ECCC 2019a, 2020b), Important Bird Areas (Bird Studies and Nature Canada 2004-2010), Western Hemisphere Shorebird Reserves (WHSRN 2019), Ducks Unlimited Canada Projects (DUC 2018), or Ramsar Wetlands (Bureau of the Convention on Wetlands 2016).

In the NWT, the Pointed Mountain Pipeline overlaps with the western edge of boreal caribou range of the NWT (NT1); the range is one of three transboundary ranges in Canada and is large (44,166,546 ha), extending from the southern border of the NWT into the north with some overlap of the Yukon. In comparison to smaller boreal caribou ranges, those in NT1 are dispersed over a large area and may move more freely and over greater distances within the area characterized by common biophysical attributes.

A list of wildlife species that have the potential to interact with the Project and are either listed federally (Schedule 1 of *SARA* or COSEWIC) or provincially/territorially (NWT, Yukon, or BC; Red- or Blue-listed in BC, or At Risk or May Be at Risk in NWT) are listed in Table 9.2-1. The list was compiled based on a review of species ranges, life histories, and habitat availability, and considering the winter construction where applicable schedule for the Project, which will avoid the migratory bird nesting period.

Table 9.2-1. Wildlife Species of Conservation Concern with Potential to Interact with the Project

Common Name	Scientific Name	Habitat	BC Provincial Designations	NWT Territorial Designations	Yukon Territorial Designations	Federal/Global Designations
Mammals						
Grizzly bear	*Ursus arctos*	Found mostly in Arctic tundra, alpine tundra, and subalpine mountain forests. open prairie, brushlands, riparian woodlands, and semidesert scrub.	Blue	--	--	Special Concern[e,f]
Little-brown myotis	*Myotis lucifugus*	Occurs where some trees and water are found - prefers to forage over water - roosts in natural cavities, crevices, under bark, in buildings; roosts in tree cavities/bark, rock crevices, buildings, females tend to form colonies; hibernates.	Yellow	At Risk[b]	--	Endangered[e,f]
Northern Myotis	*Myotis septentrionalis*	Associated with old growth forests composed of trees 100 years old or older. It relies on intact interior forest habitat, with low edge-to-interior ratios. Relevant late-successional forest features include a high percentage of old trees, uneven forest structure (resulting in multilayered vertical structure), single and multiple tree-fall gaps, standing snags, and woody debris. These late-successional forest characteristics may be favoured for several reasons, including the large number of partially dead or decaying trees that the species uses for breeding, summer day roosting, and foraging.	Blue	At Risk[b]	S1S2	Endangered[e,f]
wood bison	*Bos bison athabascae*	Woodlands with meadows.	Red[a]	At Risk[b]	--	Threatened[e] Special Concern[f]
woodland caribou, boreal population Pop.14 - Boreal Population Pop 15 - Northern Mountain Population	*Rangifer tarandus*	Mature coniferous and mixedwood forests.	Pop. 14 Red[a] Pop. 15 Blue[a]	At Risk[b]	--	Pop.14 Threatened[d,e] Pop.15 Special Concern[d,e]

Table 9.2-1. Wildlife Species of Conservation Concern with Potential to Interact with the Project

Common Name	Scientific Name	Habitat	BC Provincial Designations	NWT Territorial Designations	Yukon Territorial Designations	Federal/Global Designations
Birds						
American kestrel	*Falco sparverius*	Open or partly open habitat; prairies, deserts, wooded streams, burned forest, cultivated lands and farmland with scattered trees, open woodland, along roads, sometimes in cities.	Yellow	--	S2B	--
Barn swallow	*Hirundo rustica*	Requires open areas for foraging, sheltered vertical or horizontal substrate, near water.	Blue	At Risk[b]	S2B	Threatened[e] Special Concern[f]
Bank swallow	*Riparia*	Steep banks of soft earth near water.	Yellow	At Risk[b]	S4B	Threatened[f]
Bay-breasted warbler	*Setophaga castanea*	Boreal coniferous forest, occasionally adjoining second growth or deciduous scrub. In migration and winter in various forest, woodland, scrub, and thicket habitats.	Red	--	S2B	--
Black-and-white warbler	Mniotilta varia	Deciduous and mixed forest, usually with trees of mixed ages.	Yellow	--	S1B	--
Black tern	*Chlidonias niger*	Marshes, along sloughs, rivers, lakeshores, and impoundments, or in wet meadows, typically in sites with mixture of emergent vegetation and open water. Cattails, bulrushes, bur-reed, and/or phragmites commonly are present in nesting areas.	Yellow	--	S1B	--
Canada Warbler	*Cardellina canadensis (Wilsonia canadensis)*	Breeding habitat includes moist thickets of woodland undergrowth (especially aspen-poplar), bogs, tall shrubbery along streams or near swamps, and deciduous second growth. Habitat is more specific in localized regions.	Blue	At Risk[b]	S1B	Threatened[e] Special Concern[f]
Cape May warbler	*Setophaga tigrina*	Towns, ornamental gardens, parklands, montane forest, arid mesquite, pines, mangroves and other flowering trees, and occasionally dense forest.	Blue	--	S2B	--
Common nighthawk	*Chordeiles minor*	Habitats include mountains and plains in open and semi-open areas: open coniferous forests, savanna, grasslands, fields, vicinity of cities and towns.	Yellow	At Risk[b]	S3B	Threatened[e] Special Concern[f]

Table 9.2-1. Wildlife Species of Conservation Concern with Potential to Interact with the Project

Common Name	Scientific Name	Habitat	BC Provincial Designations	NWT Territorial Designations	Yukon Territorial Designations	Federal/Global Designations
Eastern phoebe	*Sayornis phoebe*	Open woodland, situations with scattered trees, farmlands, and suburbs, usually near water. Nests on cliffs, banks, or in ravines in open and riparian woodland or farmland with scattered trees; under bridges and eaves; in culverts or wells; sometimes in buildings.	Yellow	--	S1B	--
Evening grosbeak	*Coccothraustes vespertinus*	Coniferous (primarily spruce and fir) and mixed coniferous-deciduous woodland, second growth, and occasionally parks; in migration and winter a variety of forest and woodland habitats, and around human habitation. Year-round resident in the northeastern corner of BC and the southern NWT.	Yellow[a]	--	--	Special Concern[e]
northern goshawk	*Accipiter gentilis*	Mature mixedwood forest with high canopy closure. Year-round resident throughout its range.	Blue[a]	--	--	--
Olive-sided flycatcher	*Contopus cooperi*	High, often dead trees; nests in conifers; open habitat including: disturbances (fire and forestry), taiga, muskeg, bogs and swamps.	Blue	At Risk[b]	--	Threatened[e] Special Concern[f]
Osprey	*Pandion haliaetus*	Along rivers, lakes, reservoirs, and seacoasts. They often cross land between bodies of water.	Yellow	--	S1B	--
Ovenbird	Seiurus aurocapilla	Typically nests in mid-late-successional, closed-canopied deciduous or deciduous-coniferous forests that have deep leaf litter and limited understory. Also nests in coniferous forest if deciduous forest is unavailable.	Yellow	--	S1B	--
Peregrine falcon	*Falco peregrinus*	Various open situations from tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, to mountains, open forested regions, and human population centres.	--	--	--	Special Concern[e,f]
Pileated woodpecker	*Dryocopus pileatus*	Dense deciduous (favoured in southeast), coniferous (favoured in north, northwest and west), or mixed forest, open woodland, second growth, and (locally) parks and wooded residential areas of towns. Prefers woods with a tall, closed canopy and a high basal area.	Yellow	--	S1	--

Table 9.2-1. Wildlife Species of Conservation Concern with Potential to Interact with the Project

Common Name	Scientific Name	Habitat	BC Provincial Designations	NWT Territorial Designations	Yukon Territorial Designations	Federal/Global Designations
Red-necked phalarope	*Phalaropus lobatus*	Nests in grass-sedge borders of ponds and lakes, often far from the sea; wet marshy areas of tundra and in taiga; low Arctic and Sub-Arctic (coastal and low Arctic tundra, northern boreal forest regions).	Blue	--	--	Special concern[e,f]
Red-eyed vireo	Vireo olivaceus	Open deciduous (less frequently coniferous) forest (especially with sapling undergrowth), mixed forest with deciduous understory, second growth woodland, scrub, thickets, gardens, mangroves.	Yellow	--	S2B	--
Rose-breasted grosbeak	Pheucticus ludovicianus	Second growth woods, mature forest edge, borders of swamps and wooded streams, dense growths of small trees, gardens and parks, old orchards. In migration and winter in various forest, woodland, and scrub habitats; avoids interior of closed forest. Usually remains high in trees but sometimes descends to ground.	--	--	S1B	--
Rusty blackbird	*Euphagus carolinus*	Breeding habitat includes moist woodland (primarily coniferous), bushy bogs and fens, and wooded edges of water courses and beaver ponds.	Blue	--	S3B	Special concern[e,f]
Sandhill crane	*Grus canadensis*	Breeding habitat includes open grasslands, marshes, marshy edges of lakes and ponds, and riverbanks.	Yellow	--	S2B,S4M	--
Short-eared Owl	*Asio flammeus*	Broad expanses of open land with low vegetation for nesting and foraging are required. Habitat types frequently mentioned as suitable include fresh and saltwater marshes, bogs, dunes, prairies, grassy plains, old fields, tundra, moorlands, river valleys, meadows, savanna, open woodland, and heathland.	Blue	--	S3B	Special Concern[e] Threatened[f]
Snowy owl	*Bubo scandiacus*	Tundra, primarily where mounds, hillocks or rocks are present; in winter and migration occurring also in open country such as prairie, marshes, fields, pastures, and sand dunes.	--	--	S1B	--

Table 9.2-1. Wildlife Species of Conservation Concern with Potential to Interact with the Project

Common Name	Scientific Name	Habitat	BC Provincial Designations	NWT Territorial Designations	Yukon Territorial Designations	Federal/Global Designations
Swainson's hawk	*Buteo swainsoni*	Savanna, open pine-oak woodland and cultivated lands (e.g., alfalfa and other hay crops, and certain grain and row croplands) with scattered trees. Tolerates extensive cultivation in nesting area, though vineyards, orchards, rice, corn, and cotton are not suitable foraging habitat.	Red	--	S1B	--
Western tanager	*Piranga ludoviciana*	Breeds mostly in coniferous and mixed mountain woodlands. Migrates and winters in a variety of forest, woodland, scrub, and partly open habitats.	Yellow	--	S2B	--
Wilson's phalarope	*Phalaropus tricolor*	Shallow freshwater and saline ponds, marshes, and wet meadows.	Yellow	--	S1B	--
Winter wren	*Troglodytes hiemalis*	Coniferous forest (especially spruce and fir) and mixed forests, primarily with dense understory; in migration and winter also in deciduous forest and woodland with dense undergrowth and tree-falls, dense hedgerows, and brushy fields.	Blue	--	--	--
Amphibians						
Boreal Chorus Frog	*Pseudacris maculate*	Habitat is mostly the vicinity of quiet bodies of water and associated wetlands and meadows; sometimes these frogs cross up to a few hundred metres of upland habitat between wetlands, and they may overwinter in upland sites adjacent to wetlands; periods of inactivity may be spent in water, among thick wetland vegetation, under objects on the ground, or in rodent burrows.	Yellow	--	S1S2	--
Western toad	*Anaxyrus boreas*	Desert springs to mountain wetlands. Range into various upland habitats around ponds, lakes, reservoirs, and slow-moving rivers and streams; sometimes moving up to a few kilometres through uplands.	Yellow	At Risk	S3	Special Concern[e,f]

Notes:

[a] BC CDC 2021b.

[b] General Status Ranks of Wild Species in the NWT 2016-2020. A species designated as At Risk (S1 to S2) or May be at Risk (S1 to S2) (Working Group on General Status of NWT Species 2016)

[c] NatureServe Explorer Sub national Conservation Status Ranks. A species designated as Critically Imperiled (S1), Imperiled (S2), or Vulnerable (S3) (NatureServe 2021)

- Critically Imperiled - At very high risk of Extinction or collapse due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.
- Imperiled - At high risk of Extinction or collapse due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
- Vulnerable - At moderate risk of Extinction or collapse due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

[e] *SARA* establishes Schedule 1 as the list of species to be protected on all federal lands in Canada. The Act also applies to all lands in Canada for Schedule 1 bird species cited in the *MBCA*. This table only includes designations of Endangered, Threatened, and Special Concern.

- Endangered: A species that is facing imminent Extirpation or Extinction.
- Threatened: A species that is likely to become an Endangered species if nothing is done to reverse the factors leading to its Extirpation or Extinction.
- Special Concern: A species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats.

[f] COSEWIC (COSEWIC 2019). This table only includes designations of Endangered, Threatened, or Special Concern.

- Endangered: A species facing imminent Extirpation or Extinction.
- Threatened: A species that is likely to become an Endangered species if nothing is done to reverse the factors leading to its Extirpation or Extinction.
- Special Concern: A species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats.

Critical Habitat

The Pointed Mountain Pipeline right-of-way is within the western edge of the NT1 caribou range for approximately 26.5 km. PM-1, PM-2, PM-3, and PM-4 are located within the NT1 caribou range. This area is considered critical habitat, as it may contribute to achievement of the target 65 percent undisturbed habitat needed for self-sustaining boreal caribou populations (ECCC 2020b).

The remaining undisturbed critical habitat in NT1 is estimated to be at 65 percent, which is the target amount for all boreal caribou populations. Anthropogenic disturbance is relatively low and is estimated to be around 9 percent (ECCC 2020b).

In the NWT, an approach to range planning for boreal woodland caribou is outlined in A Framework for Boreal Caribou Range Planning (Government of the NWT 2019). The Framework addresses obligations to protect critical habitat for boreal caribou identified in ECCC's National Recovery Strategy for Woodland Caribou, Boreal Population (Environment Canada 2012) as well as the territorial recommendations to develop and implement range plans for boreal caribou habitat outlined in the NWT Boreal Caribou Recovery Strategy (CMA 2017). The NWT Recovery Strategy calls for the development of regional range plans focused on managing human disturbance, while the National Recovery Strategy sets a target of maintaining at least 65 percent of the NT1 range in an undisturbed condition.

Although there are no current boreal caribou range plans in effect, the NWT Framework takes a tiered management approach in which caribou habitat is assigned to different management classes (Basic, Enhanced, and Intensive) based on importance of habitat for caribou and range status relative to regional human disturbance thresholds. Though the framework defines the tiers, specific areas assigned to each of the three management classes will be defined spatially when range plans are developed. Areas in enhanced and intensive management classes will be subject to stricter requirements and conditions with the intent of achieving No Net Loss (or increase) of undisturbed habitat due to human activity over time.

Because of the paucity of potential caribou habitat (e.g., presence of wood bison along the right-of-way) and lack of caribou observations in the area where abandonment activities will take place, the relative importance of the area for boreal caribou can be considered low. Combined with the relatively low human disturbance level in NT1 (9 percent), high-level management actions outlined in the framework for this Basic Management Class area include:

- encouraging use of best practices and minimum standards (including actions to manage sensory disturbance, and actions specific to seasonal use of habitats); and/or
- managing of wildfires as per current Government of the NWT Policy.

Provincially and Territorially Identified Wildlife Habitats

The Pointed Mountain Pipeline right-of-way is within the delineated ranges for the Nahanni-Liard wood bison population (BC) and the Nahanni wood bison population (NWT). In Canada, wood bison (*Bison bison athabascae*) is listed as Threatened on Schedule 1 of *SARA* and as a species of Special Concern by COSEWIC.

Migratory Bird Conservation Regions

The Pointed Mountain Pipeline right-of-way is located in Bird Conservation Region (BCR) 6 (ECCC 2018). The primary nesting window when the majority (90 percent) of migratory birds will be breeding and nesting is (ECCC 2018):

- BCR 6: May 5 to August 9

Field Survey Results

Field surveys focused on sites where physical abandonment activities will take place along the Pointed Mountain Pipeline.

Wildlife species or their signs documented during the reconnaissance field survey included several mammals (black bear, red squirrel, wood bison, moose, deer species), bird species (hairy woodpecker, downy woodpecker, American redstart, osprey, red-breasted nuthatch, Bohemian waxwing, white-winged crossbill, black-capped chickadee, American goldfinch, pine siskin, peregrine falcon, Say's phoebe, tree swallow, and unidentified warbler and sparrow species) and two amphibians (wood frog and western toad). No boreal caribou or signs of their presence were observed.

Wood bison (listed as Threatened under Schedule 1 of *SARA* and At Risk under NWT *Species at Risk Act*) were observed at and while travelling between all NWT locations (PM-1, PM-2, PM-3, and PM-4), Yukon locations (PM-6 and PM-7) and BC locations (PM-8, PM-9, and PM-10). Evidence of heavy use of the pipeline right-of-way by wood bison was observed in the NWT, Yukon, and BC. This heavy use included vegetation disturbance such as trails, tracks, wallows, and grazing/scat. A single peregrine falcon (listed as Special Concern under Schedule 1 of *SARA*) was observed in the NWT at PM-4. Western toad (Special Concern under Schedule 1 of *SARA*, BC yellow-listed) was the only amphibian species with conservation status detected in BC during the survey.

9.3 Project Interactions with Wildlife and Wildlife Habitat

Table 9.3-1 identifies the Project components that may interact with wildlife and wildlife habitat, including species at risk and related habitat, to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 10.6. A justification for no interaction is provided following Table 9.3-1 in subsection 9.3.1.

Table 9.3-1. Project Interactions with Wildlife and Wildlife Habitat

Project Activities	Potential Effects			
	Loss or Alteration of Wildlife Habitat	Changes in Wildlife Movement	Increased Wildlife Mortality Risk	Changes in Habitat, Movement and Mortality Risk for Boreal Caribou
Pointed Mountain Pipeline				
Physical Abandonment	✓	✓	✓	✓
Abandonment In-place	✓	-	-	-

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

9.3.1 Project Interactions Scoped Out of Further Consideration

9.3.1.1 Changes in Wildlife Movement Including Caribou

No interaction with wildlife movement is anticipated once the pipeline is abandoned in-place since the buried pipeline is expected to be stable over the long-term (Pipeline Abandonment Steering Committee 1996; Det Norske Veritas 2010; AMEC 2017). Ground subsidence as a result of eventual corrosion or full pipeline collapse as a result of abandonment in-place is not anticipated to cause barriers or filters to wildlife movement. The Project will not result in the creation of new linear corridor or clearing of treed habitats that would affect the movement of wildlife species that may be hesitant to cross openings or gaps. This applies to changes in wildlife movement for caribou.

9.3.1.2 Increased Wildlife Mortality Risk Including Caribou

There is no predicted interaction with wildlife mortality risk once the pipeline is abandoned in-place since there will be no transportation of workers to the site required, creating mortality risk from traffic, activity, and associated noise. Further, there will be no vegetation or ground disturbance following abandonment that could affect occupied habitats, causing wildlife mortality. This applies to increased wildlife mortality risk for caribou.

9.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on wildlife and wildlife habitat. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons. Table 9.4-1 identifies these key mitigation measures for each effect pathway identified for Project components.

Table 9.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Loss or alteration of wildlife habitat	Brushing of vegetation and ground disturbance during abandonment activities will alter wildlife habitat.	Through pre-construction planning and the screening site visit, Wildlife Species of Concern with the potential to occur within or adjacent to the construction disturbance area must be identified and included in Table 1 of the EPP.
		In addition, Table 1 of the EPP must identify applicable RAPs for Wildlife Species of Concern and reference what, if any, species-specific mitigation measures are to be implemented.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		During pre-construction surveys, environmental features (e.g., dens) must be identified and either flagged, fenced off, or signage must be erected prior to construction activities.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		Fell bordering trees onto the cleared Project Footprint to prevent damaging existing property, pipelines, adjacent trees and brush, and avoid marked sensitive environmental resources.
		Do not seed mineral wetlands or peatlands.
		Reclaim disturbed areas following abandonment activities. Reclamation and restoration measures may include natural regeneration (particularly in shrubby and graminoid wetlands or wetland fringes) or active restoration methods, such as site preparation, conifer seedling planting and access control.
		Place equipment (e.g., pumps, generators) within suitable secondary containment to prevent spills onto soils. Where practical, place equipment above the ordinary high-water mark/ordinary high-water level of watercourses or wetlands.
		Appropriate spill kits must be kept readily available at fuel or hazardous materials storage locations, as well as refueling and maintenance sites.
		Use only Common No. 1 or Canada Certified No. 1 seed in reclamation seed mixes and ensure seed certificates of analysis are provided to Westcoast. Westcoast Environment must review seed certificates of analysis when any other seed grade is proposed for reclamation projects, or a custom seed mix is used per third-party requirement. Seeding should occur as soon as practical after final cleanup, as weather and soil conditions permit.
		Do not seed mineral wetlands or peatlands.

Table 9.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Loss or alteration of wildlife habitat (cont'd)	Sensory disturbance during abandonment activities may reduce habitat effectiveness, causing habitat loss or alteration within a ZOI.	In BC, a minimum setback of 100 m from active black bear dens is recommended (BC OGC 2021f). If a grizzly bear den is found, contact BC Ministry of Environment and Climate Change Strategy (BC ENV) for the appropriate buffer.
		Restrict access points to environmentally sensitive areas within or along the construction disturbance area, to deter unauthorized access. Abide by any restrictions or "in/out" privileges that are implemented in special protection areas. Where travel along the Project Footprint and physical abandonment areas in the vicinity of sensitive vegetation is required (e.g., during reclamation monitoring), use all-terrain vehicle or foot travel whenever practical.
		Ensure that exhaust and engine systems of equipment are in good working condition and inspect undercarriages periodically to ensure that grasses do not accumulate.
		Do not leave vehicles idling for extended periods of time.
	Abandonment in-place may result in eventual perforation, creating a water conduit with the potential to transport contaminants to wildlife habitat.	The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that must be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement must result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records must be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
	Abandonment in-place may result in a buoyant pipeline, potentially altering wetland habitat function in the long-term.	The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that must be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement must result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions, or social and public concerns.

Table 9.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Loss or alteration of wildlife habitat (cont'd)	As above	Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success must be identified and records must be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
Change in wildlife movement	Open excavations for isolation, excavated soil piles, material storage, and snow berms from ploughed access during abandonment activities may create temporary barriers to movement of winter-active terrestrial wildlife species.	Snow berms on ploughed access should have alternating side gaps placed a minimum of every 500 m to allow wildlife movement.
		Backfill physical abandonment excavations as soon as practical, following physical abandonment activities, to minimize hazards to wildlife.
Increased wildlife mortality risk	Traffic from transportation of Project personnel and equipment, and movement of equipment and machinery on the Project Footprint during abandonment activities may increase the risk of wildlife collisions.	Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Ensure all project personnel and other visitors receive a pre-job orientation which includes relevant considerations for pipeline right-of-way traffic control measures.
		In areas with a designated RAP (e.g., Ungulate Winter Ranges [UWRs]), restrict access in accordance with regulatory guidelines.
		Abide by any restrictions or "in/out" privileges that are implemented in special protection areas.
	Human-wildlife conflict, such as attraction of wildlife to work sites during abandonment activities may result in the need for removal or destruction of the animal.	Project personnel are prohibited from hunting, harassing, feeding, collecting, or possessing wildlife species.
		Unanticipated wildlife issues encountered during physical abandonment activities will be discussed and resolved by the EI, Wildlife Resource Specialist(s), and the appropriate regulatory authorities, if necessary.
	Open excavations at isolation locations may increase mortality risk for some species that may become trapped.	Backfill physical abandonment excavations as soon as practical, following physical abandonment activities, to minimize hazards to wildlife.
	Vegetation brushing, ground disturbance and water withdrawal scheduled during sensitive periods for wildlife may increase the risk of wildlife mortality through disturbance of occupied habitats during abandonment activities.	Implement measures in this table regarding loss or alteration of wildlife habitat.
		In BC, a setback of 100 m from active black bear dens is recommended. If a grizzly bear den is found, contact BC ENV for the appropriate buffer.

Table 9.4-1. Key Mitigation Measures for each Effect Pathway Identified for Project Components

Potential Effect	Effect Pathway	Key Mitigation[a]
Increased wildlife mortality risk (cont'd)	Artificial ponding of water following the completion of backfilling may create breeding areas that become population sinks for some amphibians (e.g., ponded areas dry out before larvae completely develop).	Refer to mitigation regarding loss or alteration of wildlife habitat due to clearing of vegetation near wetlands and riparian vegetation.
Changes in habitat, movement, and mortality risk for boreal caribou	Brushing of regenerating vegetation, physical barriers to movement (snow or soil berms, open excavations), packed or ploughed winter access may improve predator movement.	Plan access and temporary workspace within caribou range to reduce clearing of regenerating trees to the extent practical.
		Plan abandonment activities to begin as early as practical (once ground conditions permit) and prioritize areas in caribou range with the objective of avoiding or reducing working during the sensitive timing windows for caribou.
		Monitor the progress of abandonment activities, and if timelines indicate activities will extend into the sensitive timing window for caribou, consider increasing productivity to limit the duration of activities during the timing window by adding workforce resources or using alternate equipment that will increase efficiency.
		Implement the mitigation listed in this table for loss or alteration of wildlife habitat, changes in wildlife movement, and increased wildlife mortality risk.

9.5 Potential Effect Pathways Not Carried Through for Further Assessment

The following potential residual effect pathways are expected to be avoided or mitigated to negligible levels through the implementation of mitigation measures (Table 9.4-1).

- Loss or alteration of wildlife habitat attributed to:
  - abandonment in-place resulting in eventual perforation and creation of a water conduit with the potential to transport contaminants to wildlife habitat; and/or
  - abandonment in-place resulting in a buoyant pipeline, potentially altering wetland habitat function in the long-term.
- Changes in wildlife movement, attributed to:
  - open excavations for isolation, excavated soil piles, material storage, and snow berms from ploughed access during abandonment activities that may create temporary barriers to movement of winter-active terrestrial wildlife species.
- Increased wildlife mortality risk, attributed to:
  - traffic from transportation of Project personnel and equipment, and movement of equipment and machinery on the Project Footprint during abandonment activities, which may increase the risk of wildlife collisions;

- human-wildlife conflict, such as attraction of wildlife to work sites during abandonment activities, potentially resulting in the need for removal or destruction of the animal;
- open excavations at isolation locations, which may increase mortality risk for some species that may become trapped;
- vegetation brushing, ground disturbance and water withdrawal scheduled during sensitive periods for wildlife, which may increase the risk of wildlife mortality through disturbance of occupied habitats during abandonment activities; and/or
- changes in soil contours at excavation areas required for physical abandonment activities, which may create artificial ponding of water following the completion of backfilling, creating breeding areas that become population sinks for some amphibians (e.g., ponded areas dry out before larvae completely develop).

▪ Changes in habitat, movement, and mortality risk for boreal caribou, attributed to:
  - the abandonment in-place effect pathways described for wildlife habitat loss or alteration;
  - the potential barriers to movement described for wildlife movement; and/or
  - the potential mortality risk effect pathways described for wildlife movement.

Potential residual effects that remain following the implementation of mitigation measures are carried forward for further assessment.

9.6 Assessment of Residual Effects on Wildlife and Wildlife Habitat

In some cases, a residual effect on wildlife and wildlife habitat may remain after the implementation of mitigation measures. The potential residual effects include loss or alteration of wildlife habitat and loss or alteration of boreal caribou habitat.

9.6.1 Loss or Alteration of Wildlife Habitat

Physical abandonment activities will alter wildlife habitat where vegetation removal or soil disturbance for access or excavations is required. Habitat fragmentation is not anticipated to result from abandonment activities, as the new disturbance is limited mainly to the existing right-of-way and facility sites, and the current revegetation is patchy and has not reached a seral stage that would alleviate the existing fragmentation effects of the right-of-way. Habitat loss and alteration can cause the displacement of wildlife, and potentially result in use of less suitable habitat, reduced foraging ability (Bird et al. 2004), increased energy expenditure (Jalkotzy et al. 1997), and lower reproductive success (Habib et al. 2007). Physical activities have an adverse effect on vegetation and, therefore, wildlife habitat, due to removal or modification of the existing vegetation pattern and subsequent change in ecosystem dynamics (e.g., changes in microclimate, ground cover, and soil compaction) (Harper et al. 2001).

Habitat loss or alteration from vegetation or soil disturbance during abandonment activities will be limited in extent and located entirely within the existing disturbance footprint of the existing pipeline right-of-way and areas of shared temporary workspace. The adverse effects of habitat disturbance are considered minor for most wildlife species unless a substantial portion or critical element of the habitat is rendered unsuitable by the development (Harper et al. 2001). Considering the physical abandonment activities will be confined to existing disturbance footprints with only patchy early seral vegetation regeneration, and with reclamation to re-establish natural vegetation communities that will, in time, regenerate to conditions similar to the adjacent undisturbed habitat, the predicted residual effects are expected to be minor as the Project activities will not alter a substantial proportion or critical element of the habitat.

Habitat effectiveness may also be affected by noise, light, and activity associated with physical abandonment activities. These sensory effects may cause a temporary reduction in habitat effectiveness through avoidance, increased energy expenditure, changes in normal behaviours, and impaired communication between individuals. Different species and even individuals of a given species respond differently to sensory disturbances. Various factors affect an animal's response to sensory disturbances, such as noise level and frequency distribution, duration, number of events, rate of onset, level of existing ambient noise, time of year or day, animal activity and location, animal age, life stage, and gender.

Westcoast intends to complete physical activities during frozen conditions at the Yukon and BC aboveground infrastructure sites, outside of the breeding/active period for amphibians, bats and migratory birds. Year-round resident and winter-active wildlife species (e.g., boreal caribou, moose, bison, furbearers, and game birds [e.g., grouse and ptarmigan]) may be present in the Project area during abandonment activities and could be temporarily displaced from habitats on and adjacent to the Project Footprint.

The avoidance of active periods for migratory birds and amphibians, and the implementation of mitigation (Table 9.41 and detailed in the Project-specific EPP [Appendix B of this ESA]) will reduce the potential residual effect associated with reduced habitat effectiveness from sensory disturbance.

9.6.1.1 Summary of Residual Effects of Loss or Alteration of Wildlife Habitat

Residual effects on the loss or alteration of wildlife habitat are likely to occur as a result of Project activities. Habitat loss as a result of vegetation brushing will be limited in extent and is expected to regenerate to current conditions relatively quickly following physical abandonment activities (medium-term). Removal of infrastructure and reclamation of disturbed areas, including active habitat restoration of the pipeline right-of-way in caribou range, are expected to have a positive effect on current wildlife habitat availability that will increase as vegetation regenerates to later seral stages. Indirect habitat alteration within a ZOI is expected to be short-term in duration and of low magnitude with the implementation of mitigation.

The minor adverse effects associated with temporary sensory disturbance causing indirect habitat alteration and with clearing of early seral vegetation currently regenerating on the right-of-way are balanced by the immediate benefits of infrastructure removal and medium to long-term benefits as habitat regenerates. Overall, the residual effect of loss or alteration of wildlife habitat is considered positive (Table 9.5-1). Per the *Filing Manual* (CER 2021a), a significance determination is only necessary for adverse residual effects. Significance is not rated for the anticipated positive effect on wildlife habitat (Table 9.5-1).

9.6.2 Loss or Alteration of Boreal Caribou Habitat

Portions of the pipeline right-of-way are located within the western boundary of the NT1 caribou range in the NWT. In BC and the Yukon, the Project is not within any designated caribou ranges; however, the Project crosses areas where caribou may be found in trace occurrences.

Boreal caribou are provincially red-listed as Threatened under the BC *Wildlife Act* (BC CDC 2021b) and under Schedule 1 of *SARA* (Government of Canada 2021b). While the Report on the Progress of Recovery Strategy Implementation for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal population, in Canada for the Period 2012-2017 (ECCC 2017b) reports the overall population trend is declining, the integrated risk assessment for the NT1 caribou range is listed as self-sustaining (i.e., the range has the capacity to maintain a local population of boreal caribou) (Environment Canada 2012; ECCC 2020b). NT1 population numbers are estimated to be between 6,000 to 7,000 animals (ECCC 2020b).

The stated recovery goal in the Amended Recovery Strategy for the Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada is to achieve self-sustaining local populations in all boreal caribou ranges throughout their current distribution in Canada, to the extent possible (ECCC 2020b). The Recovery Strategy uses scientifically-derived models to determine that in order to achieve a 65 percent chance of self-sustaining populations, caribou require a minimum of 65 percent undisturbed habitat (which equates to a maximum disturbance level of 35 percent) within all ranges other than SK1, and a minimum of 40 percent undisturbed habitat in SK1 (ECCC 2020b).

The NT1 range is considered a continuous range where boreal caribou are dispersed over a large area and may move more freely over greater distances within the area characterized by common biophysical attributes (ECCC 2020b). The range is considered to be relatively intact, with 65 percent of the range being undisturbed and only 9 percent being disturbed by human activities (ECCC 2020b). Critical habitat for boreal caribou within the NT1 caribou range includes all remaining undisturbed habitat and habitat that over time would contribute to the attainment of 65 percent undisturbed habitat (ECCC 2020b).

Woodland caribou have large ranges and require large tracts of undisturbed mature to old forest, muskegs or peatlands, and hilly upland areas (ECCC 2020b). They select for habitat where they are able to find food (i.e., mature coniferous forest with abundant lichens and closed canopies in the winter, peatlands with available forage in the late spring and summer) and tend to avoid early successional forests and recently disturbed areas (Environment Canada 2012; ECCC 2020b). Woodland caribou are sensitive to direct and indirect anthropogenic disturbance (e.g., industrial activity [Dyer et al. 2001, 2002]) and habitat alteration (e.g., forestry [Peters et al. 2013]), in addition to natural disturbance (e.g., burns) (Schaefer and Pruitt 1991). This sensitivity typically manifests through aversion to disturbances, especially during calving season (Environment Canada 2012). Linear features can also increase access for motorized vehicles (e.g., snowmobiles) which may also contribute to a reduction in habitat effectiveness.

Because of the paucity of potential caribou habitat (e.g., presence of wood bison along the right-of-way) and lack of caribou observations in the area where abandonment activities will take place, the relative importance of the area for boreal caribou can be considered low; it is anticipated that there will be No Net Loss of undisturbed habitat as a result of the Project. Combined with the relatively low human disturbance level in NT1 (9 percent), high-level management actions outlined in the framework for this Basic Management Class area include:

- encouragement of use of best practices and minimum standards (including actions to manage sensory disturbance, and actions specific to seasonal use of habitats); and/or
- wildfire management as per current Government of the NWT Policy.

Mitigation to reduce sensory disturbance as much as practical will be implemented. For example, equipment will be well maintained (e.g., mufflers), unnecessary idling will be avoided, and Project personnel will be prohibited from snowmobile use outside of the Project Footprint. In addition, for winter abandonment activities, an early-in/early-out approach will be used to reduce sensory disturbance to caribou by initiating activities as early as ground conditions allow in the winter and working expeditiously to limit late winter activities.

In the NWT, physical abandonment activities will occur in the summer. Westcoast will monitor the progress of abandonment activities, and if timelines indicate activities will extend into the sensitive timing window for caribou, options to increase productivity and limit the duration of activities during the timing window will be considered. Options may include adding workforce resources or using alternate equipment that will increase efficiency.

For spring/summer abandonment activities, pre-construction wildlife sweeps will be conducted to ensure that caribou are not present. In the unlikely event that caribou are observed, Project schedules will be re-evaluated. The Project will be located within existing disturbance footprints however will require clearing of regenerating vegetation in some areas where access and excavations are required. The habitat in its current condition is not suitable for caribou and does not have adequate revegetation to alleviate effects associated with predator efficiency on linear corridors. In addition, field surveys noted that wood bison appear to use the pipeline right-of-way; their presence and impacts to the regeneration process along the right-of-way (e.g., vegetation removal, the use of wallows) will impact right-of-way recovery efforts. However, the removal of regenerating vegetation will reset the recovery timeframe, resulting in an extension of the duration of the existing effect.

The Project will use existing roads and, where access along the existing right-of-way is needed, Westcoast will avoid areas of taller regenerating woody vegetation to the extent practical, which will reduce the Project's residual effect on caribou habitat.

While the right-of-way is expected to progress on a successional trajectory to re-establish vegetation cover consistent with the surrounding landscape over time, this will be hampered by the presence of wood bison on and off the right-of-way. During field surveys it was noted that wood bison were found throughout the NT1 caribou range where it overlaps with the pipeline right-of-way and these areas of overlap exhibited signs of impacts from wood bison, including vegetation removal, tree/bark rubbing, heavily tracked areas, and the use of wallows. Caribou are unlikely to use such areas, and anecdotal information from local Indigenous community members during field surveys indicate that caribou are unlikely to be present in this western edge of the NT1 range.

9.6.2.1 Summary of Residual Effects of Loss or Alteration of Boreal Caribou Habitat

Residual effects of sensory disturbance during abandonment activities causing reduced habitat effectiveness for caribou within a ZOI is likely to occur, but will be short-term in duration, localized and reversible. Given the short-term duration of abandonment activities and the mitigation to reduce sensory disturbance and limit activities during the sensitive timing window, the residual effect of sensory disturbance causing reduced habitat effectiveness for caribou within a ZOI is considered to be low magnitude.

Alteration of potential caribou habitat is not expected as a result of abandonment activities. With the scarcity of potential caribou habitat (e.g., presence of wood bison along the right-of-way) and lack of caribou observations in the area where abandonment activities will take place, the relative importance of the area for boreal caribou can be considered low; it is anticipated that there will be No Net Loss of undisturbed habitat as a result of the Project. Combined with the relatively low human disturbance level in NT1 (9 percent), high-level management actions outlined in the framework for this Basic Management Class area include:

- encouragement of use of best practices and minimum standards (including actions to manage sensory disturbance, and actions specific to seasonal use of habitats); and/or
- wildfire management as per current Government of the NWT Policy.

The Amended Recovery Strategy reports that the NT1 caribou population is self-sustaining with a relatively intact range (65 percent undisturbed). Given that abandonment activities are not expected to contribute to existing disturbance levels (9 percent anthropogenic, 35 percent overall), no exceedance of the 35 percent threshold is anticipated.

However, the abandonment activities are expected to have a neutral or positive residual effect on caribou habitat that will increase over time as vegetation regenerates based on:

- the localized extent of the planned excavations, location of the footprint entirely in existing disturbance footprints, and Westcoast's commitment to plan access on the right-of-way to limit clearing of regenerating vegetation in caribou range;
- the avoidance of new forest clearing (with the possible exception of minor tree felling or bending to support habitat restoration); and
- the presence of wood bison will limit opportunities for caribou to use the area.

The assessment of effects on caribou habitat takes a precautionary approach. Although positive effects are anticipated as a result of habitat improvement after the removal of infrastructure, other factors considered including the time lag for habitat to improve, the current status and trend of the NT1 caribou population, the current use of the right-of-way by wood bison, and the small adverse residual effect associated with short-term sensory disturbance. Uncertainty will be managed through monitoring and adaptive management and given the growing body of monitoring information for caribou habitat restoration, the influence of uncertainty in the assessment conclusions is reduced.

Overall, the residual effect is conservatively rated as neutral though may be positive overall. Per the *Filing Manual* (CER 2021a), a significance determination is only necessary for adverse residual effects. Significance is not rated for the anticipated neutral effect on boreal caribou habitat (Table 9.6-1).

9.6.3 Summary of Project Residual Effects

Table 9.6-1 summarizes the significance evaluation of the predicted residual environmental effects of the Project on wildlife and wildlife habitat. As noted in Table 9.6-1, the residual effects are predicted to be positive to neutral. Per the *Filing Manual* (CER 2021a), a significance determination is only necessary for adverse residual effects.

Table 9.6-1. Project Residual Effects on Wildlife and Wildlife Habitat

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Loss or Alteration of Wildlife Habitat	Positive	Wildlife and Wildlife Habitat LSA	N/A – positive effects are not characterized further				
Loss or alteration of boreal caribou habitat	Neutral	Wildlife and Wildlife Habitat LSA	N/A – neutral effects are not characterized further				

9.7 Conclusion

As Table 9.6-1 notes, there are no predicted adverse effects on wildlife and wildlife habitat.

Prediction confidence is high based on professional judgement, the quality of publicly available literature, Project data, field surveys, and the past effectiveness of proposed mitigation measures. There is a good understanding of cause-effect relationships and sufficient information pertinent to the Project area to conclude with a high degree of confidence that the predicted effects will be positive to neutral.

9.8 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). Monitoring will primarily take place at locations where physical abandonment activities will be conducted. Vegetation re-establishment is a key component of wildlife habitat restoration. In forested areas, establishing plant cover is evaluated based on emerging desirable vegetation (e.g., early successional species consistent with the surrounding vegetation community).

Monitoring methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details on are described in Section 19 of this ESA, Follow-up and Monitoring.

10. Assessment of Effects on Air Emissions, and Greenhouse Gas Emissions and Climate Change

The assessment team conducted studies to establish the existing conditions (i.e., baseline setting) for air emissions, GHG emissions and climate change from which the potential effects of the Project can be determined. The study was based on a review of existing literature, internet searches, consultation and engagement, and expert opinion.

10.1 Scope of the Assessment

Air emissions and GHG emissions and climate change are scoped for this assessment based on the biophysical and socio-economic elements identified in the *Filing Manual* (CER 2021a). During physical abandonment activities, air and GHG emissions will result primarily from vehicle and equipment use, as the Pointed Mountain Pipeline was already deactivated, purged, cleaned, coated with corrosion inhibitor, and filled with nitrogen gas. Nitrogen gas is not considered an air contaminant of interest nor a GHG. The Project will not result in an increase in air or GHG emissions following physical abandonment activities.

Air emissions of interest for the assessment include the criteria air contaminants (CACs) nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matter less than 2.5 micrometres ($PM_{2.5}$) in diameter. The Project may lead to small detectable increases in ambient concentrations of these CACs during physical abandonment activities.

Project-related GHG emissions include carbon dioxide (CO_2), methane (CH_4), and NO_2 associated with combustion, fugitive emissions from vehicle and equipment use during physical abandonment activities, and from brushing of vegetation and decay of vegetation debris. GHG emissions are also expressed as carbon dioxide equivalent (CO_2e), which quantifies GHG emissions in terms of their total global warming potential relative to that of CO_2.

Air emissions may have potential human health effects (Section 14, Assessment of Effects on Socio-economic Elements). GHG emissions are considered a contributor to climate change (Section 17, Assessment of the Effects of the Environment on the Project). The Project is not anticipated to result in substantive emissions of CACs and GHGs.

The *Filing Manual* (Table A-2 – Filing Requirements for Biophysical Elements) (CER 2021a) requires that the following sources of GHG emissions are considered for the assessment, as appropriate.

- Direct GHG emissions from point and area sources, such as combustion, and venting and fugitive sources; all non-negligible sources, for example, emissions from changes in land use and burning of vegetation during land clearing; and the extent to which the effects of the project hinder or contribute to the Government of Canada's ability to meet its environmental obligations and commitments in respect of climate change.
- Operational emissions from third-party energy sources for electrical or other energy requirements for project operations that are not considered in the direct emissions assessment.
- Upstream GHG emissions.

There are no upstream emissions expected as a result of the Project (extraction, processing, handling, and transportation in advance of the Project); therefore, an analysis of upstream GHG emissions was not warranted. As per requirements outlined in Table A-2 of the CER *Filing Manual* (CER 2021a), this assessment also includes an evaluation and discussion on potential residual effects of GHG emissions associated with

Project activities based on estimation of GHG emissions, evaluation of Project GHG emissions with respect to provincial, national, and sector-based GHG totals and Canada GHG reduction targets.

10.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements and Table A-3 – Filing Requirements for Socio-economic Elements, were used to identify the circumstances and interactions to be considered when assessing air and GHG emissions from Project activities.

10.1.1.1 Federal

Canadian Energy Regulator *Onshore Pipeline Regulations*

Abandonment activities will be carried out in an efficient manner that is safe and environmentally responsible in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. The current scope of work does not include purging, flaring, or venting since the buried pipeline currently in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

Canadian Ambient Air Quality Standards

The Canadian Council of Ministers of the Environment (CCME) established Canadian Ambient Air Quality Standards (CAAQS) for air quality management across Canada. Table 10.1-1 presents the CAAQS for NO_2 and $PM_{2.5}$ for reference (CCME 2012, 2020).

Greenhouse Gas Reporting Program

Federal plans and legislation are in place to address GHG emissions. Canada has established the Pan-Canadian Framework on Clean Growth and Climate Change (ECCC 2020a) (adopted in 2016) to put Canada on the path towards meeting the Paris Agreement GHG emissions reduction target of 30 percent below 2005 levels by 2030.

As part of the Pan-Canadian Framework on Clean Growth and Climate Change (ECCC 2020b), the Canada GHG Reporting Program requires that all facilities emitting more than 10,000 tonnes per year of CO_2e must submit a report of GHG emissions (ECCC 2021a; Government of Canada 2021c).

Environment and Climate Change Canada's Strategic Assessment of Climate Change

In October 2020, ECCC released a revised version of its Strategic Assessment of Climate Change (SACC). The SACC provides guidance for how climate change impacts are to be assessed for projects requiring a federal impact assessment under the *IAA* (ECCC 2020b). It requires proponents of projects with a lifetime beyond 2050 to provide a credible plan that describes how the project will achieve net-zero emissions by 2050 (ECCC 2020b).

The requirements outlined in the *Filing Manual* (CER 2021a) for assessing GHG emissions from Project activities include consideration of the SACC guidance. Westcoast currently has a net-zero target by 2050 with a 35 percent reduction in GHG emissions intensity by 2030. The Project does not have a lifetime beyond 2050 and, therefore, it will not contribute to emissions following the completion of physical abandonment activities.

Policy Considering Environmental Obligations and Commitments in Respect of Climate Change under the *Impact Assessment Act*

Table A-1 of the CER *Filing Manual* (CER 2021a) notes that a consideration of the extent to which a project may hinder or contribute to Government of Canada's ability to meet environmental obligations and commitments with respect to climate change is required under the *CER Act* Guidance from the IAAC related to the assessment of Canadian environmental obligations has been developed. The Policy Considering Environmental Obligations and Commitments in Respect of Climate Change under the *IAA* (Government of Canada 2020a) sets out a process to enable decision-makers to determine whether adverse effects within federal jurisdiction are significant, in the public interest.

While the Project is not a designated project, this policy document provides proponents involved in the impact assessment process with information on relevant requirements and expectations regarding the potential emissions and discharges from a project. Consideration of the beneficial and adverse effects of a project include the nature and extent of effects, indicators or mechanisms that can be used to measure the extent of effects, interplay between obligations and commitments impacted by Project effects, links to other decision-making factors (e.g., sustainability), and local and regional context (Government of Canada 2020a).

10.1.1.2 Provincial and Territorial

Ambient Air Quality Objectives for Northwest Territories, Yukon Territory, and British Columbia

The Government of the NWT has adopted a number of concentration limits to select pollutants for protection of ambient air quality in the NWT, under the NWT *Environmental Protection Act*. The NWT standards are used in the assessment of air quality monitoring data as well as determining the acceptability of emissions from proposed and existing developments, and for reporting on the state of air quality in the NWT (Government of the NWT 2014a).

The Government of Yukon regulates the release of air emissions in Yukon. The Yukon Ambient Air Quality Standards (YAAQS) are used to determine the acceptability of emissions from proposed and existing projects and developments (Government of Yukon 2019).

The Province of BC uses a suite of ambient air quality criteria that have been developed provincially and nationally to inform decisions on the management of air contaminants in BC (Government of BC 2020a). The BC air quality objectives are non-legally-binding limits that are used to gauge current and historical air quality; guide decisions on environmental impact assessments and authorizations; guide airshed planning efforts; inform regulatory development; and develop and apply episode management strategies (e.g., air quality advisories).

Table 10.1-1 provides the Ambient Air Quality Objectives (AAQOs) in NWT, Yukon, and BC for each CAC of interest for this Project.

Table 10.1-1. Ambient Air Quality Objectives and Standards in Northwest Territories, Yukon Territory, British Columbia, and Canada

Contaminant (Unit)	Averaging Period	Applicable Ambient Air Quality Objective				
		NWT AAQOs	YAAQS	BC AAQOs	CAAQS	
					2020	2025
NO_2 (parts per billion [ppb])	1-hour	213	60	60	60[a]	42[a]
	Annual	32	17	17	17[b]	12[b]
CO (ppb)	1-hour	13,000	13,000	13,000	N/A	N/A
	8-hour	5,000	5,000	5,000	N/A	N/A
$PM_{2.5}$ (microgram(s) per cubic metre [μg/m^3])	24-hour	28	27	25	27[c]	N/A
	Annual	10	8.8	8	8.8[d]	N/A

Sources: Government of the NWT 2014a; Government of Yukon 2019; Government of BC 2020a; CCME 2012, 2020.

Notes:

[a] Compliance is based on the 3-year average of the annual 98th percentile of the daily maximum 1-hour average concentrations.

[b] Compliance is based on the average over a single calendar year of all 1-hour average concentrations.

[c] Compliance is based on the 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.

[d] Compliance is based on the 3-year average of the annual average of the daily 24-hour average concentrations.

10.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding air emissions, GHG emissions, and climate change have been identified.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no Project-specific concerns regarding air emissions, GHG emissions, and climate change have been identified.

10.1.3 Potential Effects, Pathways, and Effect Indicators

Table 10.1-2 identifies the potential effect pathways of air and GHG emissions during the Project's physical abandonment activities.

These potential effects may occur within all of the land uses encountered by the Project. The Project will not result in an increase in air or GHG emissions following physical abandonment activities.

Table 10.1-2. Project Activities, Effect Pathways, and Indicators for Air and Greenhouse Gas Emissions

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in CAC emissions	Vehicle and equipment use will increase CAC emissions as a result of fuel combustion during physical abandonment activities.	Increase in CAC emissions
Release of GHG emissions	Vehicle and equipment use will contribute to GHG emissions as a result of fuel combustion during physical abandonment activities.	Increase in GHG emissions
	Brushing of vegetation and decay of vegetative debris will contribute to GHG emissions.	

10.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 10.1-3 describes the remaining spatial boundaries for air and GHG emissions, and the rationale for choosing them.

Table 10.1-3. Spatial Boundaries for Air and Greenhouse Gas Emissions

Element	Spatial Boundaries	Rationale
Air emissions	**Air Quality LSA**: N/A **Air Quality RSA**: A 2.5-km buffer extending from the Project Footprint (Figure 4.5-2).	**Air Quality LSA**: No Air Quality LSA was established for the Project since the effects from air emissions are regional in nature due to the transport and dispersion of pollutants away from the source. **Air Quality RSA**: An Air Quality RSA was established for the Project to consider the area where activities associated with the Project would most likely increase contaminant ambient air quality concentrations. The spatial boundary also encompasses the areas where there is a potential for cumulative environmental effects from other past, present, or reasonably foreseeable developments and activities. The Air Quality RSA boundary was defined based on the knowledge and previous experience of qualified professionals.
GHG emissions	**Beyond Air Quality RSA**	**Beyond Air Quality RSA**: GHG emissions can have global effects and are managed at the provincial and national levels. Therefore, the spatial boundary for GHG emissions extends beyond the Air Quality RSA. This assessment follows common practice to compare Project-related GHG emissions to total annual provincial and national GHG emissions, since regulations and GHG emission reduction targets are set at the provincial and national levels.

10.2 Existing Conditions for Air and Greenhouse Gas Emissions

10.2.1 Methods

The Project is located mainly on forested land with limited anthropogenic activities. The existing air quality conditions were characterized through a review of ambient air quality monitoring data. The results from regional ambient air quality monitoring stations were reviewed to determine ambient contaminant concentrations. Data from representative monitoring stations were obtained to estimate regional background concentrations and the status of compliance with AAQOs for the CACs of interest. All selected monitoring stations are located closer to populated areas (e.g., cities and towns) than to the Pointed Mountain Pipeline, which affects the representativeness of the data to the Project location. Therefore, these ambient air quality data are a conservative estimate of ambient CAC concentrations at the Project Footprint.

Sources of GHG emissions from the Project are predominantly from combustion and fugitive emissions from vehicle and equipment use during physical abandonment activities, and from brushing of vegetation and decay of vegetation debris. GHG emissions can have global effects and are managed at the provincial and national levels. Provincial and national annual GHG emission levels were obtained from the most recent National Inventory Report for the years 1990 to 2019 (ECCC 2021b).

10.2.2 Overview

10.2.2.1 Air Quality

Project-related air emissions result from the exhaust of transportation vehicles and heavy-duty equipment (e.g., excavators, graders, backhoes, and dozers) and auxiliary equipment (e.g., power generators) during physical abandonment activities. CAC concentrations could increase relative to background concentrations during physical abandonment activities. Project activities do not result in continuous CAC emissions; therefore, the potential for CAC emissions following physical abandonment activities is limited to occasional monitoring (e.g., ground and helicopter surveillance) and is considered negligible.

Table 10.2-1 provides summary reports of average concentrations of the CACs of interest measured at representative stations in 2018.

Table 10.2-1. Summary of Ambient Criteria Air Contaminants Concentrations at Monitoring Stations near the Project Footprint

CACs and Measurement Averages (Units)	NWT AAQOs	YAAQS	BC AAQOs	CAAQS	Average Concentration at Representative Monitoring Stations
NO_2 (ppb)					
1-hour	213	60	60	60 (2020) 42 (2025)	28.7[a] 18.1[b]
CO (ppb)					
1-hour	13,000	13,000	13,000	N/A	1,200[c]
8-hour	5,000	5,000	5,000	N/A	700[c]

Table 10.2-1. Summary of Ambient Criteria Air Contaminants Concentrations at Monitoring Stations near the Project Footprint

CACs and Measurement Averages (Units)	NWT AAQOs	YAAQS	BC AAQOs	CAAQS	Average Concentration at Representative Monitoring Stations
$PM_{2.5}$ ($\mu g/m^3$)					
24-hour	28	27	25	27 (2020)	14.8[a]
Annual	10	8.8	8	8.8 (2020)	8.2[d]

Notes:

[a] Available data of parameters measured in 2018 at the Norman Wells monitoring station in the Northwest Territories, located approximately 560 km north of the Project location (Government of the NWT 2018b).

[b] Available data of parameters measured from June 2016 to June 2017 by a portable monitoring station at the Blueberry River First Nation School in northeast BC, located approximately 400 km southeast of the Project location (Government of BC 2017).

[c] Available data of parameters measured in 2018 at the Fort Smith monitoring station in the NWT, located approximately 670 km east of the Project location (Government of the NWT 2018b).

[d] Available data of parameters measured in 2016 at the Hidden Valley monitoring site in the City of Whitehorse, Yukon, located approximately 620 km west of the Project (Government of Yukon 2018).

10.2.2.2 Greenhouse Gases

Since Project components (e.g., pipeline, facility sites) have all been previously deactivated, Project-specific emissions related to physical abandonment activities are not anticipated to contribute to existing reporting obligations for total annual system GHG emissions under the federal GHG Reporting Program (Government of Canada 2021c).

Table 10.2-2 provides the provincial and national annual GHG emission levels obtained from the most recent National Inventory Report for the years 1990 to 2019 (ECCC 2021a), including the federal GHG reduction target levels for 2030.

Table 10.2-2. Summary of Jurisdictional Greenhouse Gas Inventories

Year	National GHG Inventory Report			
	NWT (kt CO_2e/year[a])	Yukon (kt CO_2e/year)	BC (kt CO_2e/year)	Canada (kt CO_2e/year)
Applicable Future GHG Reduction Targets				
2030[b]	1,094	415	38,000	511,000
Past GHG Emissions (2019)				
2019	1,380	690	65,700	730,000

Source: ECCC 2021a; CleanBC 2020; Government of the NWT 2020b; Government of Yukon 2020b.

Notes:

[a] kilotonne(s) of carbon dioxide equivalent per year

[b] Under the Paris Agreement, Canada has set a reduction target of 30 percent below the 2005 emission level by 2030 (ECCC 2016). The Canadian 2030 GHG emissions target is 511,000 kt CO_2e (ECCC 2020c).

10.3 Project Interactions for Air and GHG Emissions

Table 10.3-1 identifies the Project activities that may interact with air and GHG emissions to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 10.6. A justification for no interaction is provided following Table 10.3-1 in subsection 10.3.1.

Table 10.3-1. Project Interactions for Air and Greenhouse Gas Emissions

Project Activities	Potential Effects	
	Change in CAC Emissions	**Change in GHG Emissions**
Pointed Mountain Pipeline		
Physical abandonment	✓	✓
Abandonment in-place	-	-

Notes:

✓ = A potential interaction with the Project is identified.

\- = No potential interaction with the Project is identified.

10.3.1 Project Interactions Scoped Out of Further Consideration

10.3.1.1 Change in Criteria Air Contaminant and Greenhouse Gas Emissions During Abandonment In-Place

No Project interactions related to air and GHG emissions are expected during abandonment in-place following physical abandonment activities, as monitoring activities are transient and will result in negligible emissions.

10.4 Mitigation

Westcoast intends to implement minimal surface disturbance construction practices (i.e., limiting ground disturbance to the physical abandonment locations). Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects from air and GHG emissions. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Table 10.4-1 identifies these key mitigation measures for each effect pathway identified for Project activities.

Table 10.4-1. Key Mitigation Measures for Air and Greenhouse Gas Emissions

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in CAC emissions	Vehicle and equipment use will increase CAC emissions as a result of fuel combustion during physical abandonment activities	Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Ensure that exhaust and engine systems of equipment are in good working condition and inspect undercarriages periodically to ensure that grasses do not accumulate.
		Do not leave vehicles idling for extended periods of time

Table 10.4-1. Key Mitigation Measures for Air and Greenhouse Gas Emissions

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in GHG emissions	Vehicle and equipment use will contribute to GHG emissions as a result of fuel combustion during physical abandonment activities.	Use multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Ensure that exhaust and engine systems of equipment are in good working condition and inspect undercarriages periodically to ensure that grasses do not accumulate.
		Do not leave vehicles idling for extended periods of time.
	Brushing of vegetation and decay of vegetative debris will contribute to GHG emissions.	Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contains the complete set of mitigation, including key mitigation in this table.

10.5 Potential Effect Pathways Not Carried Through for Further Assessment

Due to the limited scale and transient nature of physical abandonment activities and the application of mitigation measures, the following potential residual effects are expected to be avoided, and subsequently not carried through for further assessment:

- change in CAC emissions due to vehicle and equipment use during physical abandonment activities.

Potential residual effects that remain following the implementation of mitigation measures are carried forward for further assessment.

10.6 Assessment of Residual Effects for the Air and Greenhouse Gas Emissions

Residual effects as a result of a change in air and GHG emissions remain after the implementation of mitigation. The potential residual effects include:

- change in GHG emissions as a result of the Project's contribution to emissions during vehicle and equipment use and brushing of vegetation and decay of vegetative debris during physical abandonment activities.

10.6.1 Change in Greenhouse Gas Emissions

Project-related GHG emissions result primarily from the exhaust emissions related to the use of transportation vehicles and heavy-duty equipment (e.g., excavators, graders, backhoes) and auxiliary equipment (e.g., power generators). The Pointed Mountain Pipeline was already purged and cleaned of residual product before being deactivated. Following physical abandonment activities, abandonment in-place will not contribute to Project-specific GHG emissions.

Vehicles and equipment will be used to transport equipment and workers, as well as to carry out physical abandonment activities. Internal combustion engines, such as those associated with Project vehicles and equipment, emit CO_2 and small amounts of N_2O, as part of the combustion process. Physical abandonment activities will be transient and occur at select segments of the Pointed Mountain Pipeline. In addition, some brushing of vegetation will be required.

Due to the long-lived nature of GHGs in the atmosphere and their effects on climate change, the Project contribution to GHG emissions is permanent (i.e., irreversible). As GHGs contribute to climate change, which is a global issue, the spatial boundary of the residual effect is beyond the Air Quality RSA. Despite the high likelihood and permanent nature of these emissions, their magnitude will be negligible for physical abandonment activities in comparison to local, provincial, or federal GHG inventories. The residual effect is not significant (Table 10.6-1).

As per requirements outlined in Table A-2 of the *Filing Manual* (CER 2021a), the following subsections include further evaluation and discussion on potential residual effects of GHG emissions associated with Project activities based on estimation of GHG emissions, evaluation of Project's GHG emissions with respect to territorial, provincial, national, and sector-based GHG totals and Canada's GHG reduction targets.

10.6.1.1 Direct Emissions

Sources of direct GHG emissions from the Project are predominantly from combustion, and fugitive emissions from vehicle and equipment use during physical abandonment activities, and from brushing of vegetation and decay of vegetative debris. A breakdown of Project activities and calculation methods for GHG emission estimates are presented in Table 10.6-1. Table 10.6-2 presents estimates of direct GHG emissions for the Project. An estimate of Project's contribution to territorial, provincial and national GHG emission totals is presented in Table 10.6-3.

Table 10.6-1. Calculation Methods for Greenhouse Gas Emissions Estimates

Project Activities	Calculation Method for GHG Emissions
Vehicle and equipment use	Quantify GHG emissions by estimating volume of fuel used by the equipment and appropriate emission factors
Brushing, including decay of vegetative debris	Quantify GHG emissions by estimating volume of biomass to be brushed and removed and appropriate emissions factors

The estimated direct GHG emissions from the Project's physical abandonment activities are approximately 0.741 kilotonne(s) of carbon dioxide equivalent (kt CO_2e) (Table 10.6-2).

Table 10.6-2. Estimates of Greenhouse Gas Emissions from Project Activities

Project Activities	Emission Estimates (kilotonnes)			
	CO_2	CH_4	NO_2	Total CO_2e
Vehicle and equipment use	0.731	0.00009	0.00002	0.739
Brushing, including decay of vegetative debris	0.0008	3E-06	7E-07	0.001
Total Emissions	**0.731**	**0.00009**	**0.00002**	**0.741**

Notes:

Hourly usage of on- and off-road equipment estimated from similar project and scope. Brush biomass loading estimated as 10 m^3/hectare based on information provided in https://open.alberta.ca/publications/boreal-stand-volume-tda-table-cubic-meters-per-hectare

Due to rounding, emission estimates for CO_2, CH_4, and NO_2 may not add up to the total CO_2e emissions.

Using the 2019 GHG emission totals (ECCC 2021a) reported for Canada, NWT, Yukon, BC, and Canadian sector (i.e., Oil and Natural Gas Transmission) as a baseline, Project activities will contribute 0.0001 percent to the Canada GHG emission total, 0.05 percent to NWT GHG emission total, 0.1 percent to Yukon GHG emission total, 0.001 percent to BC GHG emission total, and 0.007 percent to the Canadian sector emission total (Table 10.6-3). As shown in Table 10.6-3, Project activities will contribute 0.0001 percent to the Canada 2030 GHG emission reduction target.

Table 10.6-3. Comparison of Estimated Direct GHG Emissions from the Project to Canada, Northwest Territories, Yukon, BC, and Canadian Sector GHG Emission Totals and to Canada GHG Emission Reduction Target

Territorial, Provincial, National, and Sector-Based Comparison	Greenhouse Gas Emissions	
	CO_2e (kt/y[a])	Project Contribution (%)
Canada[b]	730,000	0.0001
NWT[b]	1,380	0.05
Yukon[b]	690	0.1
BC[b]	65,700	0.001
Canadian Sector[b] (Oil and Natural Gas Transmission)	11,000	0.007
Canada 2030 GHG Reduction Target	511,000	0.0001

Notes:

[a] kilotonne(s) per year

[b] 2019 Canada, NWT, Yukon, BC, and Canadian sector GHG emission totals (ECCC 2021a) were used for comparison.

10.6.1.2 Indirect (Third-Party) Emissions

Given the limited scale, remote location, and transient nature of physical abandonment activities and that power sources for the Project will be from power generators resulting in direct emissions (estimated emissions shown in Table 10.6-2) during physical abandonment activities, an assessment of indirect (third-party) GHG emissions from the electricity consumption of the Project is not warranted.

10.6.1.3 Summary of Greenhouse Gas Emissions

With the application of mitigation measures described in Table 10.4-1 and the Project-specific EPP (Appendix B of this ESA), direct contributions to GHG emissions from the Project's physical abandonment activities are estimated to be:

- 0.0001 percent of the 2019 Canada GHG emissions total
- 0.05 percent of the 2019 NWT GHG emission total
- 0.1 percent of the 2019 Yukon GHG emission total
- 0.001 percent of the 2019 BC GHG emission total
- 0.007 percent of the 2019 Canadian sector emission total

10.6.1.4 The Project and Canada's Efforts to Reduce Greenhouse Gas Emissions

The Project will have GHG emissions during physical abandonment activities. As noted in subsection 10.2.2.1, since Project components (e.g., pipeline, facility sites) have all been previously deactivated, Project-specific emissions related to physical abandonment activities are not anticipated to contribute to existing reporting obligations for total annual system GHG emissions under the federal GHG Reporting Program (Government of Canada 2021c). GHG emissions as a result of the Project are estimated as 0.0001 percent of Canada 2030 GHG emission reduction target. Therefore, the Project will not notably contribute to or hinder the Government of Canada's efforts to reduce GHG emissions.

10.6.1.5 Climate Resilience

As described in Section 17, potential residual effects of the environment on the Project are not significant. Due to the limited scale and transient nature of physical abandonment activities and the application of mitigation, no additional consideration of climate resilience for the Project is warranted.

10.6.2 Summary of Project Residual Effects

Table 10.6-4 summarizes the significance evaluation of the predicted residual environmental effects of the Project on GHG emissions. There are no situations of a residual environmental effect on GHG emissions that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Consequently, it is concluded that the predicted residual effects of the Project on GHG emissions are not significant.

Table 10.6-4. Project Residual Effects of Greenhouse Gas Emissions

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Change in GHG emissions	Adverse	Beyond Air Quality RSA	Long-term	Isolated	Irreversible	Negligible to low	Not significant

10.7 Assessment of Cumulative Effects on Greenhouse Gas Emissions

The CEA evaluates the likely adverse residual environmental effects of the Project, combined with effects arising from other existing and reasonably foreseeable developments and activities. GHG emissions have global effects, and cumulative effects on GHG emissions associated with the Project are not limited to provincial or national borders. Table A-2 of the *Filing Manual* (CER 2021a) indicates predicted residual effects related to GHG emissions need not be subject to a CEA.

10.8 Conclusion

10.8.1 Air Quality

Mitigation is likely to prevent change to CAC emissions, or reduce adverse effects to negligible levels. As a result, a residual effect is avoided or entirely alleviated with mitigation measures or would be transient and negligible. No residual effects or cumulative effects on air emissions are predicted.

10.8.2 Greenhouse Gases

As Table 10.6-4 noted, there are no situations of a residual effect on GHG emissions that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Therefore, the residual effect of the Project contribution to GHG emissions is not significant. Prediction confidence is high based on professional judgement, the quantity of GHG emissions estimated for the Project, a comparison of GHG emissions associated with this Project compared to previous CER-reviewed projects and the effectiveness of proposed mitigation measures. GHG emissions have global effects, and cumulative effects on GHG emissions associated with the Project are not limited to provincial or national borders. The CEA for GHG emissions is beyond the scope of this ESA.

10.9 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA).

Monitoring methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details on monitoring are described in Section 19 of this ESA, Follow-up and Monitoring.

11. Assessment of Effects on Acoustic Environment

The assessment team conducted studies to establish the existing conditions (i.e., the baseline setting) of the acoustic environment to determine the potential effects of the Project. The study was based on existing literature, internet searches, consultation and engagement, and expert opinion.

11.1 Scope of the Assessment

For this assessment, acoustic environment is scoped based on the biophysical and socio-economic elements identified in the *Filing Manual* (CER 2021a). Effects with the potential to occur as the result of Project-related noise increases include sensory effects for local residents and land users (Section 14, Assessment of Effects on Socio-economic Elements), as well as wildlife and related habitat use (Section 9, Assessment of Effects on Wildlife and Wildlife Habitat).

11.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-2 – Filing Requirements for Biophysical Elements and Table A-3 – Filing Requirements for Socio-economic elements, were used to identify the circumstances and interactions to be considered for the assessment of the Acoustic Environment for all phases of the Project.

11.1.1.1 Federal

There are no applicable specific noise standards provided by Health Canada (2017), nor are there applicable federal regulations.

Abandonment activities will be carried out in an efficient manner that is safe and environmentally responsible in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. The abandonment scope of work does not include purging, flaring, or venting since the buried pipeline was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

11.1.1.2 Provincial and Territorial

The Project will comply with applicable provincial and territorial regulatory requirements in NWT, Yukon, and BC and generally follow the intent of provincial and territorial objectives and guidance that may be relevant to the Project. As the Pointed Mountain Pipeline is located in a remote area of NWT, Yukon, and BC, there are no applicable municipal noise bylaws. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to the acoustic environment include the following.

Northwest Territories

The Government of the NWT has no guideline criteria for noise levels associated with construction activities and has no established standards on applicable limits of environmental noise. As noted in a consultation draft of Air Quality Code of Practice Upstream Oil and Gas Industry (Government of the NWT 2002), in the absence of a noise bylaw, the use of Alberta Energy Regulator Directive 038: Noise Control (AER 2007, formerly Alberta Energy and Utilities Board [EUB] Directive ID 99-08 and EUB Guide 38, and effective since 1973) has been endorsed by the Government of the NWT. This draft COP outlined the following goals related to noise emissions (Government of the NWT 2002):

- sound level increase should be kept to acceptable minimum;
- overall quality of life for the neighbours of energy facilities should not be impaired;
- wildlife should not be adversely affected by excessive noise; and
- indoor sound levels should not change significantly, particularly as they affect normal sleep patterns.

Yukon Territory

Government of Yukon (2002b) provides no applicable specific noise standards in its *Noise Prevention Act*, although it stipulates that between the hours of 11:00 p.m. to 7:00 a.m., no person, owner, or occupier of premises shall make "noise that disturbs the peace and quiet of persons outside the premises or vehicle in which the noise is made".

British Columbia

The BC OGC Noise Control Best Practices Guideline (BC OGC 2021d) applies to the noise control of operations associated with wells and facilities in BC and does not include guidance regarding physical abandonment activities. However, it does encourage consideration of potential noise through regular noise measurements in order to determine if there are any significant changes to emanated sounds from Project activities.

11.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding the acoustic environment have been raised.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no concerns regarding the acoustic environment have been raised.

11.1.3 Potential Effects, Pathways, and Effect Indicators

Table 11.1-1 identifies the potential effect pathways of the Project on the acoustic environment during physical abandonment activities. These potential effects may occur within all of the land uses encountered by the Project. The Project will not result in a change in noise levels following physical abandonment activities.

Table 11.1-1. Project Activities, Effect Pathways and Indicators for the Acoustic Environment

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in noise levels	Vehicle and equipment use, and depressurization of the pipeline will increase noise during physical abandonment activities.	Increase in noise levels

11.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 11.1-2 describes the remaining spatial boundaries for the acoustic environment and the rationale for choosing them.

Table 11.1-2. Spatial Boundaries for the Acoustic Environment

Element	Spatial Boundaries	Rationale
Acoustic Environment	**Acoustic Environment LSA**: 1.5-km buffer extending from the Project Footprint (Figure 4.5-1). **Acoustic Environment RSA**: Same as Acoustic Environment LSA.	**Acoustic Environment LSA**: An Acoustic Environment LSA was established considering the area in which humans and wildlife are most likely to be affected by Project-related noise. At distances > 1.5 km, the radiated noise is expected to attenuate to levels below the ambient sound level. The Acoustic Environment LSA boundary was defined based on the knowledge of qualified professionals and previous experience. Other factors considered in determining the size of the study area include the nature and magnitude of anticipated Project-related noise and the existing environment. Potential effects and cumulative effects interactions are not anticipated to extend beyond the Acoustic Environment LSA; therefore, the Acoustic Environment RSA is the same as the Acoustic Environment LSA.

11.1.5 Ecological or Social Context

The Project is located in a remote forested area, where noise sources and human noise receptors are generally limited to oil and gas operators and land users (e.g., recreation, hunting, trapping, and Traditional Land Use). The primary sources of Project-related noise will be vehicles and equipment, used during physical abandonment activities.

Following physical abandonment activities, Project-related noise is expected to be limited to intermittent vehicle use for ongoing monitoring.

11.2 Existing Conditions for the Acoustic Environment

11.2.1 Methods

Locations of residences as potential noise receptors within the Acoustic Environment LSA were obtained through a desktop review.

11.2.2 Overview

The BC OGC Noise Control Best Practices Guideline defines the ambient sound level for rural areas to be 35 A-weighted decibels (dBA) at night and 45 dBA during the daytime, with the stipulation that basic sound levels may need to be adjusted by either -10 dBA or +10 dBA based on seasonal and ambient monitoring adjustments (BC OGC 2021d).

There are no residences identified as potential receptors within the Acoustic Environment LSA. Recreational users may be present at the Maxhamish Lake Provincial Park and Protected Area during Project activities, which is the closest named natural area to the Project, located approximately 40 km southeast of the Pointed Mountain Pipeline. Nahanni National Park is located approximately 50 km north of the Pointed Mountain Pipeline. Westcoast will work with any affected stakeholders to address specific concerns related to noise emissions, should they arise.

The primary sources of noise from the Project will be vehicles and equipment used during physical abandonment activities. Project-related noise levels are expected to vary, depending on natural features, such as topography, weather, and vegetation. The existing pipeline is currently filled with nitrogen gas that will be depressurized during physical abandonment activities, increasing noise levels.

11.3 Project Interactions for the Acoustic Environment

Table 11.3-1 identifies the Project activities that may interact with the acoustic environment to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 11.6. A justification for no interaction is provided following Table 11.3-1 in subsection 11.3.1.

Table 11.3-1. Project Interactions for the Acoustic Environment

Project Activities	Potential Effects
	Change in Noise Levels
Pointed Mountain Pipeline	
Physical abandonment	✓
Abandonment in-place	-

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

11.3.1 Project Interactions Scoped Out of Further Consideration

11.3.1.1 Change in Noise Levels During Abandonment In-Place

Following physical abandonment activities, the pipeline right-of-way is not anticipated to present a change in noise levels, as no further physical work is required once the pipeline is left in-place. Therefore, abandonment in-place is not included in the assessment.

11.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce effects on noise. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Table 11.4-1 identifies these key mitigation measures for each effect pathway identified for Project activities.

Table 11.4-1. Key Mitigation Measures for the Acoustic Environment

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in noise levels	Increase in noise during physical abandonment activities.	Notify potentially affected land users (e.g., Indigenous groups, trappers, and outfitters) of the intended Project schedule before the start of construction to avoid or reduce impacts to their operations or activities.
		Provide potentially affected Indigenous groups with the Project schedule and maps.
		Reasonable steps to control construction-related noise will be taken near areas identified by Westcoast.
		Ensure that noise abatement equipment (e.g., mufflers) on machinery is in good working order. Turn off equipment when not in use.
		Enclose noisy equipment and use noise barriers, where warranted, to limit the transmission of noise beyond the construction site. Locate stationary equipment, such as compressors and generators, away from noise receptors.
		Replace or repair equipment parts generating excessive noise.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contains the complete set of mitigation, including key mitigation in this table.

11.5 Potential Effect Pathways Not Carried Through for Further Assessment

Following the implementation of mitigation measures, physical abandonment activities are predicted to have potential residual effects on the acoustic environment. Potential residual effects that remain following the implementation of mitigation measures are carried forward for further assessment.

11.6 Assessment of Residual Effects for the Acoustic Environment

Residual effects as a result of a change in noise levels remain after the implementation of mitigation. The potential residual effects include change in noise levels during physical abandonment activities.

11.6.1 Change in Noise Levels

Vehicle and equipment use during physical abandonment activities will change existing noise levels.

Noise from the transportation of workers and equipment will occur during all phases of the Project. Specifically, site preparation, brushing, depressurizing the existing pipeline, and cleanup will increase noise during physical abandonment activities.

General Project noise will be temporary and is expected to take place at each of the Site Features (subsection 2.4). Activities will generally occur during daytime hours and will adhere to any regulatory requirements. There are no known residences within 1.5 km of the Project Footprint. Depressurization of the existing pipeline will occur during physical abandonment activities, prior to sealing the pipeline and leaving it in-place. Physical abandonment activities will follow Westcoast's established and proven mitigation measures and practices for noise control.

The residual effects of temporary increase in noise due to physical abandonment activities will be limited to areas near human receptors (e.g., land users) in the Acoustic Environment LSA and may result in temporary sensory disturbance, which could also affect wildlife habitat effectiveness in proximity to the Project Footprint. If noise concerns are raised during Project activities, Westcoast will evaluate all reasonable measures to address the specific concerns identified.

The residual effect of a change in noise during physical abandonment activities will occur, and is predicted to be immediate in duration, depending on the location of activities, and isolated in frequency, since it will only occur during the physical abandonment activities. The residual effect is considered to be low in magnitude, since there will be a detectable, though reversible, increase in noise levels for some receptors. The predicted residual effect is not significant (Table 11.6-1).

11.6.2 Summary of Project Residual Effects

Table 11.6-1 summarizes the significance evaluation of the predicted residual environmental effects of the Project on the acoustic environment. As Table 11.6-1 notes, there are no situations of a residual environmental effect on the acoustic environment that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Consequently, it is concluded that the predicted residual effects of the Project on the acoustic environment are not significant.

Table 11.6-1. Project Residual Effects on the Acoustic Environment

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Increase in noise levels	Adverse	Acoustic Environment LSA	Immediate	Isolated	Reversible	Low	Not significant

11.7 Assessment of Cumulative Effects on the Acoustic Environment

The CEA evaluates the Project's likely adverse residual environmental effects of the Project in combination with effects arising from other existing and reasonably foreseeable developments and activities.

Subsection 4.8 identifies other projects and physical activities that may act cumulatively with the Project. Where Project-related residual environmental effects act cumulatively with those from past, present, and reasonably foreseeable future projects and physical activities, a CEA is conducted to determine their significance. The Project's predicted residual effect that may interact with existing and reasonably foreseeable developments and activities to have cumulative effects within the Acoustic Environment LSA is a localized and temporary increase in noise levels during physical abandonment activities.

Table 11.7-1 identifies the Project's potential interactions with existing and reasonably foreseeable developments and activities to have cumulative effects on the acoustic environment.

Table 11.7-1. Interactions with Potential to Contribute to Cumulative Effects on the Acoustic Environment

Projects and Physical Activities	Potential Effects Change in Noise Levels
Present Projects, Physical Activities, and Land Use	
Forestry	✓
Oil and Gas	✓
Recreation	✓
Fishing, Hunting, and Trapping	✓
Transportation	✓
Future (Reasonably Foreseeable) Projects and Physical Activities	
Forestry	✓
Oil and Gas	✓
Recreation	✓
Fishing, Hunting and Trapping	✓

Notes:

✓ = A potential interaction is identified.

11.7.1 Change in Noise Levels

Dominant noise sources in the Acoustic Environment LSA occur from local and industrial vehicle traffic, existing industrial facilities, and industrial maintenance activities. Physical abandonment activities along with reasonably foreseeable projects and physical activities and existing projects and physical activities, are anticipated to increase ambient noise levels. By implementing the mitigation measures outlined in Table 11.4-1 and described in the Project-specific EPP (Appendix B of this ESA), potential cumulative effects on the acoustic environment are expected to be limited during Project physical abandonment activities.

At times during physical abandonment activities, cumulative noise increases may be detectable above existing noise levels. However, the Project is not likely to result in a substantial change to noise levels for an extended period that will alter the status or integrity of the acoustic environment beyond an acceptable level. The duration of the effect at any location in the Acoustic Environment LSA will be limited to the physical abandonment activity period (i.e., short-term). The cumulative effects on the acoustic environment are predicted to be not significant.

11.7.2 Summary of Predicted Cumulative Effects on the Acoustic Environment

Table 11.7-2 provides the cumulative effect characterization for each cumulative effect using the criteria defined in Section 4.

Table 11.7-2. Project Cumulative Effects on the Acoustic Environment

Predicted Cumulative Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Cumulative increase in noise levels	Adverse	Acoustic Environment LSA	Immediate	Isolated	Reversible	Low	Not significant
Contribution from the Project to the cumulative effect	The Project will contribute to the cumulative increase in noise levels. With the proposed mitigation, the Project's contribution to the cumulative effect is of low magnitude at the regional scale and reversible, and immediate in duration.						Not significant

11.8 Conclusion

As Tables 11.6-1 and 11.7-2 noted, no situations of a residual effect or cumulative effect on the acoustic environment that are irreversible and of high magnitude, or reversible but long-term in duration and of high magnitude. Therefore, the predicted localized and temporary increase in noise level residual effects and cumulative effects are not significant. Prediction confidence is high based on an understanding of the cause-effect relationships for noise effects from physical abandonment activities and professional judgement.

11.9 Monitoring and Follow-up

Based on the results of this assessment, no specific noise quality monitoring programs are anticipated. An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA).

12. Assessment of Effects on Heritage Resources

The assessment team conducted a desktop study to establish the existing conditions (i.e., baseline setting) for Heritage Resources from which the potential effects of the Project can be determined. The study was based on a review of existing literature, internet searches, consultation and engagement, and expert opinion.

12.1 Scope of the Assessment

Heritage Resources are included in this assessment based on the socio-economic elements identified in the *Filing Manual* (CER 2021a). For the purpose of the assessment, Heritage Resources are defined as cultural, historic, archaeological, and palaeontological resources and collectively known as Heritage Resources. Heritage Resources are considered valued components based on scientific value, Indigenous interests, and regulatory requirements. Project activities may uncover Heritage Resources located on the Project Footprint.

12.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-3 – Filing Requirements for Socio-economic Elements, was used to identify the circumstances and interactions to be considered for the assessment of Heritage Resources for all Project phases. Heritage Resources are managed by their respective provincial jurisdictions outside of federal lands.

12.1.1.1 Federal

There are no additional federal requirements.

12.1.1.2 Provincial and Territorial

The Project will comply with applicable provincial regulatory requirements in NWT, Yukon, and BC and generally follow the intent of provincial objectives and guidance that may be relevant to the Project. Provincial regulations and guidelines that provide standards and requirements relevant to Heritage Resources include the following.

Northwest Territories

NWT Historical Resources Act, Archaeological Sites Act and Regulations,* and *Mackenzie Valley Resources Management Act and Land Use Regulations

Heritage Resources (historic, cultural, and archaeological) in the NWT are protected by law under the NWT *Historical Resources Act* (NWT *HRA*) (Government of the NWT 2009), the *Archaeological Sites Act* and Regulations (Government of the NWT 2014b), and the Mackenzie Valley *Resources Management Act* and *Land Use Regulations* (Mackenzie Valley Resources Management 1998). Collaborations between Indigenous groups, land management authorities, the developers, the Cultural Places Program of the Prince of Wales Northern Heritage Centre (PWNHC), and contract archaeologists are required for the proper preservation of Heritage Resources sites in the NWT.

The Guidelines for Developers for the Protection of Archaeological Sites in NWT (Government of the NWT 2017a) have been referred to for navigating the legislative and regulatory requirements for Heritage Resources in NWT and the PWNHC Archaeology Program and the Archaeological Overview Assessment Guidelines (Government of the NWT 2017b) have been referred to for the desktop assessment of the Project.

Territorial and federal law, as well as the Mackenzie Valley *Land Use Regulations* prohibit development activities within 30 m of a known or suspected archaeological site in the NWT. Additional avoidance measures (i.e., larger buffers) may be required by the MVLWB (100 m to 150 m) or by Indigenous groups whose Traditional Territories are affected, if a particular site is deemed to have higher cultural significance to the community (e.g., ceremonial, spiritual, or other important Traditional Use sites). Additional buffers may also be required if site coordinates are deemed imprecise. In these instances, a 250-m buffer around sites is a recommended management approach.

The effects of projects, activities, and land disposals on Heritage Resources must therefore address protection of documented Heritage Resources and make provision for avoidance of undocumented resources through planning, Heritage Resources potential modeling, and recommendations for carrying out Archaeological Impact Assessments (AIAs).

Archaeologists have not systematically investigated many areas of the NWT; therefore, it is possible that unrecorded archaeological sites exist within the Project area. During the Project proposal stage, archaeologists conducted a thorough Archaeological Overview Assessment (AOA) and provided recommendations for further assessment or mitigation (e.g., field reconnaissance, avoidance, impact assessments) to verify Project activities and their potential to pose negative impacts on Heritage Resources are being adequately addressed. .

Yukon Territory

Yukon Historic Resources Act* and *Archaeological Sites Regulation

Heritage Resources (i.e., historical, cultural, archaeological, and palaeontological) are protected by law under the Yukon *Historic Resources Act* (Yukon *HRA*) (Government of Yukon 2002a) and Yukon *Archaeological Sites Regulations* (Government of Yukon 2003c). Yukon Tourism and Culture (YTC) is the territorial government agency responsible for managing Heritage Resources on non-settlement land outside of National Parks, in partnership with land claim authorities, and other appropriate regulatory authorities.

Collaborations between Indigenous groups, land management authorities, the developers, the Heritage Unit of YTC, and contract archaeologists are required for the proper preservation of Heritage Resources sites in the Yukon. Oil and Gas BMPs for Heritage Resources (Government of Yukon 2006) provides guidance to navigate the legislative and regulatory requirements and BMPs for Heritage Resources. These BMPs have provided the baseline for the current preliminary desktop review of the Pointed Mountain Pipeline Project.

To protect and manage Heritage Resources, as well as burials outside of known cemeteries, proposed developments involving land disposal, land use or permits reviewed under the *YESAA Regulations* require proponents to provide adequate information to allow for the evaluation of the likelihood and significance of adverse effects of a proposed project on Heritage Resources, and to identify potential mitigation measures.

Therefore, it is important that proponents conduct a desktop review of Heritage Resources within proposed development areas to assist with planning projects to achieve a minimal impact on Heritage Resources. Thorough desktop assessment submitted with project applications to YESAB provides essential baseline data from which recommendations for future research and predictions of potential impacts can be made.

Territorial and federal law prohibits development activities within 30 m of a known or suspected archaeological site in the Yukon. Additional avoidance measures (i.e., larger buffers) may be required by Indigenous groups, whose Traditional Territory is affected, if a particular site is deemed to have higher cultural significance to the community (e.g., ceremonial, spiritual, or other important Traditional Use site). Additional buffers may also be required if site coordinates are deemed imprecise, and in these instances a 200-m buffer around sites is a recommended management approach.

The effects of projects, activities, and land disposals on Heritage Resources will therefore address protection of documented Heritage Resources and make provision for avoidance of undocumented resources through planning, historic potential modeling, and recommendations for and carrying out any required AIAs.

Archaeologists have not yet systematically investigated many areas of the Yukon, including the far southeast corner of the Yukon where the Project lies, therefore it is possible that unrecorded archaeological sites exist within the Project area. AIAs are frequently necessary for development projects in areas where there is little known about Heritage Resources, or where project activities may result in Level 1 or Level 2 impacts to areas identified as having high heritage potential. In some instances, post impact assessment may be identified as an appropriate response (Government of Yukon 2006).

British Columbia

British Columbia Heritage Conservation Act

Heritage Resources in BC (historical, cultural, and archaeological) are protected by law under the *Heritage Conservation Act* (*HCA*) (Government of BC 1996). Palaeontological sites are also provided protection when they receive heritage designation through the *HCA*. Under the BC *Environmental Assessment Act*, Heritage Resources are also protected and guidance from the BC EAO states that resources should be protected and assessed in accordance with BC Archaeology Branch standards.

Heritage Resources on non-federal lands in BC are administered by the BC MFLNRORD, Archaeology and Heritage Branches, and the BC OGC in accordance with the *HCA*. The BC Heritage Branch exercises regulatory authority under the *HCA* regarding the protection and alteration of designated (i.e., protected) historical heritage sites. The *HCA* confers automatic protection upon heritage sites that pre-date 1846 or sites with unknown dates that could pre-date 1846, regardless of whether they are recorded in the provincial Heritage Site Register, whether they are located on Crown land or private property, and whether they are in a disturbed or intact context.

Post-1846 historic sites can be protected by Ministerial Order, Designation by an Order-in-Council, or a municipal bylaw, however, most post-1846 historic sites are not protected in BC. The requirements and procedures for Heritage Resource studies conducted for development projects are described in the BC AIA Guidelines (Government of BC 1998). According to section 3.2.1 (pg. 7) of the BC AIA Guidelines, the Archaeology Branch exercises the following responsibilities in the project approval process for Heritage Resources:

> "…establishing impact assessment and management guidelines, study standards, and reporting requirements; reviewing development proposals to determine the proponent's level of involvement in the archaeological resource assessment process; preparation of orders and permits pursuant to the HCA in assistance to the Minister; providing guidance or direction to the proponent throughout the archaeological assessment process; ensuring that First Nations who could be affected by decisions are given an opportunity to have their concerns considered prior to making decisions; providing consultants with access to archaeological site files, maps, and other documentary materials maintained within the Ministry; monitoring field aspects of archaeological impact assessment and management studies for compliance with terms and conditions of orders and permits; reviewing reports and research proposals for relevance, completeness and objectivity; and establishing terms and conditions for project approval." (Government of BC 1998).

In accordance with Section 12 of the *HCA*, a proposed activity that is likely to impact known or unknown resources is to be preceded by an AIA, in order to recover information which might otherwise be lost as a result of site alteration or destruction.

AOAs are conducted for larger scale projects in advance of any impact assessment studies to determine potential impacts to Heritage Resources as well as determine the potential of an area to contain previously unrecorded Heritage Resources. Therefore, the intent of a thorough AOA is to identify and assess archaeological resource potential for sensitivity within a proposed region and make recommendations concerning the appropriate methodology and scope of work for subsequent inventory or impact assessment studies.

Any works associated with the Pointed Mountain Pipeline Project within BC will require *HCA* approval, administered by the Archaeology Branch, as this pipeline is CER-regulated. Therefore, a desktop review of the pipeline is being presented as Heritage Resources considerations are required for this Project. A preliminary non-permitted desktop assessment was completed to inform on archaeological potential of the Project area.

12.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding Heritage Resources have been identified.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no concerns regarding Heritage Resources have been identified.

The Acho Dene Koe First Nation participated in the AIA for the Project in the NWT and Yukon.

12.1.3 Potential Effects, Pathways, and Effect Indicators

Table 12.1-1 identifies the potential effect pathways of the Project on Heritage Resources during physical abandonment activities. The Project will not result in a change to Heritage Resources following physical abandonment activities.

Project effects on Heritage Resources may occur within all of the land uses encountered by the Project.

Table 12.1-1. Project Interactions and Potential Effects on Heritage Resources

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change to Heritage Resources	Ground disturbance during physical abandonment activities may lead to the discovery or disturbance of previously unidentified Heritage Resources.	N/A

12.1.4 Spatial Boundaries

Potential effects on Heritage Resources are assessed within the boundaries of the Project Footprint. The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure, and temporary workspace. The potential for impacting archaeological, historic, or palaeontological resources is limited to the areas directly disturbed by physical works on the Project Footprint; therefore, a separate Heritage Resource LSA or RSA has not been defined for the Project.

12.1.5 Context

The potential for encountering Heritage Resources is reduced by confining physical abandonment activities to the existing previously disturbed right-of-way and using previously disturbed land for temporary workspace to the extent practical.

A desktop review was conducted to identify previously recorded Heritage Resources within the Project Footprint, which primarily encounters the previously disturbed right-of-way.

12.2 Existing Conditions for Heritage Resources

12.2.1 Methods

Northwest Territories and Yukon

The archaeological region encompasses lands within 500 m of the Pointed Mountain Pipeline; the information gathered within this area has been used to evaluate the archaeological potential at the four proposed abandonment locations within the NWT. In addition to known archaeological site data and previous archaeological assessment reports, data from other sources were used to understand the Heritage Resources potential of the region within 100 m of the pipeline, including: satellite aerial imagery (Esri 2016); topographical maps of the local hydrological and terrain features; surficial geology information (NRCan 2021), IK (Lamont 1977); two TLU studies (Diaz 2012; Thomas and Coppard 2004); and a cumulative effects management study in the Deh Cho Territory (Deh Cho Land Use Planning Committee 2021).

British Columbia

An AOA for the Project has been conducted for the proposed abandonment sites in BC. The AOA considered existing land use and disturbances, as well as land type, forest cover, terrain, proximity to watercourse crossings and known archaeological sites, modeled potential for Heritage Resources, and previous AIAs in proximity to the Project.

12.2.2 Overview

12.2.2.1 Northwest Territories

Heritage Resources site information was requested through the PWNHC on May 26, 2020 by submission of the NWT Archaeological Site Database applicant agreement. Site data were requested for the NTS map sheet the Project crosses in NWT (095B05). Results from the site data request were received June 29, 2020.

A total of 41 Heritage Resources were identified within 1 km of the existing Pointed Mountain Pipeline. These sites were recorded before GPS technology, between the late 1960s and early 1970s. Geographic coordinates for any given site may vary substantially, particularly of those sites recorded before GPS technology.

Therefore, a 250 m buffer was applied to the Heritage Resources site points to then identify potential Heritage Resources within 500 m of the pipeline. The 250 m site buffer, in addition to accounting for geographic inaccuracies, is also being used to capture potential site boundaries.

Field work for the AIA in the NWT was completed from August 9 to 12, 2021.

The AIA focused on four abandonment location PM-1, PM-2, PM-3, and PM-4 demonstrating potential for Heritage Resources. No areas of archaeological potential were identified within the Project Footprint that warranted further evaluation or mitigation. However, three culturally modified trees adjacent to the Project Footprint were flagged for avoidance.

Approval of the AIA results in the NWT are pending.

12.2.2.2 Yukon

Although there are no previously recorded Heritage Resources in proximity to the Yukon portion of the Pointed Mountain Pipeline or the two physical abandonment locations (PM-6 and PM-7), few AIAs have been conducted in these locations that would have resulted in the discovery of these resources or landforms having potential for these resources. Therefore, it is important to identify landforms features that have high potential to contain Heritage Resources. Project abandonment locations PM-6 and PM-7 are located on uplands within 500 m and 600 m of former channels of La Biche River and approximately 1,100 m from the active channel and demonstrated potential for Heritage Resources.

Field work for the AIA in the Yukon was completed from August 11 to 12. The AIA was conducted within 30 m of PM-6 and PM-7. No areas of potential were identified during the AIA within the Project Footprint that warranted further evaluation or mitigation.

Approval of the AIA results in the NWT are pending.

12.2.2.3 British Columbia

According to the latest Remote Access to Archaeological Data (RAAD) (BC MFLNRORD 2020i), there are two known archaeological sites within 200 m to the proposed pipeline. The nearest archaeological sites are located 48 m south and 187 m southwest of the Project, respectively. Therefore, no existing archaeological sites require considerations for avoidance or mitigation along the existing right-of-way.

The Project lies partially on private land but mostly lies within Crown land, located approximately 144 m northeast of the community of Muncho Lake. The Project also crosses the Beaver River Road and oil and gas and forestry activities have impacted the region to a minor extent. Based on the State of Environment Report provided by the Consultative Areas Database, the interested Indigenous groups within the region include Fort Nelson First Nation, Acho Dene Koe First Nation, and Liard First Nation (Government of BC 2020e).

The region is forested by a mix of white poplar, white and black spruce, and birch. Terrain of the region is hummocky to rolling, and soils are predicted to be imperfectly to moderately well-drained. The Pointed Mountain Pipeline crosses four unnamed drainages and is located approximately 6 km west of La Biche River and 7.7 km northeast of Beaver River. Landforms may include breaks-in-slope, banks of drainages and micro-topographic rises. Transitions in forest cover may also indicate higher archaeological potential. The existing Pointed Mountain Pipeline crosses areas that are predicted to have moderate to high archaeological potential as indicated by the AOA Potential Model in RAAD (BC MFLNRORD 2020i). Areas crossed by the Pointed Mountain Pipeline that are considered to have higher potential than surrounding lands were identified.

Based on the results of the AOA for the Project it has been determined that an AIA is not required for the Project.

12.3 Project Interactions with Heritage Resources

Table 12.3-1 identifies the Project components that might interact with Heritage Resources and result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects. A justification for no interaction is provided following the table in subsection 12.3.1.

Table 12.3-1. Project Interactions with Heritage Resources

Project Activities	Potential Effect
	Change in Heritage Resources
Pointed Mountain Pipeline	
Physical abandonment activities	✓
Abandonment in-place	-

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

12.3.1 Project Interactions Scoped Out of Further Consideration

12.3.1.1 Change in Heritage Resources as a Result of Abandonment In-Place

No interaction is anticipated as a result of abandoning the pipeline in-place, as surface or buried Heritage Resources would be uncovered, modified, or mitigated before or during original construction and/or during physical abandonment activities.

12.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on Heritage Resources. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Table 12.4-1 identifies these key mitigation measures for the protection of Heritage Resources for the Project for each identified effect pathway.

Table 12.4-1. Key Mitigation Measures for Heritage Resources

Potential Effect	Effect Pathway	Key Mitigation[a]
Change in Heritage Resources	Ground disturbance during physical abandonment activities may lead to the discovery or disturbance of previously unidentified Heritage Resources.	Where an archaeological site has been identified in association with a construction disturbance area, efforts to avoid disturbance to the area will be made.
		Recommendations and/or requirements of applicable permitting are to be followed.
		For sites with high potential for artifacts to occur, activities should be performed carefully, with increased monitoring during ground disturbance activities, including topsoil salvage.
		If an artifact is encountered, excavation work is to be suspended and the PEL and EI contacted for further instructions.
		Personnel are not permitted to collect or disturb any artifacts.
		All Heritage Resources identified will be catalogued and collected by specialized personnel, prior to submission to the appropriate regulatory authority.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contain the complete set of mitigation, including key mitigation listed in this table.

12.5 Assessment of Residual Effects on Heritage Resources

The Project may uncover previously unidentified Heritage Resources as a result of ground disturbance, including clearing, stripping, handling, or topsoil salvage, and grading associated with physical abandonment activities. However, with the implementation of the mitigation measures listed in Table 12.4-1 and the Project-specific EPP (Appendix B of this ESA), potential effects on Heritage Resources can be effectively avoided or mitigated. In the event an unidentified Heritage Resource is uncovered during Project activities, Westcoast will implement the appropriate mitigation measures and will report any previously unidentified Heritage Resources to PWNHC, YTC, or the BC Archaeology Branch. No residual effects on Heritage Resources are anticipated.

Disturbing Heritage Resources in a controlled, scientific excavation is considered an acceptable, and in some cases, the only method to collect in situ information to add to the historic record. Regardless of the need for excavating, the removal of Heritage Resources is offset by the recovery of knowledge about the site when catalogued and preserved in compliance with provincial guidelines. No residual effects on Heritage Resources indicators have been predicted. Consequently, no further evaluation of the change in Heritage Resources is warranted as a result of the Project.

12.6 Conclusion

After the implementation of mitigation measures, no residual effects on Heritage Resources are anticipated. Consequently, a CEA is not warranted.

12.7 Monitoring and Follow-up

An EI will be onsite during Project activities to monitor for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). Interested Indigenous groups will be invited to participate in EI Assistant/Environmental Monitoring capacities during physical abandonment activities. Following physical abandonment activities, no additional monitoring or follow-up is required when approval requirements are met.

13. Assessment of Effects on Traditional Land and Resource Use

The assessment team reviewed publicly available information and information provided by Indigenous groups from consultation and engagement activities to establish the existing conditions (i.e., baseline setting) for TLRU from which the potential effects of the Project can be determined.

13.1 Scope of the Assessment

TLRU is included in this assessment based on the socio-economic elements identified in the *Filing Manual* (CER 2021a). The Project may affect the current use of lands and resources by Indigenous groups within the TLRU RSA. This assessment assumes the ability to conduct TLRU activities is influenced by the health and abundance of resources harvested and the continued availability of, and access to, Traditional Use sites and areas. Information obtained from Westcoast's Engagement Program and relevant biophysical and socio-economic information presented elsewhere in this ESA were used to inform the identification of potential Project and cumulative effects, as well as the development of mitigation measures.

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-3 – Filing Requirements for TLRU were used to identify the circumstances and interactions to be considered for the assessment of TLRU for all phases of the Project. The assessment of potential effects from the Project on the current use of lands and resources by Indigenous Peoples is discussed in this section.

As per Guide A.2 of the *Filing Manual* (CER 2021a), GBA+ should be applied when considering each of the socio-economic elements outlined in Table A-3. GBA+ was considered in the identification of potential effects on TLRU. Considering physical activities are of relatively short duration and an established construction camp offering full amenities (e.g., single occupancy rooms with showers, recreational opportunities) will be used to accommodate Project work crews, it is not anticipated that diverse groups of people within Indigenous groups will be differentially affected by the Project.

13.1.1 Regulatory and Policy Setting

13.1.1.1 Federal

Canadian Energy Regulator *Onshore Pipeline Regulations*

Abandonment activities will be carried out in accordance with the *CER Act*, CER *OPRs,* and CSA Z662-19. Companies are responsible for meeting the requirements of the CER *OPRs* to manage safety, security, and environmental protection throughout the entire lifecycle of their facilities, from design, through to construction, operation, and abandonment.

The management of vegetation, soil quality, air quality, noise, wildlife and wildlife habitat, water quality and aquatic resources, and Heritage Resources, including TLU, are expected to be part of the monitoring program. The buried pipeline left in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19.

Impact Assessment Agency

The assessment is also guided by the Technical Guidance for Assessing the Current Use of Lands and Resources for Traditional Purposes under the *CEA Act, 2012* (CEA Agency 2015a). Specifically, the assessment considers the effects of any changes to the environment on the current use of lands and resources for traditional purposes by Indigenous groups.

13.1.1.2 Provincial and Territorial

Northwest Territories

In the NWT, proponents are strongly encouraged to submit IK and Traditional Ecological Knowledge with applications for land use permits or water licences (MVLWB 2020). The Mackenzie Valley Environmental Impact Review Board requires the inclusion of IK in environmental assessments and prepared guidelines for incorporating IK (MVEIRB 2005). In the NWT, it is expected that effects on TLRU will be considered in environmental assessments.

Yukon

The *YESAA* provides direction on the factors that must be considered for assessments under the Act. Sections 42(1)(g) and (g.1) outline the following considerations specific to Yukon First Nations and the Tetlit Gwich'in:

- The need to protect the Final Agreement rights of "Yukon Indian Persons' as defined in the Umbrella Final Agreement;
- The special relationship between Yukon Indian Persons and the wilderness environment of the Yukon;
- The cultures, traditions, health, and lifestyles of Yukon Indian Persons; and
- Yukon First Nation interests. (YESAB 2018).

YESAB makes factual, not legal, determinations about the significance of effects on valued components.

British Columbia

The *Environmental Assessment Act*, 2018 establishes that one of the purposes of the BC EAO is to use the best available IK, science, and local knowledge in decision-making under the Act (s. 2(2)(b)(i)(C)). The inclusion of IK within the environmental assessment process is an important component in supporting the reconciliation objectives of the Act, and recognizing Indigenous governance, jurisdiction, and decision-making. The inclusion of IK provides decision-makers with greater understanding of the environment in which the Project is happening and the potential impacts of the Project on Indigenous groups (BC EAO 2020).

13.1.2 The Influence of Consultation and Engagement on the Assessment

On June 17, 2020, Westcoast requested that the CER complete a preliminary Traditional Territories analysis for the Project. The list of Indigenous groups identified as having known or asserted Traditional Territory in the Project area are identified in subsection 3.2. Section 3 of this ESA and Attachment 4 of Westcoast's CER Project Application detail the engagement efforts conducted to date.

Westcoast will continue to work with communities that identify any site-specific concerns or areas of interest which may require specific mitigation during the abandonment process. Westcoast is open to receive TLU or IK information from communities to incorporate into Project planning prior to construction where practical.

13.1.3 Potential Effects, Pathways, and Effect Indicators

Table 13.1-1 identifies the potential effect pathways of the Project on TLRU during physical abandonment activities and as a result of leaving the abandoned pipeline in-place. TLRU activities include trails and travelways, habitation sites, gathering places, and sacred sites as well as activities such as plant gathering, hunting, trapping, and fishing.

Project effects on TLRU may occur within all of the land uses encountered by the Project since Indigenous groups utilize forested areas, wetlands, watercourses, and shrublands for different traditional purposes.

Table 13.1-1. Project Interactions and Potential Effects on Traditional Land and Resource Use

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in TLRU activities	Physical abandonment activities may influence availability and quality of current Traditional Resources including loss or alteration of traditionally used wildlife or plant species.	▪ Change in availability of habitat for traditionally used species ▪ Change in resources identified by participating Indigenous groups ▪ Trails and travelways no longer accessible ▪ Access restrictions to previously used harvesting areas ▪ Duration of access restrictions ▪ Level and duration of sensory effects
	Physical abandonment activities may result in changes in access to Traditional Resources, areas of current harvesting, or cultural use sites including trails and travelways, gathering places, and sacred sites.	
	Physical abandonment activities may result in sensory effects related to noise, dust, and visual presence of Project activities for TLRU.	
Changes to TLRU sites	Physical abandonment activities (e.g., vegetation clearing) may result in physical changes to current use sites or areas.	▪ Number of currently used sites that are physically affected

13.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Table 13.1-2 describes the remaining spatial boundaries for TLRU and the rationale for choosing them.

Table 13.1-2. Spatial Boundaries for Traditional Land and Resource Use

Element	Spatial Boundaries	Rationale
TLRU	**TLRU LSA**: A 1.5-km buffer extending from the Project Footprint (Figure 4.5-1). **TLRU RSA**: 15-km buffer on extending from the Project Footprint (Figure 4.5-2).	**TLRU LSA**: Includes the combined extent of the Aquatics LSA, Air Emissions RSA, Acoustic Environment LSA, Wetlands LSA, Vegetation LSA, and Wildlife and Wildlife Habitat LSA. **TLRU RSA**: Includes the combined extent of the Aquatics RSA, Air Emissions RSA, Acoustic Environment LSA, Wetlands RSA, Vegetation RSA, and Wildlife and Wildlife Habitat RSA.

13.1.5 Residual Effects Description Criteria

The residual effects criteria for direction, duration, frequency, reversibility, and likelihood are the same for all elements assessed in the ESA and are presented in Table 4.7-1. Table 13.1-3 presents the criteria for the magnitude for residual effects on TLRU.

Table 13.1-3. Criteria for the Magnitude of Residual Effects for Traditional Land and Resource Use

Assessment Criteria	Definition
Magnitude – Residual Environmental Effects	
Negligible	No detectable change from existing (baseline) conditions.
Low	Change is detectable but change to TLRU activities is limited and the majority of potentially affected Indigenous groups will likely adapt easily to changes and maintain pre-effect TLRU activities.
Medium	Change is detectable and results in moderate modification to TLRU activities and the majority of potentially affected Indigenous groups will likely be able to adapt to changes and maintain pre-effect TLRU activities.
High	Change is detectable and is large enough to result in a severe modification to TLRU activities and potentially affected Indigenous groups will not be able to adapt to changes or maintain pre-effect TLRU activities.

13.1.6 Social Context

The Project is located primarily on Crown land and Westcoast understands from engagement with Indigenous groups that TLRU activities occur throughout the area.

The Project is located in a forested setting where human infrastructure and activity is limited. Human activities include forestry and energy infrastructure (e.g., pipelines and associated infrastructure). The Project is also located at the northwestern edge of ECCC-identified caribou habitat which has been identified as a culturally important species by Indigenous groups. However, a field participant from Acho Dene Koe First Nation reported that there are no caribou present in the Project RSAs.

13.2 Existing Conditions for Traditional Land and Resource Use

13.2.1 Methods

The potential effects associated with the Project on TLRU were identified based on the results of Westcoast's engagement with Indigenous groups. It is conservatively assumed that TLRU is occurring on Crown lands in the Project area.

13.2.2 Overview

Project activities, including physical abandonment activities, are not located on any reserve lands or any Métis settlements. The Indigenous groups identified in the CER Traditional Territory assessment as having known or asserted Traditional Territory in the Project area are identified in subsection 3.2.

Engagement activities to date have identified TLRU activities in the TLRU LSA and TLRU RSA.

Acho Dene Koe First Nation has identified the TLRU LSA as an area important to the exercise of their Aboriginal and Treaty Rights. Acho Dene Koe First Nation hunt, fish and gather plants for food, social, cultural, and trading purposes throughout their Traditional Territory (Acho Dene Koe First Nation 2021).

Acho Dene Koe First Nation continue to use and occupy Fisherman Lake and the area north and east of Pointed Mountain for TLU activities. Community members have cabins in the area and the area serves as an important area for subsistence hunting, fishing and berry picking, as well as a setting for cultural and spiritual gathering. Southern sections along the Pointed Mountain Pipeline right-of-way have both historic and contemporary use for hunting and fishing and the region is home to many cabins.

Acho Dene Koe First Nation identified the Pointed Mountain area as an important location for collection of berries and medicines. Culturally important plants include alpine bearberry, alpine bistort, saskatoon berries, blueberries, bunchberries, crowberry, fireweed and great willow herb, ground juniper, wild lily-of-the-valley, bog cranberry, chokecherry, skunk current, wild black current, wild red current, wild gooseberry, prickly wild rose, dwarf raspberry, cloudberry, dewberry, wild red raspberry, northern comandra, and Canada buffalo berry or soapberry.

Liard First Nation has identified the TLRU LSA in the Kotaneelee Region of Kaska Territory as an area important to the exercise of their Aboriginal and Treaty and Rights. Liard First Nation uses Kaska Traditional Territory for the exercise of TLU activities such as hunting, trapping and fishing for food, social, ceremonial, clothing, shelter and tools purposes; gathering plants and botanical resources for food, ceremonial, clothing, shelter, tools, medicinal and other purposes; and harvesting wood and forest resources for domestic purposes. Liard First Nation also engages in selling, trading, bartering and exchanging the products of resource harvesting; conducting ceremonial and spiritual practices and traditions; teaching children traditional practices, and providing a cultural and spiritual education and carrying out land and resource management and governance for a sustainable and productive landscape (Liard First Nation 2021b).

To date, Indigenous groups have not identified any specific TLRU sites that interact with physical abandonment activities on the Project Footprint and require specific mitigation.

13.3 Project Interactions with Traditional Land and Resource Use

Table 13.3-1 identifies the Project components that may interact with TLRU to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 13.6. A justification for no interaction is provided following Table 13.3-1 in subsection 13.3.1.

Table 13.3-1. Project Interactions with Traditional Land and Resource Use

Project Activities	Potential Effects	
	Change in TLRU activities	**Change to TLRU sites**
Pointed Mountain Pipeline		
Physical Abandonment	✓	✓
Abandonment in-place	-	-

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

13.3.1 Project Interactions Scoped Out of Further Consideration

13.3.1.1 Changes to Traditional Land and Resource Use Activities

There is no interaction between change in TLRU activities and abandonment in-place for the Pointed Mountain Pipeline as no physical activity will occur (i.e., no ground disturbance or dismantling of infrastructure). Therefore, there will be no effect on availability of Traditional Resources such as wildlife and plants, access to Traditional Resources, or TLRU sites or sensory effects on Traditional Land users.

13.3.1.2 Change to Traditional Land and Resource Use Sites

There is no interaction between change in TLRU sites and abandonment in-place for the Pointed Mountain Pipeline as no physical activity will occur and there will be no physical disturbance of sites.

13.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on vegetation, aquatic resources, wildlife and wildlife habitat, and Heritage Resources. The Project-specific EPP (Appendix B of this ESA) includes all environmental commitments and mitigation measures. Table 13.4-1 identifies these key mitigation measures for each effect pathway identified for Project components. Additional socio-economic measures that are known to reduce or avoid potential effects on TLRU are included with the key mitigation measures for changes in TLRU activities or sites in Table 13.4-1.

Table 13.4-1. Key Mitigation Measures for Traditional Land and Resource Use

Potential Effect	Effect Pathway	Key Mitigation[a]
Change to TLRU activities	Physical abandonment activities may result in sensory effects related to noise, dust, and visual presence of Project activities for TLRU.	Implement measures related to vegetation (Section 6 of this ESA).
		Implement measures related to fish and fish habitat (Section 7 of this ESA).
		Implement measures related to water quality and quantity (Section 7 of this ESA).
		Implement measures related to wildlife and wildlife habitat (Section 9 of this ESA).
		Follow measures in the EPP for cleanup and reclamation.
	Physical abandonment activities may result in sensory effects related to noise, dust, and visual presence of Project activities for TLRU.	Provide potentially affected Indigenous groups with the proposed Project schedule and maps prior to construction.
		Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		Adhere to posted speed limits on access roads to reduce the risk of collisions.
		Restrict access points to environmentally sensitive areas within or along the construction disturbance area, to deter unauthorized access. Abide by any restrictions or “in/out” privileges that are implemented in special protection areas. Where travel along the Project Footprint and physical abandonment areas in the vicinity of sensitive vegetation is required (e.g., during reclamation monitoring), use all-terrain vehicle or foot travel whenever practical.
		Ensure that noise abatement equipment (e.g., mufflers) on machinery is in good working order. Turn off equipment when not in use.
		Do not leave vehicles idling for extended periods of time.
		Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Follow measures in the EPP for cleanup and reclamation.
Change in TLRU sites	Physical abandonment activities (e.g., vegetation clearing) may result in physical changes to current use sites or areas.	Where practical, include culturally important plants in the reclamation and restoration plans based on discussions with Indigenous groups.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contain the complete set of mitigation, including key mitigation listed in this table.

13.5 Potential Effect Pathways Not Carried Through for Further Assessment

Following the implementation of mitigation measures, physical abandonment activities are predicted to have potential residual effects on the TLRU. Potential residual effects that remain following the implementation of mitigation measures are carried forward for further assessment.

13.6 Assessment of Residual Effects on Traditional Land and Resource Use

13.6.1 Change in Traditional Land and Resource Activities

13.6.1.1 Loss or Alteration of Traditionally Used Wildlife or Plant Species

Physical abandonment activities along the Pointed Mountain Pipeline have the potential to lead to the loss or alteration of traditionally used resources (e.g., wildlife or plant species). Activities such as brushing, excavation and dismantling aboveground infrastructure may affect plants and wildlife or their habitat as described in Section 6, Assessment of Effects on Vegetation and Section 9, Assessment of Effects on Wildlife and Wildlife Habitat. In the short-term these potential effects may affect the availability of plants and wildlife for plant gathering, hunting, and trapping. As discussed in Sections 6 and 9 no significant effects are anticipated on vegetation or wildlife and wildlife habitat.

Other physical abandonment activities such as cleanup and reclamation could enhance the resources available for TLRU activities. For example, at sites where physical abandonment activities occur, planting of culturally used plants or vegetation that serves as wildlife habitat for culturally important species could have a positive effect on the resources available for TLRU activities.

The predicted residual effect of physical abandonment activities on loss or alteration of traditionally used wildlife or plant species is expected to occur in the TLRU RSA, be immediate to short-term in duration, reversible to pre-Project or equivalent conditions, and or low magnitude. The residual effect is not significant (Table 13.6-1).

13.6.1.2 Changes in Access to Traditional Resources, Areas of Current Harvesting, or Cultural Use Sites

Physical abandonment activities along the Pointed Mountain Pipeline have the potential to temporarily disrupt access to Traditional Resources, areas of current harvesting or cultural use sites including trails and travelways, gathering places and sacred sites. Project activities in the NWT are planned to occur in June/July of 2023 which may overlap with Traditional Use activities (e.g., fishing and plant gathering) conducted in the TLRU LSA.

Project activities are planned to start in late 2022 for up to 6 months during frozen ground conditions for sites in the Yukon and BC which may overlap with some Traditional Use activities (e.g., hunting and trapping) conducted in the TLRU LSA. Once physical abandonment activities are complete, land used for access and temporary workspace will be fully restored. Mitigation identified in Table 13.4-1 will reduce the effects of physical abandonment activities on access to TLRU sites.

The predicted residual effect of physical abandonment activities on changes to access to Traditional Resources, areas of current harvesting or cultural use sites is expected to occur in the TLRU LSA, be immediate to short-term in duration, reversible to pre-Project or equivalent conditions, and of low magnitude. The residual effect is not significant (Table 13.6-1).

13.6.1.3 Sensory Disturbance on Traditional Land Users

Sensory disturbance may occur as a result of noise, air emissions, odours, or vibrations during physical abandonment activities such as brushing, excavation, depressurization and capping, dismantling aboveground infrastructure, transportation of workers and equipment, and cleanup.

Sensory disturbance associated with Project activities will be temporary and is not expected to take place at any one location for long. These activities will occur during daytime hours and will adhere to applicable permit and regulatory requirements. Potentially affected Indigenous groups will be notified in advance of the Project schedule and will be provided with maps of the locations of physical abandonment activities.

The potential effects and proposed mitigation for air and GHG emissions and the acoustic environment are provided in Section 10, Assessment of Effects on Air and GHG Emissions and Section 11, Assessment of Effects on the Acoustic Environment, respectively.

The predicted residual effect of physical abandonment activities on sensory effects for TLRU is expected to occur in the TLRU LSA, be immediate to short-term in duration, reversible to pre-Project or equivalent conditions and of low magnitude. The residual effect is not significant (Table 13.6-1).

13.6.1.4 Summary

Residual effects on TLRU activities occur as a result of physical abandonment activities. Residual effects are predicted to be adverse in direction, low in magnitude, immediate to short-term in duration, and reversible to pre-Project or equivalent conditions within the TLRU LSA. Consequently, the residual effect of change in TLRU is not significant (Table 13.6-1).

13.6.2 Change in Traditional Land and Resource Use Sites

13.6.2.1 Physical Changes to Currently Used Traditional Land and Resource Use Sites or Areas

Physical abandonment activities have the potential to physically alter TLRU sites that are present on the Project Footprint. To date, no TLRU sites have been identified on the Project Footprint however it is conservatively assumed that TLRU sites are present for this assessment.

Westcoast will implement the mitigation measures outlined in Table 13.4-1 to reduce the effects of the Project on these sites. Westcoast will continue to engage with potentially affected Indigenous groups to identify any TLRU sites on the Project Footprint and will review any information in the context of the ESA and incorporate into Project planning as appropriate.

The predicted residual effect of the Project on physical changes to currently used TLRU sites or areas is expected to occur in the Project Footprint, be short-term in duration, reversible to pre-Project or equivalent conditions, and of low magnitude. The residual effect is not significant (Table 13.6-1).

13.6.2.2 Summary

Physical changes to currently used TLRU sites or areas may occur during physical abandonment activities. Residual effects are predicted to be adverse in direction, low in magnitude, localized to the Project Footprint, immediate in duration, and reversible. Consequently, the residual effect of change to TLRU sites or areas is not significant (Table 13.6-1).

13.6.3 Summary of Project Residual Effects

Table 13.6-1 summarizes the significance evaluation of the predicted residual effects of the Project on TLRU. As Table 13.6-1 notes, there are no situations of a residual effect on TLRU that are of high magnitude, reversible but regional or beyond in extent, or of high magnitude, irreversible and within any spatial boundary. Consequently, it is concluded that the predicted residual effects of the physical abandonment activities of the Project on TLRU are not significant.

Table 13.6-1. Project Residual Effects on Traditional Land and Resource Use

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context: Duration	Temporal Context: Frequency	Temporal Context: Reversibility	Magnitude	Significance
Changes in Access to Traditional Resources, Areas of Current Harvesting, or Cultural Use Sites	Adverse	TLRU LSA	Immediate- to short-term	Isolated	Reversible	Low	Not significant
Sensory Disturbance on TLRU	Adverse	TLRU LSA	Immediate- to short-term	Isolated	Reversible	Low	Not significant
Physical Changes to Current Use Sites or Areas	Adverse	Project Footprint	Immediate- to short-term	Isolated	Reversible	Low	Not significant

13.7 Assessment of Cumulative Effects on Traditional Land and Resource Use

The CEA evaluates the likely adverse residual environmental effects of the Project in combination with effects arising from other existing and reasonably foreseeable developments and activities.

Subsection 4.8 identifies other projects and physical activities that may act cumulatively with the Project. Where Project-related residual environmental effects act cumulatively with those from past, present, and reasonably foreseeable future projects and physical activities, a CEA is completed to determine their significance.

Table 13.7-1 identifies potential Project interactions with existing and reasonably foreseeable developments and activities that may have cumulative effects related to TLRU.

Table 13.7-1. Interactions with Potential to Contribute to Cumulative Effects of Traditional Land and Resource Use

Projects and Physical Activities	Potential Effects
	Change in Traditional Land and Resource Use Activities and Sites
Present Projects, Physical Activity and Land Use	
Forestry	✓
Oil and Gas	✓
Recreation	✓
Fishing, Hunting and Trapping	✓
Transportation	✓
Future (Reasonably Foreseeable) Projects and Physical Activities	
Forestry	✓
Oil and Gas	✓
Fishing, Hunting, and Trapping	✓

Note:

✓ = A potential interaction is identified.

13.7.1 Change in Traditional Land and Resource Use

It is expected that the proposed Project, existing, and reasonably foreseeable developments described in subsection 4.8 have the potential to act cumulatively to result in cumulative changes to TLRU within the TLRU RSA.

Existing developments, such as energy infrastructure and access roads have impacted the use of the lands for TLRU activities. It is anticipated that new disturbances created by reasonably foreseeable projects may act cumulatively with the Project, affecting harvesting activities and displacing or otherwise disrupting habitat of wildlife species, creating sensory effects for Traditional Land users or restricting access to TLRU sites and activities.

However, there will be no new permanent disturbance affecting TLRU sites or activities associated with the Project. Dismantling aboveground infrastructure and cleanup and reclamation activities have the potential to enhance specific sites for harvesting activities and creating habitat for wildlife species that are hunted and trapped.

The cumulative effects to changes in TLRU in the TLRU RSA are predicted to be low in magnitude. The predicted cumulative effects are considered short-term in duration and are considered reversible.

13.7.2 Summary of Predicted Cumulative Effects on Traditional Land and Resource Use

Table 13.7-2 provides the cumulative effect characterization for each cumulative effect using the criteria defined in Section 4.

Table 13.7-2. Project Cumulative Effects on the Traditional Land and Resource Use

Predicted Cumulative Effects	Direction	Spatial Boundary	Temporal Context: Duration	Temporal Context: Frequency	Temporal Context: Reversibility	Magnitude	Significance
Change in TLRU activities and sites	Adverse	LSA	Short- to medium-term	Isolated	Reversible	Low	Not significant
Contribution from the Project to the cumulative effect	The Project may contribute to the cumulative change in TLRU activities and sites. With the proposed mitigation, the Project's contribution to the cumulative effect is of low magnitude at the regional scale and reversible, and short- to medium-term in duration.						Not significant

13.8 Conclusion

As Tables 13.6-1 and 13.7-2 note, there are no situations of a residual effect or cumulative effect on TLRU that are irreversible and of high magnitude, or reversible but high magnitude and regional or beyond in extent. Therefore, the predicted residual and cumulative effects on TLRU are not significant.

Prediction confidence is high. To date no Project-specific TLRU site information has been provided by Indigenous groups, but Indigenous groups have indicated that they use the TLRU RSA to conduct TLRU activities and therefore it is assumed TLRU sites exist within the TLRU RSA.

13.9 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). Post-abandonment monitoring will occur at locations where physical abandonment activities are conducted. Factors with the potential to influence TLRU include vegetation, wetlands, and wildlife and wildlife habitat. Monitoring methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details are described in Section 19, Follow-up and Monitoring.

14. Assessment of Effects on Socio-Economic Elements

The assessment team conducted studies to establish the existing conditions (i.e., baseline setting) for socio-economic elements from which the potential effects of the Project can be determined. The study was based on a review of existing literature, internet searches, consultation and engagement, and expert opinion.

14.1 Scope of the Assessment

Socio-economic elements included in this assessment are identified based on the *Filing Manual* (CER 2021a) and include the following elements.

1) HORU since the Project has the potential to alter land use, including forestry, hunting, fishing, and trapping.
2) Navigation and Navigation Safety: the navigational use of watercourses crossed by the pipeline routes and associated safety concerns for users are considered in the context of the recreational use of waterways.
3) Human health and aesthetics since the Project may change the existing environmental setting related to visual aesthetics.
4) Infrastructure and services since the Project may increase the demand on local infrastructure in the project area and services where Project work crews are residing.
5) Employment and economy since it is expected that the Project will create employment and increase business for local companies.

The Project will require a small workforce using the services of an established, permanent construction camp over a relatively short period and with limited to no interaction with local communities.

Consequently, the following potential social and cultural well-being effects noted in Table A-3 of the *Filing Manual* (CER 2021a) do not apply to the Project:

- stresses on family and household cohesion;
- alcohol and substance abuse; and/or
- illegal or other potentially disruptive activities.

Therefore, social and cultural well-being is not included in this assessment.

As per Guide A.2 of the *Filing Manual* (CER 2021a), GBA+ should be applied when considering each of the socio-economic elements outlined in Table A-3. GBA+ was considered in the identification of potential effects on socio-economic elements. Considering physical activities are of relatively short duration and an established construction camp offering full amenities (e.g., single occupancy rooms with showers, recreational opportunities) will be used to accommodate Project work crews, it is not anticipated that diverse groups of people including those within Indigenous groups will be differentially affected by the Project.

14.1.1 Regulatory and Policy Setting

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Specifically, Table A-3 – Filing Requirements for socio-economic elements was used to identify the circumstances and interactions to be considered for the assessment of socio-economic elements for all phases of the Project.

Canadian Energy Regulator *Onshore Pipeline Regulations*

Abandonment activities will be carried out in accordance with CER *OPRs* and CSA Z662-19. The goal of the CER *OPRs* is to ensure pipelines are abandoned in an efficient manner that is safe and environmentally responsible. The buried pipeline left in-place was cleaned of residual product and physically separated during the deactivation process. The pipeline is currently filled with nitrogen gas, and will be capped, plugged, and left without any internal pressure, as per CSA Z662-19. Pipeline abandonment will consider potential safety hazards and effects at road and railway crossings, where applicable.

Canadian Navigable Water Act

The *CNWA* protects navigation on scheduled waters, as well as navigable waters that are not currently listed. The *CNWA* introduces a process to notify the public and to help resolve conflicts related to works on navigable waters that are not on the schedule. Proponents will receive an approval prior to construction for proposed major works in any navigable water, scheduled or otherwise.

The CER is responsible for reviewing projects with respect to navigation and navigation safety, as per the MOU between Transport Canada and the NEB (CER 2020b).

Provincial and Territorial

The Project will comply with applicable provincial and territorial regulatory requirements in NWT, Yukon, and BC and generally follow the intent of provincial and territorial objectives and guidance that may be relevant to the Project. Provincial and territorial regulations and guidelines that provide standards and requirements relevant to socio-economic elements include the following.

Northwest Territories

The NWT *Wildlife Act* and *Wildlife Regulation* regulate hunting and trapping in the NWT (Government of the NWT 2021b*)*. Recreational fishing is regulated by DFO under the *Northwest Territories Fishery Regulations* made under the federal *Fisheries Act* (DFO 2021) and Northwest Territories *Sport Fishing Regulations* Guide (Government of the NWT 2021d).

The Government of the NWT has allotted various levels of protection for regions of noted ecological, heritage, and recreational importance as part of the Land Use Planning Process. The Dehcho Regional Land Use Plan provides CRs for projects to receive authorization to ensure that new land uses approved by the Plan will help to achieve the vision and goals for the region. The Project is located in the Liard Range Special Management Zone (Zone 26), where oil and gas is a permitted use.

Yukon

The Yukon *Wildlife Act* and *Wildlife Regulation* regulate hunting and trapping in the Yukon (Government of Yukon 2021b*)*. Recreational fishing is regulated by DFO under the *Yukon Territory Fishery Regulations* made under the federal *Fisheries Act* (DFO 2021; Government of Yukon 2021b).

The Yukon Government has allotted various levels of protection to areas of ecological, heritage and recreational importance as part of their Land Use Planning Process. No regional land use plan exists for the Kaska Region.

British Columbia

<u>British Columbia Wildlife Act</u>

Hunting and trapping in BC is regulated by the *BC Wildlife Act* which protects all vertebrate wildlife species (i.e., mammals, birds, amphibians, and reptiles) from direct harm except as allowed under regulation (e.g., legal hunting and trapping). Under Section 34 of the *Wildlife Act*, a person commits an offence if, except as allowed by regulation, they possess, take, injure, molest, or destroy a bird or its egg, the nest of an eagle, peregrine falcon, gyrfalcon, osprey, heron, or burrowing owl, or any bird nest that is occupied by a bird or its egg.

Other

Protected land and waters are legally established in BC to conserve natural and cultural values. Parks, protected areas, and conservation lands (e.g., provincial Park, Protected Area, Recreation Area) are managed by BC Parks. Protected areas are not distributed evenly throughout the province with lower elevation areas, such as the BWBS BGC zones, are generally under-represented in the protected area system (Environmental Reporting BC 2016).

The Fort Nelson LRMP includes recommendations to revegetate disturbed areas using local native plant species and to rehabilitate previously disturbed forest land.

14.1.2 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders, and regulatory authorities. To date, no concerns regarding socio-economic elements have been identified.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. Acho Dene Koe First Nation has expressed interest in business opportunities and developing local capacity and expertise around environmental monitoring.

14.1.3 Potential Effects, Pathways, and Effect Indicators

Table 14.1-1 identifies the potential effect pathways of the Project on the socio-economic elements during physical abandonment activities and as a result of leaving the abandoned pipeline in-place.

Projects effects on socio-economic elements may occur within all of the land uses encountered by the Project.

Table 14.1-1. Project Activities, Effect Pathways, and Indicators for Socio-Economic Elements

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change in land use	Physical abandonment activities may result in changes to access to or alteration of land use for different land users, including hunting, fishing, trapping, and recreational use.	▪ Area of recreational land affected ▪ Availability of resources for hunting, fishing, or trapping ▪ Duration of access restrictions ▪ Level and duration of sensory disturbance
	Physical abandonment activities may result in sensory effects related to noise, dust, and visual presence of Project activities for land users.	

Table 14.1-1. Project Activities, Effect Pathways, and Indicators for Socio-Economic Elements

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Change to navigation and navigation safety	Abandonment in-place may create a safety concern for watercourse users at watercourse crossings if the pipeline becomes exposed.	▪ Exposed pipe
Change to human health and aesthetics	Physical abandonment activities will result in the removal of aboveground infrastructure that may change the existing environmental setting related to visual aesthetics.	▪ Change or noticeable alteration of aesthetics
Change in infrastructure and services	Increased traffic associated with the transportation of personnel and equipment during physical abandonment activities may lead to an increase in traffic on local highways to and from the Project Footprint.	▪ Increased traffic
	The influx of workers during physical abandonment activities may increase demand on existing emergency, protective (i.e., police, fire, and ambulance) and health care services.	▪ Increase in emergency response times
	Abandonment activities are expected to generate an increase in solid, liquid, and hazardous waste, which will be hauled to landfills, transfer stations, hazardous waste centres, and wastewater treatment facilities.	▪ Project-related solid, liquid and hazardous waste materials
Change to employment and economy	Abandonment activities may generate a demand for goods, services, and workers through direct and indirect contracting and procurement opportunities, which will contribute to the local and regional economy.	▪ Employment opportunities ▪ Increased business for services

14.1.4 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure, and temporary workspace. Table 14.1-2 describes the remaining spatial boundaries for socio-economic elements and the rationale for choosing them.

Table 14.1-2. Spatial Boundaries for Socio-economic Elements

Element	Spatial Boundaries	Rationale
HORU, and Navigation and Navigation Safety	**HORU LSA:** A 1.5-km buffer extending from the Project Footprint (Figure 4.5-1). **HORU RSA:** A 15-km buffer extending from the Project Footprint (Figure 4.5-2).	**HORU LSA**: A HORU LSA was established to incorporate the area in which lands and resources occupied and used by land occupants are most likely to be affected by all phases of the Project. While most Project effects are expected to be localized within the Project Footprint, the HORU LSA includes a 1.5-km ZOI, where effects may extend beyond the Project Footprint. **HORU RSA**: A HORU RSA was established to incorporate the general Project setting and considers where the RSAs of elements or where the resource has a potential human interaction or use (e.g., wildlife, fish, vegetation, and acoustics). The HORU RSA extends to include the widest-reaching RSA of those elements which is the Wildlife RSA (15 km).
Human Health and Aesthetics, Infrastructure and Services, and Employment and Economy	**Community LSA:** Settled communities, such as, hamlets, villages, towns, cities, and Indian Reserves traversed by the Project Footprint (Figure 4.5-3). **Community RSA:** Regions where it can be reasonably expected that direct effects from the Project would occur. For this assessment, communities in the Liard Valley (Dehcho Region), Kaska Region and NRRM (Figure 4.5-3).	**Community LSA**: A Community LSA was established to incorporate human settlements that are traversed by or surrounding the Project Footprint. These are communities where it can be reasonably expected that localized direct and indirect effects of the Project's presence will be experienced. **Community RSA**: includes the regional boundaries in which the Project is located and communities and resources that are not included in the Community LSA but may be directly and indirectly affected by the Project.

14.1.5 Residual Effects Description Criteria

The residual effects criteria for direction, duration, frequency, reversibility, and likelihood are the same for all elements and are presented in Table 4.7-1. Table 14.1-3 presents the criteria for the magnitude for residual effects on socio-economic elements, specifically.

Table 14.1-3. Criteria for the Magnitude of Residual Effects Socio-economic Elements

Assessment Criteria	Definition
Magnitude – Residual Socio-economic Effects	
Negligible	No detectable change from existing (baseline) conditions.
Low	Change is detectable, but change is limited and the majority of those affected will likely be able to adapt easily to changes and maintain pre-effect land use, livelihoods, culture, quality of life, and health.

Table 14.1-3. Criteria for the Magnitude of Residual Effects Socio-economic Elements

Assessment Criteria	Definition
Medium	Change is detectable and results in moderate modification and the majority of those affected will likely be able to adapt easily to changes and maintain pre-effect land use, livelihoods, culture, quality of life, and health.
High	Change is detectable and is large enough to result in a severe modification to existing conditions and those affected will not be able to adapt to changes or maintain their pre-effect land use, livelihoods, culture, quality of life, and health.

14.1.6 Social Context

The Project is located in a remote forested setting where effects of the Project on HORU, navigation, human health and aesthetics are generally limited to land users in the area. The potential for impacting land use is reduced by confining Project activities to the existing right-of-way and the use of existing access roads and the existing Pointed Mountain Pipeline right-of-way. Pipeline abandonment projects have the potential to affect the landscape in the long-term if infrastructure is not abandoned in a manner that is acceptable to land users. Once the assets are abandoned and the CER-ordered conditions are met, the risk to public safety, property, and the environment are to be at a level that is acceptable in the public interest. The decision to abandon in-place or through removal should be made on the basis of a comprehensive site-specific assessment. In this context, the land management characteristics that may be better suited to pipeline abandonment in-place include, but are not limited to, watercourse crossings, road and railway crossings, foreign pipeline crossings, forest cut blocks; and areas exhibiting poor and/or limited access.

Pipelines left in-place may become exposed at watercourse crossings as a result of scouring or become buoyant within a watercourse, presenting a potential navigation hazard. The risk of a buried abandoned pipeline becoming exposed instream at watercourse crossing is similar to an operating pipeline. Over time, the abandoned pipeline may corrode, and eventual perforation may influence water quality or quantity through the creation of a water conduit.

The water conduit has the potential to change water quality through the transportation of contaminants, either from existing contamination along the route (e.g., from historical operations) or as a result of contaminants derived from the pipeline coating or change water quantity due to pooling or movement of water. Residual contaminants may reach an aquifer or the surface and flow into a waterbody. However, pipeline corrosion is known to be slow and localized, with structural failure of the pipeline not likely to occur for decades or even centuries (NEB 1996).

Abandonment in-place may result in the pipeline becoming a preferred water conduit, causing reduced soil productivity from poor drainage or erosion, or as a result of the transportation of contamination since it is not anticipated that the pipeline segments abandoned in-place will create preferential flow along the entire right-of-way (Pipeline Abandonment Steering Committee 1996; Det Norske Veritas 2010; AMEC 2017).

Abandonment in-place of the above grade portion of TLPs has the potential to create a safety hazard for land users who may travel or conduct land use activities along the pipeline right-of-way. However, the TLPs have been in place for many years without incident. The potential hazard risk is anticipated to be low and reduced over time as the TLPs degrade.

Potential effects of the Project on infrastructure and services and employment and economy are generally limited to the use of an existing camp (e.g., increase in business), traffic to and from the Project Footprint, and potential contracting opportunities for workers in the Community RSA.

A measurable change in social conditions is realized by the number of workers and duration of presence within local communities where crews use accommodations during the duration of physical abandonment activities. However, the Project will require an estimated peak workforce of up to 25 people that will likely be using accommodations at an established construction camp located in northeastern BC that is not located within a local community or urban centre.

14.2 Existing Conditions for Socio-Economic Elements

14.2.1 Methods

Baseline information included the review of online information, data, and existing literature applicable to Crown land. Dwelling information and land use information was determined by reviewing a Project-specific Webmap in combination with available spatial data. Baseline information was collected from secondary sources current to August 2021.

Information collected on the existing conditions for socio-economic elements was obtained from Project-specific desktop review of existing literature, government databases and internet searches, including Government of the NWT, Government of Yukon, Government of BC, BC MFLNRORD, Statistics Canada, and BC Health Services (refer to Section 21 of this ESA).

14.2.2 Overview

14.2.2.1 Human Occupancy and Resources Use

The Project is located within the Dehcho Region in southwestern NWT, Kaska Region of southeastern Yukon, and NRRM in northeastern BC. Physical activities will take place within the existing pipeline right-of-way located on provincial and territorial Crown land currently leased to Westcoast and 600 m on privately owned land.

Watercourses crossed by the Pointed Mountain Pipeline are not known to have commercial purposes. None of the watercourses crossed by the Pointed Mountain Pipeline are included on the list of scheduled waters protected under the *CNWA*; however, based on a desktop review, it is reasonable to assume that waterways crossed by the Project may be used for navigational purposes. For example, La Biche River and Kotaneelee River are considered to be navigable based on watercourse characteristics.

Northwest Territories

The Pointed Mountain Pipeline is located on Crown land in the NWT which is generally forested and public lands are managed for timber production, watershed protection, fish and wildlife, recreation, and energy development. Forestry activities in the NWT are managed by the Government of the NWT through FMAs. There are no FMAs in place in the HORU RSA.

Planning Regions were established in the NWT to guide decision-making about what activities could take place on public lands. The Government of the NWT considers land use planning an important tool for balancing investment and development opportunities with responsible environmental management, conservation, and community aspirations (Government of the NWT 2021e).

Land use plans define where certain activities can take place and determine the effect of human impacts on the landscape. They are also used to assign special areas of spiritual, ecological, or cultural importance for protection, and areas designated for development. The Project is located in the Dehcho Planning Region and a draft plan has been developed for this region.

The purpose of the plan is to promote the social, cultural, and economic well-being of the residents and communities in the Dehcho Territory, having regard to the interests of all Canadians.

> "Taking into consideration the principles of respect for the lands, as understood and explained by the Dehcho Elders, and sustainable development, the Plan shall provide for the conservation, development and utilization of the land, waters and other resources within Dehcho Territory" (Deh Cho Land Use Planning Committee 2021).

The closest community to the Project in the NWT is Fort Liard (approximately 27 km southwest). There are no communities located within the HORU LSA.

Maxhamish Lake Provincial Park and Protected Area is the closest named natural area to the Project, located approximately 40 km southeast of the Pointed Mountain Pipeline in BC. Nahanni National Park is located approximately 50 km north of the Pointed Mountain Pipeline. There are no known residences or permanent human receptors located in the HORU LSA. The nearest human receptors are anticipated to be other oil and gas operators with assets in the area or individuals hunting or trapping within the HORU LSA. Trapper and fishing cabins may be present within the HORU RSA.

The Project is located within Zone D of the NWT hunting regions (Government of the NWT 2021b) where hunting is allowed throughout defined times of the calendar year, based on the wildlife species hunted. Species hunted in the region include black bear, grizzly bear, wolf, wolverine, boreal caribou, Dall's sheep, white-tailed deer, mule deer, and moose, mountain goat (Government of the NWT 2021b). Small game hunted includes groundhog, porcupine, northern flying squirrel, hare, marmot, ground squirrel, red squirrel, ptarmigan, grouse, and woodchucks. In addition, fur trappers are able to trap beaver, coyote, ermine, fisher, fox, lynx, marten, mink, muskrat, and otter.

The Project is located entirely within the Liard River Basin. Species of fish harvested for sport in lakes and streams within the Project area include Arctic grayling, walleye, northern pike, mountain whitefish (in streams only), yellow perch, lake whitefish, burbot, and trout with fishing open in lakes all year and from June 1 to October 31 for streams (Government of the NWT 2021d).

Yukon

The Pointed Mountain Pipeline is located on Crown land in the Yukon which is generally forested and public lands are managed for timber production, watershed protection, fish and wildlife, recreation, and energy development. The Forest Management Branch of the Government of Yukon manages forestry activities in the Yukon with the intent to ensure that people and companies use forest resources in a sustainable manner (Government of Yukon 2021i). There are three levels of planning: forest resources management plans (strategic planning that covers large areas of land), THPs (planning for timber harvest at a scale of 5,000 to 300,000 acres), and site plans (focus on operational and technical aspects of harvesting) (Government of Yukon 2021i). There are no THPs in the HORU RSA.

Planning Regions were established in the Yukon to guide decision-making about activities that could take place on public lands. The Yukon Land Use Planning Council was established to support Government, Yukon First Nations, and Regional Planning Commissions to coordinate their efforts to conduct regional land use planning (Yukon Land Use Planning Council 2021). Regional land use planning is designed to resolve land use and resource conflicts within Yukon's regions and ensure that use of lands and resources is consistent with social, cultural, economic, and environmental values. These plans build upon the IK and experience of the residents of each region. The Project is in the Kaska Planning Region. No regional plan exists for this region.

There are no communities located within the HORU LSA in the Yukon. There are no known residences or permanent human receptors located in the HORU LSA. The nearest human receptors are anticipated to be other oil and gas operators with assets in the area or individuals hunting, trapping, or fishing within the HORU LSA. Trapper and fishing cabins may be present within the HORU RSA.

The Project is located within Zone 11 of the Yukon hunting regions (Government of the Yukon 2021b) where there are no hunting area restrictions, but hunting is allowed throughout defined times of the calendar year, based on the wildlife species hunted. Species hunted in the region include black bear, grizzly bear, wolf, wolverine, caribou, sheep, deer, moose, goat, and coyote (Government of the Yukon 2021b).

British Columbia

Portions of the Pointed Mountain Pipeline within BC are located in BC WMU7-56 where and trapping is allowed all year with the proper licence, and where Indigenous groups exercise their Aboriginal and Treaty Rights at all times (Government of BC 2020b).

There is a defined UWR (i.e., an area that contains habitat necessary to meet the winter habitat requirements of an ungulate species) located east of the Pointed Mountain Pipeline segment in BC (BC MFLNRORD 2020b). There are no proposed UWRs within the HORU LSA.

Within BC, the Pointed Mountain Pipeline overlaps the Hyland grizzly bear population unit in BC (BC MFLNRORD 2020c). The hunting season for grizzly bears in BC is permanently closed, allowing a focus on sustainable land management and to increase eco-tourism and the bear-viewing industry.

The segment of Pointed Mountain Pipeline in BC is within a registered trapline area TR0753T004. In BC, the Project is located over 30 km from the nearest Crown land licence (i.e., active and applied-for *Land Act* licences) (BC MFLNRORD 2020d) and over 100 km from the nearest Crown land lease (BC MFLNRORD 2020e).

A search of public data available from BC MFLNRORD identified a registered guide outfitter approximately 10 km southwest of PM-10. No established Crown land range tenures (i.e., grazing or hay cutting licence or permit) were identified within 100 km of the Project (BC MFLNRORD 2020f,g).

There are no registered recreation sites (e.g., camp sites, hiking areas) or trails located within 100 km of the Project Footprint in BC (BC MFLNRORD 2020h).

14.2.2.2 Human Health and Aesthetics

The Project is not anticipated to change the existing environmental setting related to odours or other sensory conditions (e.g., smoke) enough to present an effect on human health, aside from an increase in sensory disturbances of nearby land users, which are addressed in Section 10, Assessment of Effects on Air Emissions, and Greenhouse Gas Emissions and Climate Change and Section 11, Assessment of Effects on Acoustic Environment. The Project is not anticipated to reduce local or regional water quality, considered in Section 7, Assessment of Effects on Aquatic Resources.

Following physical abandonment activities, the Project is expected to change the existing environmental setting related to visual aesthetics. It is anticipated that the existing rights-of-way will revegetate to the equivalent of surrounding land except for localized areas that may require post-abandonment care (e.g., should any part of the abandoned pipeline become exposed or areas requiring corrective action).

Aboveground infrastructure associated with the Pointed Mountain Pipeline will be dismantled and removed. Some of the site features are the only aboveground assets at or surrounding the Project Footprint, leaving no aboveground infrastructure remaining following physical abandonment activities. Other site features are surrounded by aboveground infrastructure owned by other oil and gas operators and will remain following physical abandonment activities. A description of the site features and surrounding land at the site features is as follows:

- PM-1 in the NWT is within a regenerating forest dominated by a combination of trembling aspen, white spruce, balsam poplar and black spruce. There are also shrub, cleared, and disturbed land covers at this site.
- PM-2 in the NWT is within a regenerating forest dominated by a combination of trembling aspen, white spruce, balsam poplar, and black spruce. There is also cleared land cover at this site.
- PM-3 in the NWT is within a shrub land cover due to clearing for construction and maintenance of the pipeline.
- PM-4 in the NWT is within a shrub land cover due to beaver activity and clearing for construction and maintenance of the pipeline.
- PM-6 in the Yukon is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There is also disturbed land cover at this site.
- PM-7 in the Yukon is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There are also disturbed and wetland land covers at this site.
- PM-8 in BC is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There is also wetland land cover at this site.
- PM-9 in BC is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There is also disturbed land cover at this site.
- PM-10 in BC is a cleared area dominated by a combination of native and agronomic plant species with scattered native shrubs. There are also disturbed and wetland land covers at this site.

14.2.2.3 Infrastructure and Services

A fully serviced industrial camp in northern BC will be used to accommodate the construction workforce. These camps are located to provide easy access to major roads including Highway 77.

Transportation infrastructure intersected by the Project Footprint includes seasonal roads. There are no rail roads or local or provincial highways crossed by the Pointed Mountain Pipeline. Workers and equipment are expected to travel along existing roads (e.g., Highway 77 and high-grade petroleum development roads and winter roads), barge across the Liard River for PM-1 and PM-2, helicopter to PM-3 and PM-4 and the existing Pointed Mountain Pipeline right-of-way. It is anticipated that workers will use multi-passenger vehicles to get to the work site.

The closest airport is the Fort Liard Airport located approximately 26 km from Project Footprint. North Cariboo Air offers charter services from the airport. There are no railroad systems within the HORU RSA (i.e., there are no railway crossings associated with the pipeline to be abandoned). There are no provincial or national highways in the HORU LSA.

Emergency services are available in Fort Liard providing 911 dispatch and fire services. The Fort Liard Health Care Centre located approximately 26 km east of the Project offers general health services. Westcoast will have a medic onsite during physical abandonment activities.

The Tervita Sierra Treatment, Recovery and Disposal Site is located west of Fort Nelson and will accept oil field and industrial waste.

14.2.2.4 Employment and Economy

Key industrial sectors in the Community LSA and RSA consist of oil and gas construction, transportation, retail trade and accommodation and food services (NRRM 2019). The Project is expected to contribute to the economic well-being of families and communities in the Community LSA and RSA. Local benefits to businesses as a result of the Project will generally be realized within NRRM where the industrial camps are located. Additional businesses that might experience an increase in business include stores, restaurants and gas stations. Project activities described in subsection 2.5 of this ESA are compatible with employment opportunities within the local economies in the Community LSA and RSA.

In 2020, the Dehcho Region of the NWT had an overall population of 3,358 individuals, including 1,835 males and 1,532 females. The Community of Fort Liard had a population of 561 individuals. In 2019, the participation, employment, and unemployment rates for the Dehcho Region were 67.8 percent, 49.1 percent, and 27.7, respectively. The participation, employment, and unemployment rates for Fort Liard were 55.2 percent, 34 percent, and 38.4 percent, respectively. Data indicate that the most common occupations for Fort Liard are paraprofessionals, heavy equipment operators, and cleaners. Data also indicates that within the Dehcho Region 80 percent of the population participates in traditional activities such as hunting, fishing, trapping, plant gathering, and arts and crafts (NWT Bureau of Statistics 2021).

In March 2021, the Yukon had an overall population of 43025 individuals. The participation, employment and unemployment rates for the Yukon were 72 percent, 67.9 percent and 5.9 percent, respectively. The data is not disaggregated to a regional level so data specific to the Community RSA is not available. The nearest community in the Yukon is Watson Lake. Watson Lake has a population of 1524 individuals. Data indicate that the most common occupations in Watson Lake are sales and service, education, law and social community and government and trades, transport, and equipment operators (Government of Yukon 2021g).

In 2016, NRRM had an overall population of 4,830 individuals including 2,540 identifying as male and 2,290 identifying as female. There were 2,805 individuals in the labour force including 2,805 identifying as male and 1,620 identifying as female. The participation, employment, and unemployment rates were 75 percent, 66 percent, and 13 percent, respectively.

There were 1,615 residents in the NRRM aged 15 and over with a post-secondary certificate, diploma, or degree; 1,200 with a high school diploma or equivalent certificate; and 910 with no certificate, diploma, or degree (Statistics Canada 2017). Data indicate the most common industries in which residents were employed included mining, quarrying, and oil and gas extraction, retail trade, construction, and transportation and warehousing (Statistics Canada 2017).

A recent shift in hunting to sustainable land management occurred at locations with grizzly bear habitat (i.e., Community RSA) to increase eco-tourism and the bear-viewing industry, which is an economic driver shown to be up to twelve times more economically important than hunting tourism (Nature United 2020).

14.3 Project Interactions with Socio-Economic Elements

Table 14.3-1 identifies the Project activities that may interact with socio-economic elements resulting in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 14.6. A justification for no interaction is provided following Table 14.3-1 in subsection 14.3.1.

Table 14.3-1. Project Interactions with Socio-economic Elements

	Project Interaction				
Project Activities	**Change in Land Use**	**Change to Navigation and Navigation Safety**	**Change to Human Health and Aesthetics**	**Change to Infrastructure and Services**	**Change to Employment and Economy**
Pointed Mountain Pipeline					
Physical abandonment	✓	-	-	✓	✓
Abandonment in-place	-	✓	✓	-	-

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

14.3.1 Project Interactions Scoped Out of Further Consideration

14.3.1.1 Change in Land Use

Following physical abandonment activities, the Project is not anticipated to present a change in land use since no further physical work is required once the pipeline is left in-place. Oil and gas operators will continue to use the existing access roads and respective assets within the HORU LSA. No physical activities (i.e., no ground disturbance or dismantling of infrastructure) will occur during abandonment in-place.

14.3.1.2 Change to Navigation and Navigation Safety

There are no anticipated changes to navigation and navigation safety associated with physical abandonment activities, as no work will be conducted within 30 m of a navigable waterway when the waterways are flowing (i.e., used for navigational purposes).

14.3.1.3 Human Health and Aesthetics

No interaction with human health and aesthetics is anticipated during physical abandonment activities. The Project is not anticipated to change the existing environmental setting related to odours or other sensory conditions (e.g., smoke) enough to present an effect on human health, aside from an increase in sensory disturbances of nearby land users, which are addressed in Section 10, Assessment of Effects on Air Emissions, and GHG Emissions and Climate Change and Section 11, Assessment of Effects on Acoustic Environment. The Project is not anticipated to reduce local or regional water quality, considered in Section 7, Assessment of Effects on Aquatic Resources.

14.3.1.4 Change to Infrastructure and Services

There is no change to infrastructure and services anticipated from abandoning the pipeline in-place since there is no need for workforce crews to be residing in nearby communities or using existing services.

14.3.1.5 Change to Employment and Economy

There is no change to employment and economy anticipated during abandonment in-place since no staff or work crew will be required following physical abandonment activities. The pipeline is currently in a deactivated state and will not have an impact on existing product services agreements.

14.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects on socio-economic elements. The Project-specific EPP includes mitigation measures (Appendix B of this ESA). Table 14.4-1 identifies these key mitigation measures for each effect pathway identified for Project activities.

Westcoast has procedures, plans, and protocols (e.g., Alcohol and Drug Policy, health, safety, and environment programs) designed to reduce or avoid socio-economic effects. Additional measures that are known to reduce or avoid potential effects on socio-economic elements are included with the key mitigation measures in Table 14.4-1.

Table 14.4-1. Key Mitigation Measures for Human Occupancy and Resource Use

Potential Effect	Effect Pathway	Key Mitigation
Change in land use	Physical abandonment activities may result in changes to access to or alteration of land use for different land users, including hunting, fishing, trapping, and recreational use.	Provide potentially affected Indigenous groups with the proposed Project schedule and maps.
		Utilize multi-passenger vehicles for the transport of construction crews to and from the Project Footprint.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		Adhere to posted speed limits on access roads to reduce the risk of collisions.
		Restrict access points to environmentally sensitive areas within or along the construction disturbance area, to deter unauthorized access. Abide by any restrictions or "in/out" privileges that are implemented in special protection areas. Where travel along the Project Footprint and physical abandonment areas in the vicinity of sensitive vegetation is required (e.g., during reclamation monitoring), use all-terrain vehicle or foot travel whenever practical.
	Physical abandonment activities may result in sensory effects related to noise, dust, and visual presence of Project activities for land users.	Ensure that noise abatement equipment (e.g., mufflers) on machinery is in good working order. Turn off equipment when not in use.
		Do not leave vehicles idling for extended periods of time, weather permitting.
		Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Follow measures in the EPP for cleanup and reclamation.

Table 14.4-1. Key Mitigation Measures for Human Occupancy and Resource Use

Potential Effect	Effect Pathway	Key Mitigation
Change in navigation and navigation safety	Abandonment in-place may create a safety concern for watercourse users at watercourse crossings if the pipeline becomes exposed.	The pipeline company is expected to have a long-term monitoring program. The monitoring program includes measurable parameters that will be recorded and compared to representative control areas to measure success.
		Deficiencies discovered or opportunities for enhancement will result in developing proposed recommendations for corrective actions. The remedial actions are to be implemented as soon as practical during the most appropriate season, preferably summer, but may be outside of this period due to environmental timing restrictions (reproductive periods and migration periods), field and weather conditions, or social and public concerns.
		Areas that do not meet equivalent land capability for items such as landscape features, vegetation establishment, soils, and reclamation success will be identified and records will be maintained for remedial measures implemented, the success of these measures and to ensure that outstanding issues are investigated and resolved.
Change in human health and aesthetics	Physical abandonment activities will result in the removal of aboveground infrastructure that may change the existing environmental setting related to visual aesthetics.	Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		Use only Common No. 1 or Canada Certified No. 1 seed in reclamation seed mixes and ensure seed certificates of analysis are provided to Westcoast. Westcoast Environment will review seed certificates of analysis when: any other seed grade is proposed for reclamation projects, or a custom seed mix is used per third-party requirement. Seeding should occur as soon as practical after final cleanup, as weather and soil conditions permit.
		Allow mineral wetlands and peatlands to naturally regenerate following construction. Do not seed mineral wetlands or peatlands.
		Reclaim disturbed areas following abandonment activities. Reclamation and restoration measures may include natural regeneration (particularly in shrubby and graminoid wetlands or wetland fringes) or active restoration methods, such as site preparation, conifer seedling planting and access control.
		Seed permafrost areas in the winter of the year of construction to promote rapid revegetation of disturbed areas. Reseed in the spring, if warranted.

Table 14.4-1. Key Mitigation Measures for Human Occupancy and Resource Use

Potential Effect	Effect Pathway	Key Mitigation
Changes in infrastructure and services	Increased traffic associated with the transportation of personnel and equipment during physical abandonment activities may lead to an increase in traffic on local highways to and from the Project Footprint.	Ensure all Project personnel and other visitors receive a pre-job orientation which includes relevant considerations for pipeline right-of-way traffic control measures.
		In areas with a designated RAP (e.g., UWRs), restrict access in accordance with regulatory guidelines.
		Abide by any restrictions or "in/out" privileges that are implemented in special protection areas.
		Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
	The influx of workers during physical abandonment activities may increase demand on existing emergency, protective (i.e., police, fire, and ambulance) and health care services.	Consult and coordinate with local authorities and emergency services, as required.
		Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments as warranted.
		Adhere to all relevant procedures, plans, and protocols (e.g., Alcohol and Drug Policy, health, safety, and Traffic Control Management Plan).
		Fallen or leaning trees are not permitted to be left in-place or leaning off the Project Footprint.
		Review Project-specific safety and response plans for fire protection and control, if available.
		Ensure there is a medic onsite at all times during physical activities.
	Abandonment activities are expected to generate an increase in solid, liquid, and hazardous waste, which will be hauled to landfills, transfer stations, hazardous waste centres, and wastewater treatment facilities.	All construction-related waste is to be collected and disposed of in designated containers or at approved facilities.
		Collect all waste materials, including oil or other waste liquids generated as a result of equipment maintenance, daily in suitable or approved containers (i.e., labeled and meeting any relevant regulatory requirements).
		On an as-required basis, remove the containers of waste from the site and properly dispose of them in accordance with applicable regulatory requirements. Throughout the duration of construction, cleanup areas to the satisfaction of Westcoast. Periodic assessments of disposal manifests should be incorporated into environmental inspection activities. No wastes are to be left on Westcoast property, along the right-of-way, buried in an excavation or otherwise disposed of without documented approval.
		Collect and dispose of all construction-related garbage, debris, wastes, and hazardous material from the Project Footprint in designated containers or at approved facilities.
		Ensure all hazardous waste materials generated at the site are properly identified, collected, stored, and disposed.

Table 14.4-1. Key Mitigation Measures for Human Occupancy and Resource Use

Potential Effect	Effect Pathway	Key Mitigation
Changes in infrastructure and services (cont'd)	As above	Identify a local licensed landfill able to receive soils if contamination is confirmed by lab analysis. Dispose of soil that does not meet applicable regulatory criteria at a licensed landfill. Obtain waste acceptance at the proposed disposal facilities for each location anticipated to contain contaminated soil and/or groundwater. Wherever practical, have disposal acceptance for all wastes anticipated during construction in place prior to initiation of the Project.
		Retain and submit to Westcoast disposal records (e.g., manifests, waybills, etc.) for any waste types which are directly disposed of from a Westcoast site. Westcoast projects will also maintain accurate records of all waste information. Domestic, nonsewage-based waste (e.g., food waste or construction material containers) do not require such tracking.
Change in employment and economy	Abandonment activities may generate a demand for goods, services, and workers through direct and indirect contracting and procurement opportunities, which will contribute to the local and regional economy.	Inform appropriate municipalities, Indigenous groups, and economic development agencies of the Project developments and workforce details, as warranted.
		Implement Enbridge's Indigenous Peoples Policy.
		Where practical, notify local municipalities and business associations of the Project schedule and Project-related contracting and subcontracting opportunities and requirements.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contain the complete set of mitigation, including key mitigation in this table.

14.5 Potential Effect Pathways Not Carried Through for Further Assessment

Potential residual effects are expected to be avoided through the implementation of mitigation measures for the following effect pathways.

- Change in navigation and navigation safety due to the pipeline becoming exposed.
- Change in infrastructure and services due to:
  - increased traffic associated with the transportation of personnel and equipment during physical abandonment activities, and
  - increased demand for existing emergency, protective, or health care services.

Potential effects that remain following the implementation of mitigation measures are carried forward for further assessment.

14.6 Assessment of Residual Effects for Socio-Economic Elements

An effect on socio-economic elements may remain after the implementation of mitigation. The potential residual effects include:

- change in land use due to:
  - an alteration of land use (hunting, trapping); and
  - sensory disturbance during physical abandonment activities;
- change in human health and aesthetics as a result of removing aboveground infrastructure;
- change in infrastructure and services due to an increase in solid, liquid, and hazardous waste as a result of physical abandonment activities; and
- change in employment and economy as a result of physical abandonment activities generating a demand for goods, services, and workers.

14.6.1 Change in Land Use

14.6.1.1 Loss or Alteration of Land Use

Physical abandonment activities along the Pointed Mountain Pipeline have the potential to lead to the loss or alteration of land for users (e.g., hunting, trapping). During physical abandonment, activities such as brushing, excavation and dismantling aboveground infrastructure may affect wildlife or their habitat as described in Section 9, Assessment of Effects on Wildlife and Wildlife Habitat potentially displacing species during the hunting and trapping seasons.

The predicted residual effect of physical abandonment activities on loss or alteration land use in the HORU LSA is anticipated to be immediate to short-term in duration, reversible to pre-Project or equivalent conditions, and of low magnitude. The residual effect is not significant (Table 14.6-1).

14.6.1.2 Sensory Disturbance

Sensory disturbance due to air emissions, light, noise, odours, or vibrations will occur during the physical abandonment activities. Land users may experience sensory disturbance as a result of vehicle and equipment traffic, vegetation clearing, dismantling of aboveground infrastructure, and cleanup and reclamation activities. These activities will generally occur during daytime hours and will adhere to applicable permit and regulatory requirements. There are no permanent residents located within the HORU LSA; however, it is reasonable to assume that land users may be active throughout the Project work schedule for a variety of activities within the HORU LSA (e.g., hunting, trapping, recreational use).

Land users will be notified in advance and consulted before the initiation of physical abandonment activities. The potential effects and associated mitigation for air and GHG emissions and the acoustic environment are provided in Sections 10 and 11 of the ESA, respectively.

The predicted residual effect of physical abandonment activities on change in land use due to sensory disturbance is expected to be confined in the HORU LSA, immediate to short-term in duration, reversible to pre-Project or equivalent conditions, and of low magnitude. The residual effect is not significant (Table 14.6-1).

14.6.2 Change in Human Health and Aesthetics

Residual effects related to human health and aesthetics will occur as a result of dismantling and removing aboveground infrastructure associated with the Pointed Mountain Pipeline. Although there are no permanent residents or defined parks, recreation areas or scenic highways located on the Project Footprint, it is anticipated that the Project will result in an overall positive aesthetic change for land users (e.g., hunters, trappers, guide outfitters, recreational users), especially in areas where no aboveground infrastructure will remain.

14.6.3 Change in Infrastructure and Services

Residual effects on infrastructure and services will occur as a result of increased waste associated with the Project including any physical abandonment garbage, contaminated soil, and aboveground infrastructure that will be dismantled and removed. The Project will result in the disposal of potentially hazardous waste associated with old oil and gas infrastructure; however, all abandonment-related waste is to be collected and disposed of in designated containers or at approved facilities in an organized manner that will reduce overall effects on local landfills and transfer stations.

The predicted residual effect of physical abandonment activities on a change in infrastructure and services due to an increase in waste is anticipated to be short-term in duration, reversible, and or low magnitude considering local licensed landfills will be identified prior to the start of Project activities to ensure the proper disposal of certain material (e.g., hazardous waste, domestic waste) is complete. The residual effect is not significant (Table 14.6-1).

14.6.4 Change in Employment and Economy

The Project will generate a demand for goods, services, and workers through direct opportunities in both the Community LSA and RSA. Examples of direct contracting opportunities include project management and construction management, general construction workers, and skilled trades workers. Local businesses that could benefit indirectly from contract opportunities and goods and service provisions include the industrial camp where the workforce will be accommodated and waste management providers.

Enbridge's Indigenous Peoples Policy is designed to direct and develop mutually beneficial relationships with Indigenous groups close to, or potentially affected by, the Project. Westcoast is committed to a series of economic requirements that all contractors will follow, including supporting existing relationships and providing economic participation in Indigenous-owned businesses and community members. Westcoast will work with Indigenous groups to achieve benefits resulting from the Project, including education, employment, and community economic development. These opportunities are expected to extend into the Community LSA and RSA.

An increase in business at the industrial camps where the Project work force will reside for the duration of activities (i.e., 3 months) is expected. Given the small size of the workforce, the Project is not expected to restrict other operators from using the chosen camp for the duration of Project activities. The Project will not result in an increase in supplies since existing infrastructure is being abandoned, and there is no new infrastructure being constructed.

This potential residual effect of increased contracting opportunities is positive and, therefore, has not been further characterized.

14.6.5 Summary of Project Residual Effects

Table 14.6-1 summarizes the significance evaluation of the predicted residual socio-economic effects of the Project. As Table 14.6-1 notes, there are no situations of a residual socio-economic effect that are of high magnitude, reversible but regional or beyond in extent, or of high magnitude, irreversible and within any spatial boundary. Consequently, it is concluded that the predicted residual effects of the Project on socio-economic elements are not significant.

Table 14.6-1. Project Residual Effects on Socio-Economic Elements

Predicted Residual Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Change in land use	Adverse	HORU LSA	Immediate- to short-term	Isolated	Reversible	Low	Not significant
Change in human health and aesthetics	Positive	Community LSA	N/A – positive effects are not characterized further.				
Change in infrastructure and services	Adverse	Community LSA	Short-term	Isolated	Reversible	Low	Not significant
Change in Employment and Economy	Positive	Community RSA	N/A – positive effects are not characterized further.				

14.7 Assessment of Cumulative Effects on Socio-Economic Elements

The CEA evaluates the likely adverse residual environmental effects of the Project, in combination with effects arising from other existing and reasonably foreseeable developments and activities.

Subsection 4.8 identifies other projects and physical activities that may act cumulatively with the Project. Where Project-related residual environmental effects act cumulatively with those from past, present, and reasonably foreseeable future projects and physical activities, a CEA is completed to determine their significance.

Table 14.7-1 identifies potential Project interactions with existing and reasonably foreseeable developments and activities that may have cumulative effects related to HORU and infrastructure and services.

Table 14.7-1. Interactions with Potential to Contribute to Cumulative Effects of Socio-economic Elements

Projects and Physical Activities	Potential Effects	
	Change in Land Use	**Change in Infrastructure and Services**
Present Projects, Physical Activities and Land Use		
Forestry	✓	✓
Oil and Gas	✓	✓
Recreation	✓	-
Fishing, Hunting, and Trapping	✓	-
Transportation	✓	-
Future (Reasonably Foreseeable) Projects and Physical Activities		
Forestry	✓	✓
Oil and Gas	✓	✓
Fishing, Hunting, and Trapping	✓	-

Notes:

✓ = A potential interaction is identified.

- = A potential interaction has not been identified.

14.7.1 Change in Land Use

It is expected that the Project, existing, and reasonably foreseeable developments described in subsection 4.8 have the potential to act cumulatively to result in cumulative changes to HORU within the HORU RSA. Existing developments, such as forestry, roads, and oil and gas development already influence the use of the lands for hunting, guide outfitting, trapping, and recreational activities. It is anticipated that there will be some cumulative effects arising from future foreseeable projects (including the Project), as well as future forestry operations, fishing, hunting, and trapping, and other recreational activities.

The cumulative effects to changes in land use in the HORU RSA are predicted to be low in magnitude, as there are limited reasonably foreseeable developments within the HORU RSA compared to other areas of NWT, Yukon and BC. The predicted cumulative effects are considered short-term in duration and are considered reversible.

The implementation of proposed mitigation in Table 14.4-1 and the Project-specific EPP (Appendix B of this ESA) will effectively reduce the Project's contribution to the cumulative change in land use. It Is expected that similar measures will be implemented, and environmental and industry guidelines will be followed for existing and reasonably foreseeable developments.

Following the completion of abandonment activities, the Project will not contribute to long-term cumulative effects since ongoing or routine physical work (e.g., maintenance) is not anticipated. Once aboveground infrastructure is dismantled, the landscape will revegetate, and may contribute to future activities such as hunting, guide outfitting and trapping, as well as forestry in the long-term.

The Project is predicted to have a limited incremental contribution of the cumulative effects causing disruption of land use and sensory disturbance. The Project's contribution to the cumulative effects is low in magnitude since the potential disruption to land use will be temporary (short-term) and reversible. No mitigation beyond that already recommended in Table 14.4-1 and the Project-specific EPP (Appendix B of this ESA) is warranted.

14.7.2 Change in Infrastructure and Services

It is expected that the Project, existing, and reasonably foreseeable developments described in subsection 4.8 have the potential to act cumulatively to result in cumulative changes to HORU within the Community RSA. Project-related waste as well as waste collected from additional existing activities and reasonably foreseeable disturbances will temporarily increase volumes to local waste transfer stations, recycling centres, and landfills which are generally designed to handle typical construction garbage as well as any hazardous materials resulting from the Project.

An increase in waste as a result of the Project will increase the demand on existing facilities; however, Westcoast will arrange with local licensed landfills in advance for potential hazardous or contaminated soils and materials. All Project-related waste will be disposed of in a timely manner and in accordance with applicable regulations.

It is anticipated that existing and reasonably foreseeable activities in the Community RSA may temporally overlap with the Project schedule, contributing to a cumulative increase in demand on waste transfer stations, recycling centres, and landfills for an isolated period of time (i.e., during physical abandonment).

Some of the reasonably foreseeable activities described in subsection 4.8 that may occur in the Community RSA are expected to be completed before or during Project activities. Some of the reasonably foreseeable developments that are ongoing such as oil and gas developments and access road maintenance may coincide with the Project, placing cumulative pressure on waste services within the Community RSA. It is assumed that all existing and reasonably foreseeable developments will be constructed and operated in accordance with regulatory approval and permit requirements and located to allow local and regional authorities to meet their long-term growth and land development objectives.

Cumulative effects on changes to infrastructure and services are low magnitude, since effects associated with existing and reasonably foreseeable developments are expected to be within an acceptable range within the Community RSA. It is anticipated that with the proposed mitigation, the capacity of local stations can handle the waste demands created by the Project as well as those of other existing and reasonably foreseeable activities without overburdening them.

It is anticipated that the companies involved in the construction and operations of the existing activities and reasonably foreseeable developments will implement mitigation in accordance with relevant regulations, authorizations, or permit requirements, which will reduce the potential cumulative effects on infrastructure and services. The Project's contribution to the cumulative effect is considered to be low magnitude, of short-term duration, and reversible. No mitigation beyond the Project-specific mitigation already recommended in Table 14.4-1 and the Project-specific EPP (Appendix B of this ESA) is warranted.

14.7.3 Summary of Residual Cumulative Effects on Socio-Economic Elements

Table 14.7-2 provides the cumulative effect characterization for each cumulative effect using the criteria defined in Section 4.

Table 14.7-2. Project Cumulative Effects on Socio-Economic Elements

Predicted Cumulative Effects	Direction	Spatial Boundary	Temporal Context			Magnitude	Significance
			Duration	Frequency	Reversibility		
Change in land use	Adverse	HORU RSA	Short-term	Isolated	Reversible	Low	Not significant
Contribution from the Project to the cumulative effect	The Project will contribute to the cumulative change in HORU. With the proposed mitigation, the Project's contribution to the cumulative effect is of low magnitude at the regional scale and reversible, and short-term in duration.						Not significant
Change in infrastructure and services	Adverse	Community RSA	Short-term	Isolated	Reversible	Low	Not significant
Contribution from the Project to the cumulative effect	The Project will contribute to the cumulative change in infrastructure and services. With the proposed mitigation, the Project's contribution to the cumulative effect is of low magnitude at the regional scale and reversible, and short-term in duration.						Not significant

14.8 Conclusion

As Tables 14.6-1 and 14.7-2 note, there are no situations of a residual effect or cumulative effect on socio-economic elements that are irreversible and of high magnitude, or reversible but high magnitude and regional or beyond in extent. Therefore, the predicted residual and cumulative effects of socio-economic elements are not significant.

The Project will have positive residual effects regarding changes to human health and aesthetics and employment and economy. Westcoast has identified enhancement measures to maximize these positive effects of the Project.

Prediction confidence is high based on a good understanding of cause-effect relationships, and the past effectiveness of proposed mitigation measures. As Tables 14.6-1 and 14.7-2 note, there are no situations of a residual effect or cumulative effect on socio-economic elements that are irreversible and of high magnitude, or reversible but high magnitude and regional or beyond in extent. Therefore, the predicted residual and cumulative effects are not significant.

14.9 Monitoring and Follow-up

An EI will be onsite during physical abandonment activities to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). Post-abandonment monitoring will occur at locations where physical abandonment activities are conducted. Monitoring methods and activities will be followed for compliance with specific reclamation performance expectations and conditions. Additional details on are described in Section 19, Follow-up and Monitoring.

15. Rights of Indigenous Peoples

The *Filing Manual* (CER 2021a) notes that the rights of Indigenous Peoples in Canada are considered in regard to pipeline projects. As per Table A-3 of the *Filing Manual* (CER 2021a), the level of detail and depth of information relating to potential Project effects on Aboriginal and Treaty Rights is commensurate with the scale and scope of the Project. Project-specific input brought forward by potentially affected Indigenous groups has been reflected in the assessment. Westcoast remains available to discuss the Project with the potentially affected or interested Indigenous groups. Should any of the Indigenous groups identify potential effects or issues of concern that have not already been assessed in the ESA, those matters will be reviewed in the context of the ESA and incorporated into ongoing Project planning, including the Project-specific EPP (Appendix B of this ESA), where appropriate.

15.1 Rights and Interests of Indigenous Groups

15.1.1 Overview of Aboriginal and Treaty Rights and Indigenous Interests

Through existing relationships and engagement with local Indigenous groups on various activities related to the Project, Westcoast has some understanding of Aboriginal and Treaty Rights and Indigenous interests in the Project area. Each of the Indigenous groups identified in Section 3 of this ESA has, or asserts claims of, rights and title to the lands, water, and resources within their Traditional Territories. This includes, but is not limited to, the use of land, water, and other resources within those territories for traditional purposes. Activities associated with the exercise of these rights include, but are not limited to, fishing, hunting, trapping, and gathering activities for food (plants), materials, trade, medicines, and traditional ceremonies. This section provides information on the Aboriginal and Treaty Rights and Indigenous interests of the Indigenous groups potentially affected by the Project.

15.1.2 Acho Dene Koe First Nation

Acho Dene Koe First Nation administration is located in Fort Liard, NWT. Acho Dene Koe First Nation is affiliated with Dehcho First Nations. As of August 2021, Acho Dene Koe First Nation had a registered population of 714 members (CIRNAC 2021a), many of whom reside in the Deh Cho region including Fort Liard.

Acho Dene Koe First Nation is a signatory of Treaty 11. Treaty 11 outlines Acho Dene Koe First Nation's right to pursue their usual vocations of hunting, fishing, and trapping throughout their Traditional Territory. Acho Dene Koe First Nation has stated that their Aboriginal Rights, including Title, have never been ceded, abandoned, or extinguished in any part of their Traditional Territory. Aboriginal Rights include a priority use of resources (e.g., fish, wildlife, trees, traditional medicines, and foods) and Aboriginal Title confers on the rights-holding group the exclusive right to decide how land is used and the right to benefit from those uses (Acho Dene Koe First Nation 2021).

The Pointed Mountain and Fisherman Lake area is of great cultural significance to Acho Dene Koe. Presently, the area is home to important moose hunting and fishing territory, gathering sites, burial sites, as well as a number of seasonal and permanent dwellings. These dwellings are essential to providing access to the Acho Dene Koe land base, connecting members to the land. This area is also an important focus for historic Dene cultural heritage sites, with evidence of activity dating to 5,000 to 8,000 B.P.

> "Prior to European contact and the presence of the Northwest and Hudson's Bay Companies at Fort Liard, an historic Athabascan people are thought to have inhabited the territory. In 1952, a team of archaeologists excavated the Pointed Mountain site located along the western side of a

> small valley just north of Fisherman Lake, NWT. According to MacNeish (1954), the archaeological evidence excavated from this site indicates a dating of 5,000 to 8,000 years ago for the occupation of the Pointed Mountain site (MacNeish, 1954:237). Furthermore, artifacts similar to the 'long-side notched points' found at the Pointed Mountain site have also been found at Bovie Lake, Nelson Forks, and Trout Lake near Fort Liard, as well as in parts of the Yukon and Alaska (MacNeish, 1954:246). Although the cultural origin of these early peoples cannot be proven, MacNeish suggests that "there are hints of a thread of cultural continuity from the Pointed Mountain microlithic assemblage to the Spence River complex which may be connected with a more historic Athabascan culture" (MacNeish, 1954:252)". (Diaz 2012)

Through engagement activities for the Project, Acho Dene Koe First Nation has identified the Project area as an area important to the exercise of their Aboriginal and Treaty Rights and Indigenous interests, including fishing, hunting, trapping, and gathering. Acho Dene Koe First Nation is an entrepreneurial Nation with its own economic development corporation (ADK Holdings Ltd.), and has expressed interest in business opportunities, and developing local capacity and expertise around environmental monitoring and replanting native plant species for reclamation purposes. Acho Dene Koe First Nation also requested that Elders be engaged in the development of reclamation plans in order to share views and Dene Traditional Knowledge.

15.1.3 Dehcho First Nations

The Dehcho First Nations is a tribal council representing the Dene (South Slavey) and Métis people of the Dehcho Region of the NWT, Canada. It is made up of ten First Nations bands and two Métis Locals (Dehcho First Nations 2021). The Dehcho First Nations unites several First Nations to work together and promote shared interests, develop healthy and prosperous communities, and maintain their heritage.

15.1.4 Fort Liard Métis Local 67

Fort Liard Métis Local 67 is located in Fort Liard, NWT and is associated with the Dehcho Tribal Council.

Fort Liard Métis Local 67 continue to exercise their rights in the Project area. To date, engagement activities for the Project have not indicated specific activities regarding the exercise of Fort Liard Métis Local 67's Aboriginal Rights associated with the TLRU LSA and TLRU RSA.

15.1.5 Fort Nelson First Nation

Fort Nelson First Nation is located in Fort Nelson, BC. Fort Nelson First Nation has four reserves including Fontas 1, Fort Nelson 2, Kahntah 3, and Snake 5 (CIRNAC 2021b). The registered population of Fort Nelson First Nation, as of August 2021, was 976, with 416 members living on-reserve (CIRNAC 2021b).

Fort Nelson First Nation is a signatory of Treaty 8 (CIRNAC 2021b) and is also a member of the Treaty 8 Tribal Association (Treaty 8 Tribal Association 2021). In 2006, the leadership of the Treaty 8 Tribal Association signed the Declaration of BC Treaty 8 First Nations which includes several position statements including recognition that the groups had the right to maintain the land and resources through self-governance based on sacred laws and affirmed their efforts to ensure that Aboriginal and Treaty Rights and Indigenous interests were not infringed upon (Treaty 8 Tribal Association 2021).

Treaty 8 outlines Fort Nelson First Nation's right to pursue their usual vocations of hunting, fishing, and trapping throughout their Traditional Territory and rights to areas used for hunting, fishing, cultural activities, and burial grounds.

The June 29, 2021, BC Supreme Court ruling in Blueberry River First Nations (Yahey) v. Province of British Columbia, determined the Treaty 8 Rights of the Blueberry River First Nations have been breached by development authorized by the provincial government over many years. The province is starting dialogue with the other Treaty 8 Nations on matters of Treaty Rights, including advancing new environmental restoration work across Treaty 8 Territory and ensuring all Treaty 8 Nations are part of the development of a new approach to how natural resource activity is planned and authorized in the territory.

To date, engagement activities for the Project have not indicated specific activities regarding the exercise of Fort Nelson First Nation's Aboriginal Rights within their Traditional Territory associated with the TLRU LSA or TLRU RSA.

15.1.6 Kaska First Nations

The Kaska Nation is comprised of five Kaska First Nations, three in BC (Daylu Dena Council, Dease River First Nation, and Kwadacha First Nation) and two in Yukon (Ross River Dena Council and Liard First Nation). The three BC First Nations are known as the Kaska Dena Council. Negotiations with the two Yukon Indigenous groups are inactive (Kaska Dene Council 2021).

The Kaska Dena Council formed in 1981 to advance interests of Kaska individuals, promote and protect respect for the land and cultural heritage of the Kaska Dena, promote unity and sharing amongst all Kaska, assist in the delivery of services including social, economic, cultural, and educational programs, promote a community environment, and work toward recognition and protection of the Aboriginal Rights of all Indigenous Peoples in Canada (Kaska Dena Council 2021).

To date, engagement activities for the Project have not indicated specific activities regarding the exercise of Kaska First Nations Aboriginal Rights within their Traditional Territory associated with the TLRU LSA or TLRU RSA.

15.1.7 Liard First Nation

Liard First Nation is located in southeastern Yukon. Liard First Nation has nine reserves including Blue River 1, Dease River 2, Dease River 3, Horse Ranch Pass 4, Liard River 3, McDames Creek 2, Mosquito Creek 5, Muddy River 1, One Mile Point 1 (CIRNAC 2021c). The registered population of Liard First Nation as of August 2021 was 1,227.

Liard First Nation is part of the Kaska First Nations (Liard First Nation 2021a) and is affiliated with the Kaska Dene Council (Kaska Dene Council 2021). Liard First Nation has never ceded or surrendered its Kaska Aboriginal Rights and Title (Liard First Nation 2021b). Through engagement activities for the Project, Liard First Nation has identified the Project area as an area important to the exercise of their Aboriginal and Treaty Rights and Indigenous interests, including fishing, hunting, trapping, plant gathering, and harvesting of wood and forest products.

Liard First Nation have indicated that they support work that will support the safe and environmentally responsible removal of pipeline infrastructure as efforts to remediate the environmental effects of past oil and gas infrastructure may improve their ability to exercise their rights within their Traditional Territory if done appropriately and with Kaska guidance (Liard First Nation 2021b).

15.1.8 Nahæâ Dehé Dene Band (Nahanni Butte)

Nahæâ Dehé Dene Band is located in Nahanni Butte, NWT. Nahæâ Dehé Dene Band is affiliated with Dehcho First Nations. As of August 2021, Nahæâ Dehé Dene Band had a registered population of 140 members (CIRNAC 2021d).

Nahææ Dehé Dene Band is a signatory of Treaty 11. Treaty 11 outlines Nahæâ Dehé Dene Band's right to pursue their usual vocations of hunting, fishing, and trapping throughout their Traditional Territory. To date, engagement activities for the Project have not indicated specific activities regarding the exercise of Nahæâ Dehé Dene Band's Aboriginal Rights within their Traditional Territory associated with the TLRU LSA or TLRU RSA.

15.1.9 Ross River Dena Council

Ross River Dena Council is located in southeastern Yukon. The registered population of Ross River Dena Council as of August 2021 was 550 (CIRNAC 2021e).

Ross River Dena Council is part of the Kaska First Nations and is affiliated with the Kaska Dene Council (Kaska Dene Council 2021). Ross River Dene has never ceded or surrendered its Kaska Aboriginal Rights and Title and maintains their right to hunt, fish, trap, and gather plants within their Traditional Territory. To date, engagement activities for the Project have not indicated specific activities regarding the exercise of Ross River Dena Council's Aboriginal Rights within their Traditional Territory associated with the TLRU LSA or TLRU RSA.

15.1.10 Sambaa K'e Dene Band/Trout Lake

Sambaa K'e Dene Band is located in Fort Simpson, NWT. Sambaa K'e Dene Band is affiliated with Dehcho First Nations. The registered population of Sambaa K'e Dene Band as of August 2021 was 120 (CIRNAC 2021f). Sambaa K'e Dene Band is a signatory of Treaty 11. Treaty 11 outlines Sambaa K'e Dene Band's right to pursue their usual vocations of hunting, fishing, and trapping throughout their Traditional Territory. To date, engagement activities for the Project have not indicated specific activities regarding the exercise of Sambaa K'e Dene Band's Aboriginal Rights within their Traditional Territory associated with the TLRU LSA or TLRU RSA.

15.2 Potential Effects on the Rights and Interests of Indigenous Groups

The Project has the potential to adversely affect the Aboriginal and Treaty Rights and Indigenous interests of Indigenous groups during physical abandonment activities. Project activities such as excavation, brushing for access along the existing pipeline right-of-way and temporary workspace, and dismantling aboveground infrastructure could temporarily affect the Indigenous group's ability to exercise their Aboriginal Rights to harvest in the TLRU LSA. As identified in subsection 13.6 of this ESA, the Project has the potential to adversely affect the plant and wildlife resources harvested, access to TLRU sites and the experience on the land through sensory disturbance. However, with the implementation of mitigation measures outlined in Table 13.4-1 and the Project-specific EPP (Appendix B of this ESA), the effects on TLRU activities and sites are considered to be low in magnitude and not significant.

During engagement activities for the Project, some Indigenous groups made specific mitigation requests to reduce the effects of the Project on their Aboriginal Rights and Indigenous interests. Acho Dene Koe First Nation requested that areas where physical abandonment activities occur be reclaimed with native plant species and that Elders be engaged in the preparation of reclamation plans. Acho Dene Koe First Nation also expressed interest in business opportunities and developing local capacity and expertise around environmental monitoring. Fort Nelson First Nation requested engagement in reclamation plans. Westcoast will work with Acho Dene Koe First Nation and Fort Nelson First Nation to develop reclamation plans that include culturally important plants where practical. This could act to enhance Acho Dene Koe First Nation's and Fort Nelson First Nation's ability to exercise their rights within their traditional territory by the implementation of reclamation measures that re-establish culturally important plants and habitat for culturally important wildlife species.

Once the physical abandonment activities are complete, the Project has potential to positively affect the Aboriginal Rights and Indigenous interests of Indigenous groups. Following reclamation activities and applicable regulatory requirements, the existing pipeline easements will contribute to available Crown land and will be reinstated as part of the land base in which Indigenous groups can exercise their Aboriginal Rights and Indigenous interests. The pipeline easements will no longer be cleared of vegetation for further activities and native vegetation will be able to repopulate the land. This will reduce the amount of disturbed land and has the potential to reinstate culturally important native plants and restore habitat for culturally important wildlife.

16. Assessment of Effects from Accidents and Malfunctions

This section presents the assessment of the potential effects and potential residual effects of accidents and malfunctions that may occur during Project activities.

16.1 Scope of the Assessment

Accidents and Malfunctions are unplanned events that could result in adverse effects on human health, property, or the environment. As stated in the *Filing Manual* (CER 2021a), an ESA will identify and assess the effects on workers, the public, and biophysical and socio-economic elements of all potential accidents and malfunctions. Events causing accidents and malfunctions include: a pipeline or equipment failure, human error, and criminal activity. Effects regarding natural hazards (e.g., flooding) are considered in Section 17 of this ESA, Assessment of the Effects of the Environment on the Project.

Accidents and malfunctions can occur during activities associated with all Project components and activities and can affect various environmental and socio-economic elements. Considering the Project is required to support the abandonment of assets (as opposed to the installation of a new, operating pipeline) the net potential effects associated with accidents and malfunctions are expected to decrease. This section includes potential accidents and malfunctions that may take place during Project activities (subsection 2.5 of this ESA, Project Activities) although they are unlikely to occur. While accidents and malfunctions are predicted to be unlikely for all Project activities, the potential consequences are evaluated so emergency response and contingency planning can be identified to further mitigate risk.

16.1.1 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding accidents and malfunctions as a result of the Project have been identified.

Westcoast has also engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no concerns regarding accidents and malfunctions as a result of the Project have been identified.

16.1.2 Potential Effects, Pathways, and Effect Indicators

Table 16.1-1 identifies the potential effect pathways of the Project for accidents and malfunctions during physical abandonment activities. Project effects for accidents and malfunctions may occur within all of the land uses encountered by the Project. Accidents and malfunctions are not anticipated once the pipeline is abandoned in-place.

Table 16.1-1. Project Activities, Effect Pathways, and Indicators for Accidents and Malfunctions

Potential Effect	Project Activities and Effect Pathways	Effects Indicators
Small spill or release of hazardous materials during physical abandonment activities	Project activities involve the operation of equipment, and the release of small quantities of contaminants could occur as a result of equipment failure or operator error.	▪ Severity of the volume of the spill ▪ Spill location and accessibility ▪ Nature of the contaminant ▪ Required level of cleanup and reclamation activities
	Small spills during physical abandonment activities could contaminate or otherwise alter soil quality, water quality, aquatic habitat (i.e., instream fish habitat and wetlands) or terrestrial habitat (i.e., riparian areas, upland vegetation, and wetlands).	
Damage to third-party utilities	Damage to third-party utilities, such as pipeline crossings, could lead to an interruption of services.	▪ Any damage to third-party facilities
Transportation accidents	Increased traffic on roads associated with Project activities can lead to a transportation accident that could cause damage to property, inconvenience to the public, and injury to humans or wildlife. Depending upon severity, a transportation accident could increase demand on emergency services (Section 14 of this ESA).	▪ Severity of transportation accident to property ▪ Inconvenience to the public ▪ Injury to humans or wildlife

16.1.3 Spatial Boundaries

The Project Footprint is the land area directly disturbed by abandonment activities, including associated physical works and activities for the cut and cap locations, removal of infrastructure and temporary workspace. Spatial boundaries for accidents and malfunctions include the applicable environmental or socio-economic element LSA or RSA of affected elements (Sections 5 to 14) noted per effect.

16.1.4 Ecological and Social Context

The Pointed Mountain Pipeline was already deactivated, purged and cleaned of residual product, reducing the potential for accidents or malfunctions associated with the transport of product. The Pointed Mountain Pipeline is currently filled with nitrogen gas to a minimum pressure of 70 kilopascals and will be depressurized during physical activities. Aboveground facilities included in the scope of work will be removed and sent for disposal.

Accidents and malfunctions are generally limited to the physical abandonment phase of the Project as crews needed for routine monitoring post-abandonment activities will be limited, and the use of heavy equipment is not expected. Physical abandonment activities will be conducted in the summer in the NWT (PM-1, PM-2, PM-3, and PM-4) where there is a risk of fires occurring that may contribute to accidents. At physical abandonment sites in the Yukon and BC (PM-6, PM-7, PM-8, PM-9, and PM-10); physical abandonment activities will be conducted in the winter under frozen conditions and the risk of fire occurring is lower.

16.2 Project Interactions with Accidents and Malfunctions

Table 16.2-1 identifies the Project activities that may interact with accidents and malfunctions to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 16.5.
A justification for no interaction is provided following the table in subsection 16.2.1.

Table 16.2-1. Project Interactions with Accidents and Malfunctions

Project Activities	Potential Effects		
	Small Spill of Hazardous Materials	Damage to Third-Party Utilities	Transportation Accidents
Pointed Mountain Pipeline			
Physical abandonment	✓	✓	✓
Abandonment in-place	-	-	✓

Notes:

✓ = A potential interaction with the Project is identified.

\- = No potential interaction with the Project is identified.

16.2.1 Project Interactions Scoped Out of Further Consideration

16.2.1.1 Small Spill of Hazardous Material

Following physical abandonment activities, small spills of hazardous material are not anticipated along the right-of-way, as there is no further physical work required.

16.2.1.2 Damage to Third-Party Utilities

Following physical abandonment activities, damage to third-party utilities is not anticipated, as there is no further physical work required.

16.3 Mitigation

The Project will be abandoned in a manner that prevents and reduces potential hazards and risks to the safety and security of the public, employees, property, and the environment. By selecting and implementing abandonment methods that meet applicable industry standards, regulatory requirements (i.e., legislation, codes, standards, and conditions of approval) and public expectations, the risk of accidents and malfunctions is reduced. In the unlikely event an accident or malfunction were to occur during physical abandonment activities, contingency measures in the Project-specific EPP (Appendix B of this ESA) would be implemented, as well as the Project-specific emergency response plans.

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities to avoid or reduce environmental effects of accidents and malfunctions. The Project-specific EPP includes mitigation measures (Appendix B of this ESA). Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons. Table 16.3-1 identifies key mitigation measures for each effect pathway identified for Project activities.

Table 16.3-1. Mitigation for Potential Effects from Accidents and Malfunctions

Potential Effect	Effect Pathway	Key Mitigation
Small spill or release of hazardous materials	Small spills during physical abandonment activities could contaminate or otherwise alter water quality, aquatic habitat (i.e., wetlands) or terrestrial habitat (i.e., riparian areas, upland vegetation, and wetlands).	Place equipment (e.g., pumps, generators) within suitable secondary containment to prevent spills onto soils. Where practical, place equipment above the ordinary high-water mark/ordinary high-water level of watercourses or wetlands.
		Appropriate spill kits will be kept readily available at fuel or hazardous materials storage locations, as well as refueling and maintenance sites.
		Equipment parked overnight at the work site will be equipped with adequate secondary containment beneath areas prone to leakage of fuel and oils (e.g., place driptray beneath excavator).
		The Contractor will designate a Spill Coordinator, subject to Westcoast approval. For all construction-related spills, the Spill Coordinator will: ▪ Immediately report all spills to Westcoast Inspection personnel and the EI ▪ Mobilize onsite personnel, equipment, and materials for containment and/or cleanup of the spill ▪ Assist emergency response and monitor containment procedures to ensure that the actions are consistent with the requirements of this section ▪ In consultation with Westcoast and appropriate agencies, determine if it is necessary to evacuate spill site to safeguard human health ▪ Document the incident using the Spill Report Form (Appendix D of the EPP) or equivalent form containing the same information
		The Contractor will ensure that all personnel are trained in the handling of fuels and other regulated substances to follow spill prevention procedures (i.e., use of fueling equipment, establishment of watch person if required). All personnel will be trained to effectively contain and cleanup spills that may occur, in accordance with applicable regulations.
		Maintain appropriate spill response equipment at all worksites. Each construction site or crew will have adequate materials on hand to enable the rapid containment of any spill which may occur.
		Perform pre-construction inspection and testing of all equipment to ensure that it is in good repair. During construction, regularly inspect hoses, pipes, valves, and tanks to ensure equipment is free of leaks. Remove from service any equipment found to be leaking or in need of service and repair prior to resuming work.
		All mechanical fuel nozzles will include functional automatic shut-offs to prevent overfilling and will not be left unattended during fueling.
		Trucks transporting fuel to onsite construction equipment will travel only on approved access routes.

Table 16.3-1. Mitigation for Potential Effects from Accidents and Malfunctions

Potential Effect	Effect Pathway	Key Mitigation
Small spill or release of hazardous materials (cont'd)	As above	Westcoast requires that the storage of petroleum products, refueling, maintenance, and lubricating operations take place in upland areas that are more than 30 m from wetlands, streams, and waterbodies (including drainage ditches) and provide for secondary containment, unless otherwise indicated in regulatory authorizations.
		Immediately upon learning of any fuel, oil, hazardous material or other regulated substance spill, or upon learning of conditions that will lead to an imminent spill, the person discovering the situation will report to the Spill Coordinator and the EI, who will ensure that: ▪ Action to contain the fluid that has spilled or is about to spill are taken, and the source of the spill eliminated to the extent safely possible ▪ Action is taken to control danger to human life and the environment ▪ Westcoast PEL is notified ▪ Resources are available to contain and cleanup the spill
		The PEL will report applicable spills to appropriate federal, provincial , territorial and local agencies, as required.
Damage to third-party utilities	Damage of third-party utility lines could lead to temporary interruption of services and, in very rare situations, could pose a risk to human safety.	Mark and locate all foreign lines and cables using appropriate line locating services in NWT, Yukon, and BC before the start of physical abandonment activities.
Transportation accidents	Increased traffic on roads associated with Project activities can lead to a transportation accident that could cause damage to property, inconvenience to the public, and injury to humans or wildlife.	Utilize multi-passenger vehicles for the transport of construction crews to/from the Project Footprint.
		Restrict access points to environmentally sensitive areas within or along the construction disturbance area, to deter unauthorized access. Abide by any restrictions or "in/out" privileges that are implemented in special protection areas.
		Equipment bridges will be constructed using one of the following techniques: typical span type bridge (timber mats; EPP Figures 8 and 9), ice bridge (EPP Figure 10), swamp mats (EPP Figure 11), snow fill (EPP Figure 12), flexi-float or other pre-fabricated portable bridges, or other methods as approved by Westcoast CM/EI and appropriate regulatory authorities.
		Do not allow clearing, grubbing, or brushing beyond the staked and/or flagged construction disturbance area boundaries. Limit clearing to the minimum necessary to safely complete the work.
		Adhere to posted speed limits on access roads to reduce the risk of collisions.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contain the complete set of mitigation, including key mitigation in this table.

16.4 Potential Effect Pathways Not Carried Through for Further Assessment

Potential effects that remain following the implementation of mitigation measures are carried forward for further assessment.

16.5 Assessment of Residual Effects on Accident and Malfunctions

Effects as a result of accidents and malfunctions may remain after the implementation of mitigation measures. The potential residual effects include:

- inadvertent small spills during Project activities could adversely affect several biophysical and socio-economic elements (e.g., soil and soil productivity, water quality and quantity, fish and fish habitat, wetlands, vegetation, wildlife and wildlife habitat, HORU, Heritage Resources, TLRU, and human health);
- damage to third-party utilities could lead to power outages and interruption of services; and
- a transportation accident may cause damage to property, public inconvenience, and injury to humans, depending on the location and severity of the accident.

16.5.1 Inadvertent Small Spills During All Project Activities

Activities regulated by the CER are required to report spills that could have a significant adverse effect on the environment, regardless of size. An example of this would be a release of hydrocarbons into a waterbody. In addition, the *Transportation of Dangerous Goods Act* and regulations, such as the *Spill Reporting Regulation,* ensure standards are in place to promote public safety during the transportation of dangerous goods in Canada.

Adherence to the previously noted regulations, in addition to the implementation of the proposed spill prevention measures described in Table 16.3-1 and in the Project-specific EPP (Appendix B of this ESA), reduces the probability for significant residual effects from small spills to low. Nevertheless, Project activities involve the operation and use of large equipment and vehicles, and the release of small quantities of contaminants could occur as a result of equipment failure or operator error. Westcoast requires its contractors to implement proper planning and prevention measures to minimize the likelihood of spills, and to quickly and successfully cleanup spills that do occur. Spill response measures outlined in Table 16.3-1 and in the Project-specific EPP (Appendix B of this ESA) will be implemented in case of a spill during physical abandonment activities. The residual effects resulting from small spills are considered reversible with the implementation of the proposed mitigation.

Small spills during physical abandonment activities could contaminate or otherwise alter water quality, aquatic habitat (i.e., instream fish habitat and wetlands), or terrestrial habitat (i.e., riparian areas, vegetation, and wetlands). For instance, a spill near a watercourse or drainage crossing may alter or contaminate the aquatic habitat and could cause behavioural, sublethal, or lethal effects on fish. Given the spill prevention measures in place (Table 16.3-1 and Appendix B of this ESA) and the timing of physical abandonment activities, the likelihood of a spill affecting the water quality and aquatic habitat is low.

If a small terrestrial spill occurs during physical abandonment, it is likely to be noted quickly and be of small volume. Evidence suggests the effects of most minor terrestrial spills are localized (Simmons and Keller 2003). The rate of migration would depend on the permeability of the surficial materials, the presence or absence of fractures, the properties of the spilled contaminant (i.e., density and viscosity), and the vertical hydraulic gradients.

Spilled contaminants could result in a long-term source of groundwater contamination if not treated or physically removed and if allowed to migrate to the water table. Direct effects on vegetation and riparian vegetation from small spills, cleanup, and reclamation measures may result in some habitat disturbance.

Direct effects on human health could result if volatile compounds are inhaled. Indirectly, humans and wildlife could ingest contaminated country foods (e.g., affected fish, vegetation, and wildlife).

Small spills during physical abandonment activities could affect HORU and TLRU through the contamination of resources that are harvested in these activities, such as vegetation and fish. In turn, contamination could lead to effects on human health. Should the effects of a small spill on the resources that support harvesting activities be mitigated, the corresponding effect on HORU, TLRU, and human health would also be mitigated.

The magnitude and duration of residual effects of spills varies, depending on the volume of the spill, spill location and accessibility, season, the nature of the contaminant, required cleanup and reclamation activities, and sensitivity of the receiving environment. In most cases, the predicted residual effects of spills are considered low magnitude and of short-term duration given the mitigation in place for the Project (Table 16.5-1) (e.g., a small spill confined to the Project Footprint).

Depending on the volume of the release and release location, the extent of the residual effects of spills may include the Project Footprint to Aquatics RSA (or beyond), Wetlands RSA, Vegetation RSA, HORU LSA, and TLRU LSA. While spill events could result in residual effects with a high magnitude and long-term duration (e.g., a fuel truck rollover in a stream with high quality fish habitat), these events are not expected to occur with the implementation of the proposed spill prevention and response measures (Table 16.3-1).

Although a spill event has the potential to be of high magnitude and of long-term duration, the event has a low probability of occurrence or rare in frequency and is reversible to pre-Project or equivalent conditions. General release prevention and mitigation measures, described in Table 16.3-1 and in the Project-specific EPP (Appendix B of this ESA), have been proven successful on past projects in preventing releases during activities and ensuring appropriate action and reporting if releases do occur. As a result, a significant residual effect of a spill is not likely to occur (Table 16.5-1).

16.5.2 Damage to Third-Party Utilities During Physical Abandonment Activities

Damage to third-party utilities could lead to an interruption of services during physical abandonment activities. Repair of damage to third-party utilities may require excavation, repair, or replacement of the affected section of pipeline or utility. These activities may affect biophysical elements such as soil quality, vegetation types, wildlife habitat, and wetland habitat. The extent of the effects resulting from damage to third-party utilities may extend from the Community LSA to the Community RSA, depending on the location and extent of the damage. The worst-case scenario involves a major rupture causing a service outage and leading to an interruption of community utilities and services. Therefore, the effects range from low to medium in magnitude.

However, damage to a utility line is reversible through repair and is considered short-term in duration. The probability of the Project activities causing damage to third-party utilities is considered unlikely (i.e., rare in frequency) with the implementation of mitigation measures, such as ground disturbance procedures, site planning, and marking third-party utilities using appropriate line locating services in NWT, Yukon, and BC (Table 16.3-1). Consequently, it is predicted with a high degree of confidence that residual effects of damage caused by the Project activities to a third-party utility is not significant (Table 16.5-1).

16.5.3 Transportation Accidents During Physical Abandonment Activities

A transportation accident during physical abandonment activities could cause damage to property, inconvenience to the public, and injury to humans or wildlife in the HORU RSA and Community RSA. A transportation accident arising from increased traffic associated with Project activities could be of negligible to high magnitude, depending on whether the accident resulted in minor damage or in serious injury or death of humans, damage to property from a fire, or damage to aquatic or terrestrial habitat. Residual effects of transportation accidents may be of immediate-term (for minor injuries) or long-term (for serious injuries or mortality) in duration.

The residual effects may be reversible (for minor injuries or damage) or irreversible (i.e., for mortality, permanent injuries, or damage). With the implementation of traffic control mitigation measures described in Table 16.3-1 and in the Project-specific EPP (Appendix B of this ESA), the probability of a transportation accident is considered to be low (i.e., rare in frequency), and a significant residual effect from a transportation accident is not likely to occur (Table 16.5-1).

16.5.4 Summary of Residual Effect Characterization and Significance Determination

Table 16.5-1 summarizes the significance evaluation of the predicted residual effects associated with accidents and malfunctions during physical abandonment activities.

Residual effects of an accident or malfunction associated with spills and transportation accidents are potentially significant; however, accidents and malfunctions are considered to be an event with a rare probability of occurrence, and with the implementation of the mitigation measures outlined in Table 16.3-1, and in the Project-specific EPP (Appendix B of this ESA), a significant effect of a spill or a transportation accident is not likely to occur, and residual effects of damage caused by the Project to a third-party utility are not significant.

Table 16.5-1. Residual Effects Significance Evaluation for Accidents and Malfunctions

Predicted Residual Effects	Spatial Boundary	Temporal Context: Duration	Temporal Context: Frequency	Temporal Context: Reversibility	Magnitude	Significance
Inadvertent small spills during Project activities could adversely affect several biophysical and socio-economic elements	Project Footprint, HORU LSA	Short- to long-term	Rare	Reversible	Low to high	A significant effect is not likely to occur
Damage to third-party utilities could lead to power outages and interruption of services	HORU LSA or RSA	Short-term	Rare	Reversible	Low to medium	Not significant
A transportation accident may cause damage to property, public inconvenience and injury to humans, depending upon the location and severity of the accident	HORU RSA and Community RSA	Immediate- to long-term	Rare	Reversible to irreversible	Negligible to high	A significant effect is not likely to occur

16.6 Conclusion

With the application of mitigation measures, the residual effects of accidents or malfunctions are not significant, or significant effects are not likely to occur. Prediction confidence is high, as it is associated with the effectiveness of proposed mitigation. Cumulative interactions cannot be meaningfully predicted; consequently, a CEA is not warranted.

16.7 Monitoring and Follow-up

An EI will be onsite during physical abandonment to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). Post-abandonment methods and activities will be followed. Additional details are described in Section 19 of this ESA, Follow-up and Monitoring.

17. Assessment of the Effects of the Environment on the Project

The assessment team conducted studies to establish the existing conditions (i.e., baseline setting) to determine potential effects of the environment on the Project. The study was based on a review of existing literature, internet searches, consultation and engagement, field surveys, and expert opinion.

17.1 Scope of the Assessment

The scope of this assessment considers the requirements outlined in the *Filing Manual* (CER 2021a). Guide A.2.5 of the *Filing Manual* specifies that the baseline setting information within the study area be used to identify and predict the effects of the environment on the project. Therefore, natural hazards that are reasonable to assume may occur in southwest NWT, southeast Yukon, and northeast BC are considered in the assessment of Effects of the Environment on the Project.

Natural hazards and conditions that may occur within the Project area with potential to impact the Project's execution or a pipeline left in-place are identified as follows.

- **Extreme Weather Events.** Includes events such as floods, high winds, heavy or persistent precipitation (e.g., rain or snow), hail, extreme temperatures, and electrical storms.
- **Changing Climate Trends.** Climate change is acknowledged as the variability of local climate that is identified or documented over an extended period of time. Therefore, the effects of changing climate trends (e.g., extreme weather, changes in precipitation levels, and/or temperature) should be considered through the abandonment in-place phase of the Project.
- **Seismic Hazard.** The Project is located within a medium to medium-high risk seismic hazard range (NRCan 2015).
- **Wildfires.** The Project is located in an area where the fire danger can be high, especially during summer months (NRCan 2009b).

While effects of the environment on the Project are predicted to be unlikely for all Project activities, the potential consequences are evaluated so that emergency response and contingency planning can be identified to further mitigate risk.

Effects of the environment on the Project may result in accidents or malfunctions such as a transportation accident. An assessment of effects of accidents and malfunctions that may occur during Project activities is provided in Section 16 of this ESA. Potential effects of permafrost are assessed in Sections 5 and 8.

17.1.1 The Influence of Consultation and Engagement on the Assessment

Westcoast has engaged with potentially affected stakeholders and appropriate regulatory authorities. To date, no concerns regarding the effects the environment may have on the Project have been identified.

Westcoast has engaged potentially affected Indigenous groups through the Engagement Program. Detailed information regarding the Engagement Program is presented in Attachment 4 of Westcoast's CER Project Application. To date, no concerns regarding effects of the environment on the Project have been identified.

17.1.2 Potential Effects, Pathways, and Effect Indicators

Table 17.1-1 identifies the potential effect pathways of the Project regarding effects of the environment on the Project during physical abandonment activities along the existing right-of-way and as a result of leaving the abandoned pipeline in-place. Project effects of the environment on the Project may occur within all of the land uses encountered by the Project.

Table 17.1-1. Natural Hazards/Events, Pathways, and Effects of the Environment on the Project

Natural Hazard/Event	Project Activities and Effect Pathways	Potential Effects/Indicators
Extreme weather events	High winds, snowstorms, and cold temperatures creating reduced visibility for equipment operators or unsafe working conditions could delay physical abandonment activities.	▪ Delays in the Project schedule ▪ Delays in planned monitoring activities ▪ Damage to infrastructure
	Severe weather events, such as heavy or persistent precipitation, may lead to flooding, scour, bank erosion, and avulsion for the pipeline abandoned in-place.	
	A severe flood event may result in exposure of or damage to the pipeline or could cause the pipeline to float to the surface in areas of prolonged flooding.	
	High winds and lightning have the potential to damage aboveground infrastructure, restrict access, or ignite wildfires during physical abandonment activities.	
Changing climate trends	Depending on the nature and extent of changing climatic trends, monitoring of the pipeline may be delayed (e.g., changes in summer temperatures and reduced summer rainfall could lead to an increase in wildfires).	▪ Delays in planned monitoring activities ▪ Damage to infrastructure
Seismic activity	Seismic activity may result in the temporary suspension of physical abandonment activities or delays in planned monitoring activities, either directly, or as a result of evacuation procedures or travel restrictions imposed by emergency response services.	▪ Delays in the Project schedule ▪ Delays in planned monitoring activities ▪ Damage to infrastructure
	Seismic activity may damage or expose the pipeline abandoned in-place	
Wildfires	A wildfire on or near the Project Footprint during physical abandonment activities may present a safety hazard for workers, reduce visibility for equipment operators (smoke), or delay planned monitoring activities.	▪ Delays in the Project schedule ▪ Delays in planned monitoring activities ▪ Damage to infrastructure
	Wildfires may result in the temporary suspension of physical abandonment activities, either directly, or as a result of evacuation procedures or travel restrictions imposed by emergency response services.	
	In addition to the combustion of woody and plant materials, wildfires may also cause soil to burn. In extreme cases, this could result in loss of pipeline cover and expose the abandoned pipeline to damage in a similar manner to extreme weather events.	

17.1.3 Spatial Boundaries

The Project Footprint is the land area directly disturbed by physical abandonment activities including temporary workspace.

The spatial boundaries for effects of the environment on the Project are variable and can include various environmental and socio-economic study areas (Section 4 of this ESA). For example, damage to Project infrastructure or equipment would occur within the Project Footprint; however, potential delays to the Project schedule would be felt within the socio-economic boundaries of the Project (e.g., Community LSA).

17.1.4 Residual Effects Description Criteria

The residual effects criteria for direction, duration, frequency, reversibility, and likelihood are the same for all elements and are presented in Section 4 of this ESA. Table 17.1-2 provides the criteria definitions for the magnitude of residual effects for effects of the environment, specifically.

Table 17.1-2. Criteria for the Magnitude of Residual Effects for Effects of the Environment on the Project

Assessment Criteria	Definition
Magnitude – Residual Effects of the Environment on the Project	
Negligible	No change to Project schedule and no risk to integrity of Project infrastructure.
Low	Change is detectable but has no effect on the Project schedule beyond that of an inconvenience or nuisance value and does not pose a risk to integrity of Project infrastructure.
Medium	Change is detectable and results in moderate modification to the Project schedule or poses a low or moderate risk to integrity of Project infrastructure, which could result in a minor or moderate modification to the biophysical or social environment.
High	Change is detectable and is large enough to result in a severe modification to the Project schedule or poses a high risk to integrity of Project infrastructure, or risk integrity of Project infrastructure that could result in a severe modification to the biophysical or social environment.

17.2 Context

Natural hazards and conditions may influence method selection (e.g., in-place versus removal) and Project schedule.

17.2.1 Existing Conditions

Meteorological data and a description of natural hazards with the potential to create an environmental interaction with the Project are included in Section 5 of this ESA, Assessment of Effects on the Physical Environment and Soil Productivity.

17.3 Environmental Interactions with the Project

Table 17.3-1 identifies the Project components that may present an environmental interaction with the Project to result in a potential effect. These interactions are indicated by checkmarks and are explained in the context of the effect pathways, standard and Project-specific mitigation, and residual effects in subsection 17.6 of this ESA. A justification for no interaction is provided following the table in subsection 17.3.1.

Table 17.3-1. Environmental Interactions with the Project

Project Activities	Natural Hazard/Event			
	Extreme Weather Events	Changing Climate Trends	Seismic Hazard	Wildfires
Pointed Mountain Pipeline				
Physical abandonment	✓	-	✓	✓
Abandonment in-place	✓	✓	✓	✓

Notes:

✓ = A potential interaction with the Project is identified.

- = No potential interaction with the Project is identified.

17.3.1 Project Interactions Scoped Out of Further Consideration

17.3.1.1 Changing Climate Trends

Changing climate trends are not anticipated to affect the Project physical abandonment activities, as trends occur over the long-term and would not be detectable within the short schedule.

17.4 Mitigation

Westcoast will implement established and proven mitigation measures and construction practices during physical abandonment activities. The Project-specific EPP include mitigation measures (Appendix B of this ESA) to protect the safety of crew members during the duration of physical activities. Construction will occur during both summer and winter seasons; therefore, mitigation measures are identified for all seasons. Table 17.4-1 identifies key mitigation measures for each effect pathway identified for Project components.

Table 17.4-1. Key Mitigation Measures for Effects of the Environment on the Project

Potential Effect	Effect Pathway	Key Mitigation[a]
Delays in the Project schedule	Extreme weather events may reduce visibility or create unsafe working conditions.	Monitor weather conditions on a daily basis. If a major storm is predicted or occurs, inspect all waterbody crossings where construction is in progress or has been completed, to determine whether additional corrective actions are needed.
		If weather conditions result in frozen backfill placement into the excavation areas, topsoil replacement should be delayed until soils thaw to allow for any subsidence to be fixed by grading of subsoils. Once grading of subsoil occurs, full topsoil replacement can occur.
		If winter conditions prevent final cleanup and topsoil restoration, the area will be stabilized and temporary ECDs will remain in place until installation of permanent erosion control measures is complete.
	Seismic activity may result in the temporary suspension of physical abandonment activities, either directly, or as a result of evacuation procedures or travel restrictions imposed by emergency response services.	Suspend work immediately in the event of a seismic activity. If warranted, implement the emergency response. Review Project-specific safety or response plans for seismic events, if available.
		In the event remedial actions are required, utilize an adaptive management approach to address site-specific conditions.
	A wildfire on or near the Project Footprint during physical abandonment activities may present a safety hazard for workers, reduce visibility for equipment operators (smoke), or delay planned monitoring activities.	If burning activities are required and approved by the PEL, the Contractor will obtain applicable burning permits and adhere to the conditions. Inform the community fire protection service of the location of the work and any hazardous material used or stored on the Project Footprint.
		Review regional fire prevention, control and reporting requirements prior to construction. Review Project-specific safety or response plans for fire prevention and control, if available.
		Designate an appropriately trained emergency contact to be responsible for coordinating initial response to a fire, as well as directing any necessary fire suppression activities. All Project vehicles will be equipped with firefighting equipment in accordance with applicable regulations.

Table 17.4-1. Key Mitigation Measures for Effects of the Environment on the Project

Potential Effect	Effect Pathway	Key Mitigation[a]
Delays in planned monitoring activities	Extreme weather events may create unsafe working conditions when monitoring is required.	Schedule future monitoring activities within the appropriate season and monitor weather conditions on a daily basis.
	Depending on the nature and extent of changing climatic trends, monitoring of the pipeline may be delayed (e.g., changes in summer temperatures and reduced summer rainfall could lead to an increase in wildfires).	In the event remedial actions are required in the long-term, utilize an adaptive management approach in order to accommodate local environmental conditions that may shift due to changing climatic conditions.
		If warranted, implement the emergency response, adverse weather, fires suppression, flood, or wet soil contingency measures.
	Seismic activity may result in delays in planned monitoring activities, either directly, or as a result of evacuation procedures or travel restrictions imposed by emergency response services.	If warranted, implement the emergency response. Review Project-specific safety or response plans for seismic events, if available. In the event remedial actions are required, utilize an adaptive management approach to address site-specific conditions.
	Wildfires present a safety hazard and reduce visibility, which may delay monitoring activities on or near the right-of-way.	If burning activities are required and approved by the PEL, the Contractor will obtain applicable burning permits and adhere to the conditions. Inform the community fire protection service of the location of the work and any hazardous material used or stored on the Project Footprint, if applicable.
		Review regional fire prevention, control and reporting requirements prior to monitoring activities. Review Project-specific safety or response plans for fire prevention and control, if available.
		Designate an appropriately trained emergency contact to be responsible for coordinating initial response to a fire, as well as directing any necessary fire suppression activities. All Project vehicles will be equipped with firefighting equipment in accordance with applicable regulations.

Table 17.4-1. Key Mitigation Measures for Effects of the Environment on the Project

Potential Effect	Effect Pathway	Key Mitigation[a]
Damage to infrastructure	A severe flood event may result in exposure of or damage to the pipeline or could cause the pipeline to float to the surface in areas of prolonged flooding.	In the event of an adverse weather event that may result in remedial action required along the abandoned pipeline (e.g., severe flood), schedule monitoring activities within the appropriate season and monitor weather conditions on a daily basis.
	Depending on the nature and extent of changing climatic trends, monitoring of the abandonment isolation locations may be delayed (e.g., changes in summer temperatures and reduced summer rainfall could lead to an increase in wildfires).	In the event remedial actions are required in the long-term, utilize an adaptive management approach in order to accommodate local environmental conditions that may shift due to changing climatic conditions.
		If warranted, implement the emergency response, adverse weather, fires suppression, flood, or wet soil contingency measures.
	Seismic activity may damage or expose the pipeline abandoned in-place.	If warranted, implement the emergency response. Review Project-specific safety or response plans for seismic events, if available. In the event remedial actions are required, utilize an adaptive management approach to address site-specific conditions.
	In addition to the combustion of woody and plant materials, wildfires may also cause soil to burn. In extreme cases, this could result in loss of pipeline cover and expose the abandoned pipeline to damage in a similar manner to extreme weather events.	In the event of a severe wildfire that may result in remedial action required along the abandoned pipeline, schedule monitoring activities within the appropriate season and monitor weather conditions on a daily basis.
		Review regional fire prevention, control, and reporting requirements prior to monitoring activities. Review Project-specific safety or response plans for fire prevention and control, if available.

Note:

[a] The Project-specific EPP (Appendix B of this ESA) contain the complete set of mitigation, including key mitigation in this table.

17.5 Potential Effect Pathways Not Carried Through for Further Assessment

Following the application of mitigation, the potential effects or probability of effects occurring are reduced, however, potential for effects of the environment on the Project may still occur. Potential effects that remain following the implementation of mitigation measures are carried forward for further assessment.

17.6 Assessment of Residual Effects for Effects of the Environment on the Project

Effects of the Environment on the Project may remain after the implementation of mitigation. The potential residual effects include:

- delays in the Project schedule;
- delays in planned monitoring activities; and
- damage to aboveground or belowground infrastructure.

17.6.1 Delays in the Project Schedule

The potential adverse effects associated with delays in the Project schedule will vary, depending on the severity, proximity, and duration of the source of the delay (i.e., extreme weather). Extreme weather events (i.e., heavy or persistent precipitation, extreme temperatures) have the potential to delay physical abandonment activities by reducing visibility for equipment operators, damaging equipment or vehicles, reducing or changing access to the Project Footprint, or loss of electrical power. Seismic events or wildfires may cause reducing or changing access to the Project Footprint, or loss of electrical power resulting in the temporary suspension of physical abandonment activities, either directly, or as a result of evacuation procedures or travel restrictions imposed by emergency response services.

Delays in the Project schedule are anticipated to be immediate to short-term in duration. An extreme weather event may last less than a day (e.g., heavy snowfall), but is not anticipated to extend longer than one season. Project equipment used will be suitable for the expected climate conditions in the Project area, including potentially high precipitation and low temperatures. Physical abandonment activities and Project-related traffic would be suspended in potentially affected areas if conditions were considered to be unsafe or if requested by the appropriate authority. Delays to the Project schedule are reversible and are confined to the physical abandonment phase of the Project. This residual effect could be low magnitude. Therefore, a delay in the Project schedule is considered to be not significant (Table 17.6-1).

17.6.2 Delays in Monitoring Activities

Delays in planned monitoring activities may result from extreme weather events, wildfire, or changing climate trends. A severe weather event (e.g., persistent rainfall) may lead to hydrotechnical hazards such as flooding, scour, bank erosion, or avulsion. A seismic event or a wildfire may prevent planned monitoring activities. Future climate trends (e.g., extreme weather, changes in precipitation levels or temperature) are considered through the abandonment in-place phase to account for future warming in the Project area. Higher temperatures, shorter winters, and increased precipitation around the Project Footprint may contribute to wildfires or flood events. Monitoring efforts should include an adaptive management approach to accommodate local environmental conditions that may shift due to changing climate.

Delays during monitoring of the pipeline are anticipated to be immediate- to short-term in duration. A severe weather event, seismic activity or wildfire may last less than a day (e.g., heavy rainstorm), but is not anticipated to extend longer than one season. Prolonged flooding may result in monitoring activities being delayed for more than a season but completed within any one year. With the implementation of planned monitoring, as well as an adaptive management approach, these residual effects are low magnitude and reversible because monitoring activities can be rescheduled. Delays are anticipated to be rare (e.g., a wildfire causing soil to burn) to periodic (e.g., extreme cold in future winters). This residual effect is low magnitude, because an issue resulting from delayed activities will be detectable but will result in a moderate or severe modification to the biophysical or social environment. Therefore, a delay in planned maintenance activities is considered to be not significant (Table 17.6-1).

17.6.3 Damage to Infrastructure

Damage to infrastructure from extreme weather events, changing climate trends, seismic activity, or wildfires may result in increased potential risks to public safety. An extreme weather event (e.g., prolonged flooding) could expose the abandoned pipeline at watercourse crossings (i.e., floating to the surface or being uncovered), making the pipeline susceptible to damage by the flowing water carrying debris or a navigation hazard. Once the pipeline is left in-place, a wildfire may result in the combustion of woody and plant materials that may also cause soil to burn, resulting in a loss of pipeline cover, exposing it to damage in a similar manner to extreme weather events. A seismic event may damage or expose the pipeline abandoned in-place. Changing climate trends, such as increased precipitation or temperatures, may damage infrastructure through flooding or wildfires, and, in more rare cases, laterally expose the pipeline as the channel widens during a weather event.

Infrastructure will be abandoned in accordance with the CER *OPRs* and CSA Z662-19. Damage to infrastructure as a result of effects of the environment would be confined to the Project Footprint and is anticipated to be a rare occurrence. If infrastructure is damaged, it may be considered of low to high magnitude, depending on the extent and location of the damage, and whether the damage results in modifications to the surrounding biophysical or social environment. However, there are no predicted situations where the effect of the environment would cause a long-term effect on the Project. Therefore, damage to infrastructure as a result of effects of the environment on the Project is considered to be not significant (Table 17.6-1).

17.6.4 Summary of Residual Effects

Table 17.6-1 summarizes the significance evaluation of the predicted residual effects associated with effects of the environment on the Project. As Table 17.6-1 notes, there are no situations of a residual effect of the environment on the Project that are long-term duration and of high magnitude. Consequently, it is concluded that the potential residual effects of the environment on the Project are not significant.

Table 17.6-1. Residual Effects Significance Evaluation for Effects of the Environment on the Project

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Significance
		Duration	Frequency	Reversibility		
Delays in the Project schedule	Project Footprint to Community RSA	Immediate- to short-term	Rare	Reversible	Low	Not significant
Delays in planned monitoring activities	Project Footprint to RSA	Immediate- to short-term	Rare to periodic	Reversible	Low	Not significant
Damage to infrastructure	Project Footprint	Short-term	Rare	Reversible	Low to high	Not significant

17.7 Conclusion

As Table 17.6-1 notes, there are no situations of a residual effect as a result of effects of the environment on the Project that will result in a long-term duration and of high magnitude residual effect. With the application of planning, design and mitigation measures, the residual effects of delays in the Project schedule, delays in planned maintenance activities, and damage to aboveground or belowground infrastructure from effects of the environment on the Project are not significant.

No determination of significance for cumulative effects was required as a CEA is not warranted. Prediction confidence is high, associated with the effectiveness of Project engineering and design, and the proposed mitigation.

17.8 Monitoring and Follow-up

An EI will be onsite during physical abandonment to monitor activities for compliance with regulatory commitments and mitigation measures as outlined in the Project-specific EPP (Appendix B of this ESA). In the event of an extreme wildfire or seismic activity with the potential to expose the pipeline left in-place, vegetation and soil can be assessed to ensure there are no resulting safety risks.

Once the assets are abandoned and the CER-ordered conditions are met, the risk to public safety, property, and the environment are to be at a level that is acceptable in the public interest. Should any part of the abandoned pipeline become exposed or otherwise require additional care, the company is required to monitor the pipeline and provide post-abandonment care (e.g., conduct monitoring and take corrective actions for any issues) and the CER will continue regulatory oversight.

18. Environmental Compliance Strategy

18.1 Commitment to Environmental Protection

Westcoast is committed to implementing the mitigation and protection measures found in this ESA or those that may occur during ongoing consultation and engagement or as a result of the regulatory process.

18.1.1 Environmental Policy

Westcoast believes that minimizing the environmental footprint and impact associated with physical activities delivers value to stakeholders, customers, and employees. Enbridge's Environmental Management System includes environmental protection programs established to protect and sustain the environment throughout a project's lifecycle, and to anticipate, prevent, manage, and mitigate conditions that could adversely affect the environment. To support this, Westcoast will follow the steps as follows:

- Identify interactions with and impact to the environment
- Minimize adverse environmental effects through effective planning and execution
- Comply with government regulations and applicable industry standards
- Effectively respond to unanticipated events
- Provide appropriate training to ensure employees and contractors understand their responsibility to protect the environment
- Promote a culture where environmental excellence is everyone's responsibility
- Actively engage with the public and government regarding environmental activities
- Learn from past experiences in order to continually improve competency and performance
- Maintain a non-retaliatory culture that encourages reporting of potential hazards, near-misses, incidents, and non-compliance

18.2 Environmental Protection and Mitigation Measures

Mitigation measures provided in the Project-specific EPP (Appendix B of this ESA) are guided by Enbridge's Environmental Guidelines for Construction.

The Project-specific EPP is written in construction specification format for inclusion in relevant contract documents and include mitigation commitments found in the ESA. Information gathered during the background environmental surveys and studies, the Project public consultation process, and the Indigenous engagement process have been used to develop the mitigation measures in this ESA. Additional information gathered during these processes are included in the Project-specific EPP (Appendix B of this ESA) and ESIS (Appendix C of this ESA) which will also be accessible in the field office(s) during execution of the Project.

The Project-specific EPP will be updated throughout the regulatory process as necessary to include additional commitments that may occur from ongoing consultation and engagement, or as a result of the regulatory process. Site-specific mitigation measures and associated mapping will be updated, where applicable. Relevant contingency and management plans are appended to the EPP. To the extent of any inconsistency between this ESA report and the Project-specific EPP, the latter will prevail.

18.3 Environmental Training

Westcoast will conduct environmental training with all field personnel involved with physical abandonment activities, as needed. This training will be implemented in two levels based on increasing knowledge requirements and responsibility levels. The two levels of orientation conducted will include an advanced training session for management and supervisory personnel (e.g., Contractor and Westcoast), and environmental inspection staff, and a basic level for all other Project personnel. The training will include expectations on environmental protection, key environmental issues, and corresponding Project mitigation measures.

18.4 Environmental Inspection

Westcoast will retain the services of a qualified EI during physical abandonment activities. The EI will be familiar with pipeline construction and abandonment activities, as well as with the potential effects and corresponding mitigation available to avoid or reduce the effects of the Project. The EI will monitor compliance with the EPP, all permit or Approval Conditions, applicable environmental regulations and guidelines, and other environmental commitments. Working with the Westcoast Construction designate, the EI will report directly to the Westcoast PEL. The Westcoast PEL will be available to the EI for decision-making support and resolution of environmental resource issues arising onsite.

The EI will monitor physical abandonment activities, inspect completed work, and prepare daily reports of activities and conditions. The EI will carefully monitor environmental issues and the implementation of mitigation measures. If the mitigation measures are found to be ineffective, the EI will consult with the Construction designate and the Westcoast PEL. The EI will also be responsible for:

- suggesting additional or alternative mitigation measures;
- noting potentially adverse environmental effects;
- identifying site-specific issues; and
- determining the status of environmental issues physical abandonment activities.

Throughout and following completion of physical abandonment, the EI will work with the PEL and Construction designate to prepare the Environmental As-built Report for the facilities removed and abandoned in-place making use of the daily reports, photographs, and records of government liaison. The Environmental As-built Report will include a description of the existing condition of the Project Footprint and the construction program and mitigation measures employed, as well as the status of outstanding environmental issues and concerns.

18.5 Issue Monitoring

Westcoast will carry out the Project in an environmentally responsible manner through the assessment of environmental issues as well as the effective planning and implementation of mitigation measures and contingency plans. These initiatives will be managed through the establishment of compliance initiatives, such as environmental training and inspection.

If an unforeseen environmental issue arises during physical abandonment activities for which no mitigation measures have been approved, the PEL, the EI, and the Contractor will formulate a plan of action in consultation with the appropriate regulatory authorities, if warranted. The plan of action will include measures to avoid or mitigate environmental impacts.

19. Follow-up and Monitoring

Following the completion of physical abandonment activities, Westcoast will reclaim the disturbed sites and conduct PCM for a period of 5 years to ascertain if vegetation regrowth is on an appropriate trajectory to successfully meet equivalent land capability. In addition, long-term monitoring of the pipeline right-of-way by aerial flyovers is planned to account for the remote possibility of issues arising in the long-term following completion of the PCM program.

The purpose of the reclamation monitoring phase of the Project is to:

- assess the effectiveness of environmental protection measures implemented during physical abandonment activities;
- review the success of re-establishing equivalent land capability at areas disturbed during physical abandonment activities; and
- document any corrective actions or opportunities for improvement on future projects.

19.1 Reclamation Goals

The goal for reclamation and abandonment in-place is to ensure that the Project Footprint is on an appropriate trajectory to successfully meet equivalent land capability on and off right-of-way.

19.2 Post-Physical Abandonment Monitoring

Westcoast will conduct monitoring in accordance with reclamation expectations and applicable regulatory requirements. Westcoast will monitor restoration success over the PCM program (Years 1, 3, and 5 following completion of final cleanup). If issues are identified during monitoring, Westcoast will implement an adaptive management protocol to address identified issues and conduct further monitoring. Mitigation measures described in the EPP are based on the principle that land reclamation success will be measured against adjacent site conditions that are considered to be representative of expected land use.

Following the first, third, and fifth full growing seasons after final cleanup, monitoring will be conducted that includes:

- inspecting areas disturbed using ground reconnaissance to capture previously unidentified environmental issues;
- evaluating the natural recovery of lands disturbed during physical abandonment activities;
- assessing the effectiveness of mitigation practices used during physical abandonment activities;
- evaluating the recovery of ecological function of wetlands disturbed during physical abandonment activities; and
- recommending further remedial measures, if warranted, to be implemented to address outstanding environmental issues in a timely manner.

Preliminary work may be required to develop an Environmental Issues List based on a review of relevant planning, construction, and environmental reports, as well as any other documentation of potential issues encountered during physical abandonment. The Environmental Issues List will form the basis for the field inspection and monitoring program.

Preliminary work will be followed by ground or aerial reconnaissance, or both. During the reconnaissance, Westcoast will inspect the pipeline right-of-way to assess its condition and the effectiveness of mitigation and reclamation measures. The Environmental Issues List will be used to track issues, and will be updated as issues are resolved, or as new ones are discovered. When an environmental issue is identified, the extent of the affected area will be delineated, and the cause of the deficiency identified. Where warranted, the affected area will be scheduled for repair.

The reclamation assessments will include a visual evaluation of the physical landscape, vegetation, soils, watercourses, wetlands, wildlife, and Heritage Resources, as described in the following subsections. Additional expertise will be sought to assess specific issues that arise, if necessary.

19.2.1 Landscape Assessment

The landscape assessment consists of visual observations of surface drainage, coarse fragments, and microtopography (e.g., subsidence, mounding, and erosional features). Where potential issues are observed, a more detailed comparison is made to a reference site off the Project Footprint. The indicators for the determination of landscape and terrain reclamation success include the following five subcategories:

- Refuse
- Coarse fragment content
- Contour and drainage re-establishment
- Microtopography (landform features)
- Erosion (soil stability)

Success of landscape and terrain reclamation is determined by comparing consistency of the reclaimed Project Footprint with the pre-construction conditions and/or the surrounding landscape (i.e., the reference habitat).

<u>Refuse</u>

The presence of construction-related refuse (e.g., construction/abandonment materials and slash piles) can affect the management of soils and landscapes on all land uses. Where construction- or abandonment-related refuse is observed on, or adjacent to, the right-of-way, the affected area will be delineated and documented.

<u>Coarse Fragment Content</u>

The presence of coarse fragments (e.g., stones, gravel, and woody debris) can affect the management of soils and landscapes on all land uses. Where an excess of coarse fragments is evident as a result of abandonment activities on the Project Footprint (when compared to control sites off the Project Footprint), the affected area will be delineated and documented.

<u>Contour and Drainage Re-establishment</u>

Proper contour re-establishment involves returning any disturbed area to its pre-existing state without altering natural drainage patterns or topography. Where alterations to natural drainage patterns are evident, the degree of disturbance on the Project Footprint will be delineated and documented. The drainage characteristics observed on the Project Footprint will be considered, as well as the effectiveness of drainage controls (e.g., trench breaks and ditch plugs), where applicable.

Microtopography

Microtopography will be assessed by describing landform features as they exist within the reclaimed topography on the Project Footprint compared to the naturally occurring landform features found off the right-of-way. Any evidence of soil erosion, ponding water, subsidence, slumping will be measured, while considering the intended land use on and off the right-of-way. Excessive elevation changes and a delineation of the affected area will be recorded.

Erosion

Erosion monitoring involves an assessment of the effects of wind and water on the Project Footprint (including steep slopes) after abandonment and reclamation activities are complete and includes an assessment of the current function and effectiveness of any erosion or sediment controls, as well as water diversion measures implemented during or after construction. Recommendations for the implementation of additional measures or repairs to existing installations will be determined, where applicable.

19.2.2 Vegetation Assessment

Plant species composition and growth are considered as factors in the vegetation assessment. In wetlands, differences in percent cover between the physical work locations and the reference site are assessed more conservatively than in forested land, since decreases in vegetation cover are typically directly related to concurrent decreases in wetland function. In forested areas, the establishing plant cover is evaluated based on emerging desirable vegetation (e.g., early successional species consistent with the surrounding vegetation community) and the presence or absence of Noxious weeds. The vegetation parameters assessed can include:

- vegetation type, health, vigour, and distribution on perennial lands
- canopy cover
- litter presence (i.e., tame pasture and native grassland only) coverage
- bare soil exposure
- presence of a positive growth trajectory for vegetation
- weed distribution, density, and species present

Vegetation growth parameters, such as height, density, and health on the Project Footprint will be visually assessed qualitatively and, where appropriate, quantitatively compared to adjacent vegetation off the Project Footprint (or within the vicinity of the Project Footprint).

Vegetation health will be rated as poor, fair, or good based on a visual assessment of plant growth characteristics, including stress. Weed densities will be rated as low, moderate, or high, depending upon their distribution and density pattern (BC MOFR 2010).

19.2.3 Soils Assessment

The linkage between vegetation community establishment success and soil quality is well-documented, and in many circumstances, vegetation is the main indicator of an underlying soil issue. Where areas with poor vegetation growth are observed on the Project Footprint, a secondary assessment investigating the soil profile may be completed. In these circumstances, the degree of soil physical or chemical changes, and alterations (i.e., change in organic matter and soil texture due to admixing of subsoil with upper surface material, compaction and change in soil structure, salinity/sodicity, and upper surface material depth) are assessed against representative reference sites to identify potential issues within the disturbed soil profile.

Soil Compaction

Soil compaction will be assessed by physical resistance tests (e.g., using a shovel and/or penetrometer), visual observations of physical soil characteristics (e.g., aggregate size and strength), plant rooting patterns (e.g., inped or exped roots), and vegetation growth on the Project Footprint. In some circumstances, bulk density testing may also be used to assist with quantifying the degree of compaction on the Project Footprint.

The degree of compaction will be determined by comparing characteristics present on the Project Footprint with equivalent soil and vegetation characteristics present off the Project Footprint. In areas where the observed degree of compaction differs from those occurring off the Project Footprint, the observed degree of compaction was rated as minor, moderate, or severe.

- **Minor compaction -** physical resistance tests and observations of physical soil characteristics reveal a minor amount of compaction with minor effects to vegetation growth.
- **Moderate compaction -** physical resistance tests and observations of physical soil characteristics reveal a moderate amount of compaction with moderate effects to vegetation growth.
- **Severe compaction -** physical resistance tests and observations of physical soil characteristics reveal a severe amount of compaction with severe effects to vegetation growth.

Topsoil Depth

Where topsoil depths indicate a loss of topsoil on the Project Footprint greater than 20 percent of the control site average off the Project Footprint (i.e., the reference habitat), an attempt will be made to delineate the area of topsoil loss.

Topsoil and Subsoil Mixing

Where soil mixing is evident, an estimation of the extent of the affected area observed on the Project Footprint will be recorded and delineated. If vegetation on the Project Footprint do not appear to be affected by the soil mixing issue, no further soil assessment work will be conducted. Soil mixing will be rated as minor, moderate, or severe, depending upon the changes in topsoil colour, texture, structure, and aggregate size, and vegetation cover observed on the right-of-way compared to the control sites off the Project Footprint (i.e., the reference habitat).

- **Minor soil mixing -** 10 to 30 percent soil mixing observed based on changes in topsoil colour, structure, and aggregate size on the right-of-way, resulting with the appearance of minor effects to vegetation growth.
- **Moderate soil mixing -** 30 to 50 percent soil mixing observed based on changes in topsoil colour, structure, and aggregate size on the right-of-way, resulting with moderate effects to vegetation growth.
- **Severe soil mixing -** 50 to 100 percent soil mixing observed based on changes in topsoil colour, structure, and aggregate size on the right-of-way, resulting with severe effects to vegetation growth.

19.2.4 Wetland Assessment

Wetlands within the physical abandonment locations are assessed for alterations to, and recovery of, wetland function, and to validate the effectiveness of mitigation measures. Disturbed wetlands (e.g., infrastructure sites within wetlands) are revisited to assess the progress of natural recovery and determine whether the affected area is similar in function to the surrounding off footprint (i.e., reference site) wetland system where appropriate.

The following parameters, which are representative of wetland hydrological, biogeochemical, and habitat functions, are included as part of the wetland assessment, in conjunction with the vegetation assessment.

- Vegetation cover – consistent species composition, compared to the reference wetland areas. Alterations to vegetation types within a wetland on the Project Footprint, compared to off the Project Footprint, can be an identifier of changes in substrate conditions that result from any topographical changes.
- Presence of invasive or undesirable species – Noxious weed growth along the Project Footprint is recorded, as well as invasive species or species present due to any influences in previous hydrological function/water table depth.
- Vegetation health and vigour – this is noted if poor or dead.
- Presence of bare ground caused by pipeline abandonment activities.
- Overall topography (e.g., profile contours and elevation) – compared to the reference site. The elevation on the Project Footprint is assessed against the wetland reference site to determine whether the targeted moisture regime is likely to re-establish.
- Surface water flow and potential erosion along the Project Footprint, including evidence of channelized and ephemeral flow.
- Evidence of changes in sediment oxidation state, including stained sediment or sediment that smells (i.e., whether the wetland has become anoxic).

Differences in a wetland between the Project Footprint and reference site (or baseline conditions if a representative offsite reference site was not available) are investigated further.

19.2.5 Wildlife

Vegetation re-establishment is a key component of wildlife habitat restoration. Methods for vegetation monitoring were outlined in previous subsections. Westcoast will monitor restoration success over the PCM period (Years 1, 3, and 5 following completion of final cleanup). If issues are identified during monitoring, Westcoast will implement an adaptive management protocol to address identified issues and conduct further monitoring.

19.3 Project Footprint Criteria for Success

The effectiveness of the planned mitigation will be determined based on the success of:

- mitigation measures implemented during and after the physical abandonment activities; and/or
- remedial actions in returning the disturbed area within the Project Footprint to a trajectory to successfully meet equivalent land capability reflective of pre-Project site conditions.

19.4 Further Remedial Measures

Further remedial measures may be warranted following completion of the PCM program at locations where mitigation has been unsuccessful in avoiding or reducing potential Project effects. As a result, additional remedial measures will be employed, and the deficient site(s) will be subject to continued monitoring. In addition, long-term monitoring of the pipeline right-of-way by aerial flyovers is planned to account for the remote possibility of issues arising in the long-term following completion of the PCM program.

19.5 Reporting

A PCM report will be prepared to document the results of each monitoring event (in Years 1, 3, and 5 following completion of final cleanup) and track the progress of the restoration at the physical work locations. Each report will discuss the elements described in subsection 19.2 of this ESA. If required, the reports will be filed with the CER.

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20. Conclusion

This ESA for the Project concludes that physical abandonment activities and abandonment in-place will not result in significant environmental or socio-economic effects.

The environmental concerns identified are consistent with expected and known potential effects arising from the Project and can be mitigated by standard environmental protection and monitoring measures.

The socio-economic concerns identified are consistent with expected and known potential effects arising from the Project. The Project is in an area of high TLRU, and the abandonment of the pipeline will allow the land and resources to return to a more natural state for use by Indigenous groups. Westcoast's engagement activities will continue post-Application filing, with a focus on addressing issues that remain and informing all potentially affected parties as construction planning commences. GBA+ principles were applied during the assessment. There are some project activities that could not be conducted by personnel with certain physical disabilities, but this was due to the nature of the required work and remote location requiring travel as opposed to any bias or discrimination.

CER compliance does not end when the pipeline has been abandoned and all CER-imposed conditions are satisfied. Once the assets are abandoned and the CER-ordered conditions are met, the risk to public safety, property, and the environment are to be at a level that is acceptable in the public interest. Towards that end, the pipeline company is expected to have a long-term monitoring program. Should any part of the abandoned pipeline become exposed or otherwise require additional care over the course of time, the company or its successor is required to take appropriate remediation actions (NEB 2016).

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Appendix A
Comparison of Predicted Effects from Abandoning In-Place and Removal

Appendix B
Environmental Protection Plan

Appendix C
Environmental Site Information Sheets

Appendix D
Phase I Environmental Site Assessment