DETAILED IMPACT ANALYSIS

Jasper Interconnection Project

Internal Project File No: J14-067

Prepared for

ATCO Electric Ltd.

Version 3.0

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Executive Summary

Introduction and Project Description

ATCO Electric Ltd. (ATCO Electric) is proposing to construct and operate the ATCO Electric Jasper Interconnection Project (the Project), which will connect Jasper National Park (JNP) with the Alberta Interconnected Electric System (AIES). The current electrical generation network for JNP is nearing the end of its operational life, and ATCO Electric is proposing to construct a new 69-kilovolt (kV) single-circuit transmission line (to be designated 6L530) spanning approximately 44.7 kilometre (km) from Jasper, Alberta to an AIES interconnection point at the JNP boundary at SW 14-49-27 W5M (see Figure ES-1). As part of the Project, ATCO Electric intends to construct the Sheridan Substation 2085S (Substation) located within the existing Palisades Thermal Generating Station (Palisades) site at NW 2-46-1 W6M. When the substation is commissioned, ATCO Electric will decommission Palisades.

Regulatory Framework

The following subsections provide information on the regulatory context for the Project within JNP.

Canada National Parks Act

In JNP, this Project is allowable under Section 38(a) of the *National Parks General Regulations*, whereby the Minister may enter into an agreement for the development, operation and maintenance in the Park of electrical services for use only in the Park.

As part of decommissioning of Palisades, ATCO Electric will reduce the current fence line to a smaller area around the substation. Under Section 15(2) of the *Canada National Parks Act*, lands outside the new reduced fence line will revert to the Crown.

In addition, the Project will require a development permit and other authorizations under the *Canada National Parks Act*.

Canadian Environmental Assessment Act

The Project is not considered a 'designated project' under the *Canadian Environmental Assessment Act*, 2012 as per the *Regulations Designating Physical Activities*. Parks Canada Agency is the responsible authority for assessing the Project in accordance with Section 67 of the *Canadian Environmental Assessment Act, 2012*. The Project is assessed in accordance with *Parks Canada Directive on Impact Assessment, 2015* which prescribes that projects involving the expansion of regional or community power supply, power lines, pipelines, or other regional utilities infrastructure are subject to a DIA.

Alberta Hydro and Electric Energy Act

ATCO Electric is additionally applying to the Alberta Utilities Commission (AUC) pursuant to the *Hydro and Electric Energy Act*, for permits to construct and licenses to operate the Project.

Project Components

The Project will consist of one 69-kV single-circuit transmission line (to be designated as 6L530), approximately 44.7 km in length. The proposed transmission line will depart from the JNP east boundary and continue west to the proposed Sheridan Substation 2085S located within the Palisades site. Table ES-1 provides information on the transmission line and substation.

Table ES-1. 6L530 Transmission Line Details

Nominal Voltage	Number of Electrical Circuits	Typical Structure Height	Typical Span Between Structures	Typical Right-of-Way Width
Typical Conventional/Insulated 69-kV Single-Pole Structure				
69-kV	1 – 2	13 – 20 m	95 – 150 m	10 m in total
Typical 69-kV Conventional H-Frame Structure				
69-kV	1 – 2	15 – 23 m	200 – 250 m	varies

m = metre

Route Selection

ATCO Electric's route selection process started with identifying the Project area that accounted for large scale geographic, environmental, and social constraints. The Project area is bound by the Athabasca River Valley entering JNP from the north, terminating at Palisades to the south.

ATCO Electric selected the route along existing corridors such as roads, distribution corridors, and pipeline corridors in order to make use of better access, straighter alignments, and potential right-of-way abutment to reduce new clearing. The preferred route selection combines linear disturbances and shares seasonal access. The proposed route has been routed adjacent to existing disturbance for 44.1 km of its 44.7 km total length (99 percent). Existing linear disturbance includes the Highway 16, Snaring Road, Celestine Lake Road, Canadian National Railway, Kinder Morgan Canada Inc. Trans Mountain Pipeline and TMX Anchor Loop Project pipeline rights-of-way, ATCO Pipelines, and existing distribution line rights-of-way.

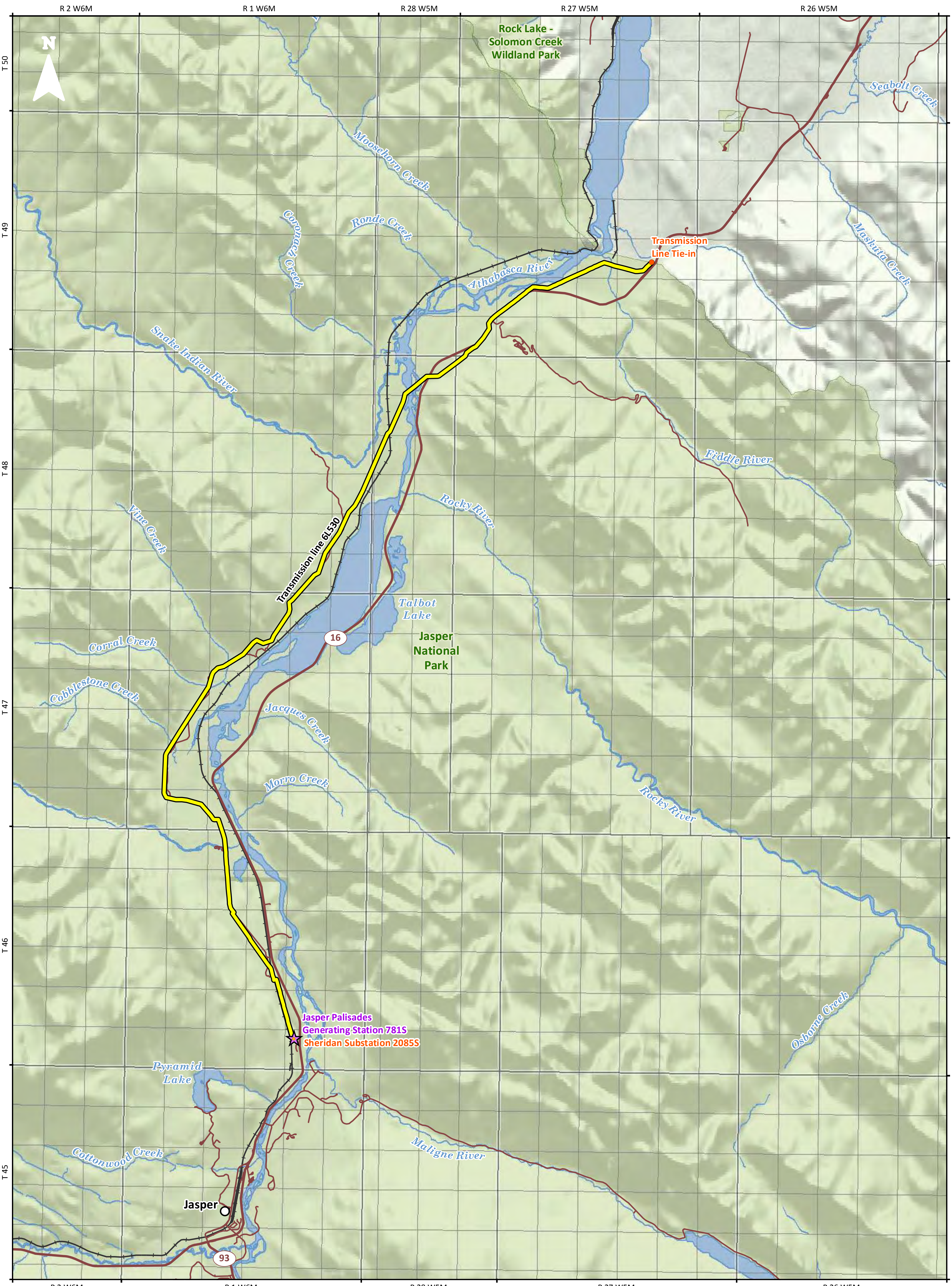
ATCO Electric, in collaboration with Parks Canada will continue to conduct public and Indigenous consultation prior to project approval. Routing opportunities presented by stakeholders will be evaluated and may result in alterations where significant benefits to the Project would be achieved.

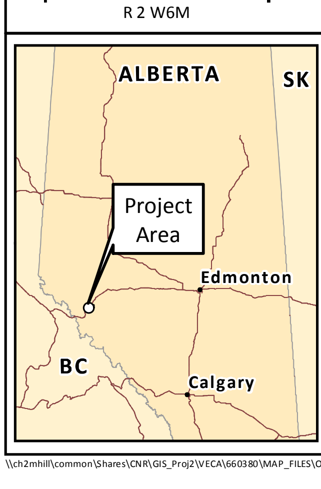
Right-of-Way and Temporary Workspace

The 6L530 transmission line will have a typical width of 10 m, total Footprint of the proposed right-of-way is approximately 46.1 hectares (ha). Temporary facilities will be required during the construction phase of the Project including laydown areas, temporary workspace and access roads. ATCO Electric has identified several temporary workspace areas (occupying approximately 7.9 ha) and four laydown sites in the Pocahontas, Devona, and Snaring areas, and the Palisades site (occupying approximately 7.6 ha). ATCO Electric has located laydown sites, temporary workspace and access roads in previously disturbed areas to the extent practical. The total Footprint size is approximately 61.9 ha and includes the proposed route, laydown yards, temporary workspace, and the Sheridan Substation.

Workforce

ATCO Electric estimates a maximum of 150 workers during peak construction of the transmission line and substation. In addition, 25 workers are anticipated for the decommissioning of Palisades. ATCO Electric will be accommodating the workforce in either Jasper or Hinton, Alberta.





Legend	
Proposed Route	Watercourse
Highway (892)	Waterbody
Road	Park/Protected Area
Railway	

ATCO Electric

SCALE: 1:150,000

0 1 2 3 4 5 km

(All Locations Approximate)

FIGURE ES-1

PROJECT OVERVIEW

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Hillshade: TERA 2008; Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Parks/Protected Areas: NRCan 2016, ATPR 2012; Jasper: NRCan 2003; Generating Station, Substation, Proposed Route: ATCO Electric Ltd. 2016.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

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Decommissioning

At the time of decommissioning the Project, it is expected that ATCO Electric will review and consider current options, issues, and regulatory requirements in consultation with stakeholders and regulatory authorities having an interest in the proposed works. Decommissioning of the Palisades power plant for the construction of the Sheridan Substation is considered part of the construction phase.

Public and Indigenous Engagement

ATCO Electric is required to undertake comprehensive Public and Indigenous Engagement program for the Jasper Interconnection Project and the DIA for review and approval by Parks Canada. To date public and Indigenous engagement has included information sessions with interested groups, attendance at a Jasper Chamber of Commerce Annual General Meeting, Project introduction at the Jasper Indigenous forum, newspaper articles and a public review and comment period for the DIA. ATCO Electric has considered and responded to the degree reasonably possible, the feedback received from the public and Indigenous groups which has led refinements of the Project (adjustments to Project Footprint, timing of construction, mitigation measures). The Project refinements and additional mitigation measures are reflected in this final version of the DIA submitted to Parks Canada.

Effects Assessment

Landform and Soils

Existing landform and soils conditions within the Landforms and Soils Study Area (SA) (as defined in Section 5.21.1.) were determined though desktop review and field surveys. Soil mapping within the SA identified five soil orders within the Montane Natural Subregion and Subalpine Natural Subregion: brunisolic; luvisolic; regosolic; gleysolic; and organic. Permafrost is not expected to occur in soils located within the Project Footprint. Several ecological land classifications are crossed by the Project Footprint which describe typical terrain and soil relationships for defined ecosite types and their associated potential soil constraints, these are described further in Section 5.1. Soil characteristic and constraints were confirmed during the 2015 field surveys. The effects assessment for Landforms and Soils considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-2).

Table ES-2. Summary of Potential Effects on Landforms and Soils

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Decreased soil productivity from surface disturbance of calcareous soils	• Reduction in soil fertility resulting from admixing with calcareous soils	• Project contribution to cumulative incremental change of soil fertility
Water and/or wind erosion	• Reduction in soil fertility from the loss of topsoil/subsoil resulting from water and/or wind erosion	
Soil compaction and rutting	• Reduction in soil fertility due to mixing of topsoil and subsoil due to compaction and rutting	
Mixing of topsoil/strippings with subsoil	• Reduction in soil fertility resulting from over stripping soils during salvage and replacement resulting in mixing	

The key mitigation measures to reduce potential effects on Landforms and Soils for the Project are outlined in Section 5.1 and were developed based on industry-accepted best management practices. The potential residual effects of the Project on Landforms and Soils are considered reversible and minor in magnitude.

Vegetation

Existing vegetation conditions within the Vegetation SA (as defined in Section 5.2.1.1) were determined through desktop review, field surveys, and Ecological Land Classification mapping. During the 2015 and 2016 vegetation surveys, 18 Alberta Conservation Information Management System-listed rare vegetation species that warrant mitigation (31 Element Occurrences) were observed along the proposed 6L530 transmission line right-of-way. One Prohibited Noxious weed species (spotted knapweed) and six Noxious weed species (creeping [Canada] thistle, Dalmatian toadflax, ox-eye daisy, perennial sow-thistle, tall buttercup, and yellow [common] toadflax) were observed. Signs of mountain pine beetle were observed at NE 5-47-1 W6M, and evidence of controlled burns and removal of colonized trees (i.e., cutting and burning) were observed at SW 14-49-27 W6M near the eastern boundary of JNP.

Along the Project Footprint, approximately 30.0 ha (48 percent of the Project Footprint) of native vegetation will be cleared. ATCO Electric's right-of-way widths vary with the voltage and structure type being utilized for each project. A typical 72 kV transmission line being constructed outside of JNP would require an 18 m right-of-way with an associated hazard tree area outside of the 18 m. Within JNP, ATCO Electric will utilize a non-standard right-of-way width of 10 m for construction and maintenance activities to ensure the safe and reliable operation of the electrical facilities, while respecting and protecting the Park and its world heritage setting.

ATCO Electric determined that approximately 34.6 ha or 75 percent of the proposed right-of-way and 7.2 ha or 91 percent of the temporary workspaces are open areas with sparsely distributed trees present. ATCO Electric estimates that approximately 14,972 trees greater than 2.5 m in height on the 10 m wide proposed right-of-way and up to an additional 1,958 trees in the temporary workspace will be removed. While ground verification is required to determine if clearing can be avoided in the case of temporary workspaces, no tree clearing is planned in any of the temporary laydown sites.

Adjacent to the proposed right-of-way, approximately 20.7 ha of additional area was identified to potentially contain hazard trees that will require some level of treatment to reduce the associated hazard to the transmission line. ATCO Electric, estimates that up to 10,010 trees will require some level of treatment, but this number will likely be reduced somewhat as ground verification is required prior to tree removal to determine whether select trees can be retained. A prescribed burn is scheduled by Parks Canada in 2017, a portion of which will overlap the Project Footprint and adjacent target areas for hazard tree removal.

For comparison, if the typical 18 m right-of-way was applied to the Project the resultant vegetation removal numbers (that is, the number of trees greater than 2.5 m in height) would be approximately 27,539 trees on the 18 m wide right-of-way, approximately 1,761 trees within the temporary workspaces and approximately 6,144 trees within the hazard tree management areas. Compared this to the proposed 10 m right-of-way, there is a difference of 8,504 trees or approximately 25 percent reduction in the amount of clearing required for the Project construction.

According to the provincial land cover data (Alberta Biodiversity Monitoring Institute, 2010) the area currently occupied within JNP by a forest cover type is approximately 401,486 ha. The Project 10 m right-of-way, temporary workspace, and hazard tree areas comprise a total of 74.2 ha or approximately 0.0002 percent of forest cover within the Park.

The effects assessment for Vegetation considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-3).

Table ES-3. Summary of Potential Effects on Vegetation

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Loss or alteration of native vegetation	• Loss or alteration of native vegetation.	• Project contribution to cumulative incremental change of native vegetation community composition.
Loss or alteration of rare vegetation or rare ecological communities	• Loss or alteration of rare vegetation or rare ecological communities.	• Project contribution to cumulative effects on rare vegetation species and rare ecological communities.
Weed introduction or spread	• Weed introduction or spread.	• Project contribution to cumulative effects on weed introduction or spread.
Introduction or spread of forest pests	• Introduction or spread of forest pests.	• Project contribution to cumulative effects on the introduction or spread of forest pests.

Routing and selective vegetation management is the primary mechanism for avoiding or reducing potential effects of the Project on Vegetation. Routing criteria such as using existing access and overlapping existing disturbances to minimize new disturbance and clearing for the Project right-of-way, utilize existing distribution lines where practical, and minimizing transmission line length along environmentally sensitive areas such as watercourses and wetlands were implemented during Project planning. The key mitigation measures developed for the Project include limiting vegetation disturbance through winter construction and use of access matting and snow packing along the right-of-way, implementing the Plant Species of Concern Discovery Contingency Plan where communities or species of concern potentially overlap with work activities, and monitoring the effectiveness of revegetation efforts. With the implementation of the key mitigation measures, potential residual effects of the Project on Vegetation are considered reversible and minor to moderate in magnitude.

Aquatic Wildlife and Ecosystems

Within the Aquatic SA, 24 tributaries of the Athabasca River were assessed, as well as one crossing of the Athabasca River. The mean annual discharge at the headwater monitoring station is 2,790,000 cubed decametres (dam). The Athabasca River flows over 1,400 km from the headwaters into Lake Athabasca and the Peace-Athabasca Delta. The Athabasca River is a Canadian Heritage River System and is considered a scheduled navigable waterway under the *Navigable Waters Protection Act.* There are no fish species identified within the Aquatic SA that are listed under the *Species at Risk Act*. Athabasca Rainbow Trout are found in the Aquatics SA and are listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and 'at risk' by Alberta Environment and Parks (AEP) in the *General Status of Alberta Wild Species*. Bull trout are listed as Sensitive by AEP under the AEP *General Status of Alberta Wild Species* and Threatened under the provincial *Wildlife Act*. Pygmy whitefish are listed as May Be At Risk by AEP under the AEP *General Status of Alberta Wild Species*.

Fish and fish habitat field assessments were performed at 12 watercourses during the 2015 field survey. Water quality measurements were conducted at sites to determine the suitability of water conditions with respect to fish survival. Water quality was within the normal ranges for species expected or sampled within the Project Footprint. During the fish and fish habitat field assessments, two fish species were captured, Northern pike and Brook trout.

The effects assessment for Aquatic Wildlife and Ecosystems considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-4).

Table ES-4. Summary of Potential Effects on Aquatic Wildlife and Ecosystems

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Alteration of natural surface water flow patters	• No residual effect identified.	• N/A
Increased surface runoff	• No residual effect identified.	• N/A
Alteration or loss or riparian habitat function	• Direct or indirect alteration or loss of riparian habitat function resulting from Project activities.	• Project contributions to the cumulative alteration or loss of riparian habitat function.
Reduction in surface water quality	• Reduction in surface water quality due to increased sediment concentrations resulting from erosion from approach slopes and banks.	• Project contributions to the cumulative reduction in surface water quality
Fish mortality and injury	• No residual effect identified.	• N/A
Interbasin transfer of aquatic organisms	• No residual effect identified.	• N/A

Key mitigation measures to reduce or eliminate potential effects on Aquatic Wildlife and Ecosystems include limiting disturbance to natural drainage channels during grading, implementation of standard erosion and sediment control measures, maintaining compatible vegetation or ground mat within riparian areas, and using existing bridges and crossings where possible to minimize the development of new crossings. With the implementation of the key mitigation measures described in this DIA, potential residual effects of the Project on Aquatic Wildlife and Ecosystems are considered reversible and minor to moderate in magnitude.

Wetlands and Hydrology

Wetlands and hydrological features encountered by the Project were determined through desktop review of relevant and available documents and database, satellite imagery interpretation, and wetland delineation. Ground-based wetland surveys were conducted in summer 2015 to confirm wetland classes and refine wetland boundaries identified through desktop studies. The Project is located within the South Rocky Mountain subregion of the Rocky Mountain Wetland Region. The Project Footprint does not occur in any Important Bird Areas, Migratory Bird Sanctuaries, National Wildlife Areas, Western Hemisphere Shorebird Reserves, Ramsar Wetlands of International Importance, or World Biosphere Reserves. There are 21 known water wells and 10 known springs located within 400 m of the Project Footprint. A total of nine wetlands were identified as being crossed by the 6L530 transmission line route, covering a total area of 1.52 ha (4.8 percent of the 6L530 transmission line route). Wetlands classes identified include marshes, swamps, and shallow open water wetlands. No wetlands were identified within Pocahontas, Devona, Snaring, and Palisades laydown areas. In addition, no wetlands were encountered by the substation.

The effects assessment for Wetlands and Hydrology considered the following potential effect, potential residual effects, and potential cumulative effect during construction and operations of the Project (Table ES-5).

Table ES-5. Summary of Potential Effects on Wetlands and Hydrology

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Loss or alteration of wetland function (i.e., habitat, hydrology, biogeochemistry) during construction and maintenance activities during operations	• Loss or alteration of habitat function during and following construction and maintenance activities during operations until vegetation is re-established.	• Project contribution to cumulative effects on alteration of wetland habitat function.
	• Loss or alteration of hydrological function during and following construction and maintenance activities during operations until natural drainage patterns are restored.	• No cumulative effects identified.
	• Loss or alteration of biogeochemical function during and following construction and maintenance activities during operations until sedimentation is controlled at structure locations, related facilities, and access locations, vegetation is re-established, hydrology is restored, and biological/chemical processes have recovered.	• No cumulative effect identified.

ATCO Electric is intent on achieving the goal of “no net loss” of wetland function during construction and maintenance activities during operations of the Project. Where feasible, the transmission line has been routed to reduce potential effects on Wetlands by implementing routing and design decisions such as following existing linear infrastructure and altering transmission line structures, so that a greater ground distance can be spanned (i.e., to avoid wetland features). Key mitigation measures to reduce or eliminate potential effects on wetlands and hydrology include maintaining compatible vegetation or vegetated ground mat within the riparian area of wetlands, to the extent possible, and installation of erosion and sediment control measures. With the implementation of the key mitigation measures, the potential residual effects of the Project on the of loss or alteration of wetland habitat, hydrological, and biogeochemical function is considered reversible and minor to moderate in magnitude.

Wildlife and Wildlife Habitat

In general, wildlife habitat within JNP, and in proximity to the proposed route, is largely comprised of later-seral stage coniferous-dominated forests. Although JNP overall has relatively little urban or industrial development and disturbance, millions of tourists visit the park each year for recreation. Effects of tourism and recreational use on wildlife in the park may include the modification of movement patterns, a shift in habitat use that is unrelated to seasonal habitat quality, increased hormonal stress and predation rates, and lower survivorship and mating success. There are 13 species with special conservation status with the potential to occur in the Wildlife SA (Appendix 5.5A). During the waterfowl surveys, 21 suitable wetlands or waterbodies were visited along the Project within JNP and 3 waterfowl species (i.e., common goldeneye, mallard, and common loon) were observed at two of the sites. No active raptor nests were observed during the field studies along the Project or during the aerial overflight. Raptor species observed include merlin and red-tailed hawk. No Columbian ground squirrels were seen or heard at the sites visited for field studies. Incidental mammal observations either enroute to or from the sites, or within Columbian ground squirrel survey sites, include tracks of wolf, elk, deer, and black bear. Commonly observed incidental songbird species identified during the field studies include clay-coloured sparrow, dark-eyed junco, Lincoln’s sparrow, song sparrow, white-throated sparrow, Swainson’s thrush, and yellow-rumped warbler. In addition, a bank swallow colony (listed as Threatened by COSEWIC) was observed during the field studies. Amphibian breeding activity was observed at one site. Wildlife polygons, for a variety of important wildlife habitat areas, have been delineated by Parks Canada and the recommendations and guidelines associated with each wildlife polygon have been incorporated into Project-specific mitigation measures.

The effects assessment for Wildlife and Wildlife Habitat considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-6).

Table ES-6. Summary of Potential Effects on Wildlife and Wildlife Habitat

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Change in habitat	• Wildlife habitat loss or alteration.	• Project contribution to cumulative habitat loss or alteration.
Change in movement	• Displacement or alteration of wildlife movement patterns.	• Project contribution to cumulative displacement or alteration of wildlife movement patterns.
Change in mortality risk	• Increased wildlife mortality risk.	• Project's contribution to a cumulative increase in wildlife mortality risk.
Combined effect on wildlife	• Combined effect of the Project on wildlife.	• Cumulative effect of the combined effect of the Project on wildlife.

Key mitigation measures include routing as the primary mechanism for avoiding or reducing potential effects of the Project on Wildlife and Wildlife Habitat. Routing criteria for the Project included using existing access and overlapping existing disturbances to reduce new disturbance and clearing for the Project right-of-way, utilize existing distribution lines where practical to reduce habitat fragmentation, and minimizing transmission line length along environmentally sensitive areas such as watercourses and wetlands. In addition, scheduling Project activities outside of sensitive periods for wildlife to the extent feasible will further reduce potential residual effects on Wildlife and Wildlife Habitat. With the implementation of the key mitigation measures, the potential residual effects of the Project on Wildlife and Wildlife Habitat are considered reversible and minor in magnitude.

Air Quality and Greenhouse Gas Emissions

Ambient air quality along the Project is primarily affected by anthropogenic sources of emissions from transportation corridors (e.g., Highway 16, the Canadian National Railway main line, and local roads), and sources typical of municipal development such as home heating and the existing power plant located within the Atmospheric Regional Area (RA) (as defined in Section 5.6.1-1). The following contaminants were chosen for assessment since it was expected that Project activities would produce these emissions during construction and operations: nitrogen oxides (NO_x), carbon monoxide (CO), course particulate matter (PM_{10}), and respirable particulate matter ($PM_{2.5}$). The greenhouse gases (GHGs) included in the Project inventory are: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) since these are substances emitted by the combustion of carbonaceous fuels. The ambient background concentrations of contaminants of interest were reviewed from the Hinton monitoring station and all were found to be well within the Alberta Ambient Air Quality Objectives (see Section 5.6.3.2). Emissions estimates completed for the Project found that increases in Criteria Air Contaminants (CACs) emissions during construction are expected relative to existing background CAC concentrations which, is common during construction activities. However, based on the professional experience of the assessment team, the long-term average concentrations are expected to stay below the long term Alberta Ambient Air Quality Objectives. The Project's contribution to annual provincial and federal air and GHG emissions was estimated based on the Project description to characterize expected ambient air quality in the Atmospheric RA. Additionally, the Palisades power plant will be decommissioned and GHG and CAC operational emissions will cease to be produced by that facility. The effects assessment for Air Quality and GHG Emissions considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-7).

Table ES-7. Summary of Potential Effects on Air Quality and Greenhouse Gas Emissions

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Project contribution to air emissions	• Increase in air emissions during construction of the Project.	• The Project-related air emissions will act cumulatively with reasonable foreseeable developments and existing air emission sources in that an incremental increase in air emissions will occur. • As acknowledged in the scientific community and amongst policymakers, no individual activity is responsible for global effects on climate due to GHG emissions. The Project's GHG emissions will contribute to global effects on climate, but the contribution, though measurable, will be negligible in a provincial, federal, or global context. Further, the decommissioning of the Palisades power plant will result in the cessation of GHG emissions from that facility during operations.
Project contribution to GHG emissions	• Increase in GHG emissions during construction of the Project.	

Key mitigation measures identified to reduce or eliminate the potential effects on Air Quality and GHG Emissions were principally developed in accordance with ATCO Electric standards, industry, and provincial regulatory guidelines including the *Best Available Methods for Common Leaseholders*, ATCO Electric's Environmental Protection Plan (EPP) for JNP, and Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities. Key mitigation includes equipment maintenance, dust control measures, and using best available economically achievable technology during Project design on all facility-related sources. With the implementation of the key mitigation measures, potential residual effects of the Project on Air Quality and GHGs Emissions are considered minor in magnitude.

Aesthetics and Visual Resources

The aesthetics and visual resources of an area refer to the key landscape characteristics, as well as any existing disturbances that may determine the visual quality of a landscape. Visual aesthetics are especially important to consider in areas that are readily accessible by the public or frequently visited, as well as areas of high aesthetic or historic importance. Other aesthetic attributes could include sensory disturbances such as nuisance visual disturbance (e.g., lighting and temporary activities) and noise. The JNP of Canada Management Plan outlines the importance of a visitor's visual experience in JNP and states importance of careful stewardship and restoration along road, rail, and pipeline corridors to preserve the visual and ecological integrity of JNP. The JNP *Regulations* outlines the importance of quiet for visitor enjoyment during the day and night. In addition, JNP is a Dark Sky Preserve, which involves a commitment to protect the night sky by reducing or eliminating light pollution. Existing anthropogenic disturbances in the Visual and Visitor Experience SA include linear infrastructure such as Highway 16, local roads, power lines and pipelines, as well as recreational sites and park facilities, such as trails, cabins, highway turnouts, and campsites. The visual assessment utilized visualizations to represent potential visual effects anticipated for the Project from five viewpoints in JNP. The visualization, including modelled transmission line structures, are provided in Appendix 5.7-1. The effects assessment for Aesthetics and Visual Resources considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-8).

Table ES-8. Summary of Potential Effects on Aesthetics and Visual Resources

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Alteration of viewsheds	• Alteration of viewsheds.	• Project contribution to cumulative effects on aesthetics and visual resources.
Sensory disturbance	• Sensory disturbance for visitors during construction.	

Key mitigation measures identified to reduce the potential effects on Aesthetics and Visual Resources such as constructing outside peak tourist season, reclaiming temporary access roads/trails and conducting construction activities during daytime hours Monday to Saturday, and not within 1 km of active campgrounds on Sundays. With the implementation of key mitigation measures, potential residual effects of the Project on Aesthetics and Visual Resources are considered reversible and minor.

Visitor Experience

JNP currently receives over 2.2 million of visitors per year with potential for minor yearly fluctuation based on special events in the Park (e.g., 150th Anniversary of Canada's Confederation in 2017). Numerous roads, trails and campgrounds are located within the Project area. The Project area follows an existing industrial, commercial and transportation corridor. The effects assessment for Visitor Experience considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-9).

Table ES-9. Summary of Potential Effects on Visitor Experience

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Disruption of visitor services, facilities and access	• Disruption of visitor services, facilities and access routes during construction and operation	• Project contribution to cumulative effects on aesthetics and visual resources
Concern for visitor and public safety	• Concern for visitor and public safety during construction and operations	
Disruption of recreational activities	• Construction and regular maintenance activities will create temporary, localized disturbances	

Key mitigation measures identified to reduce the potential effects on Visitor Experience such as constructing outside peak tourist season, installation of safety barriers and signage and power line co-location. With the implementation of key mitigation measures, Project planning and scheduling, the potential residual effects of the Project on Visitor Experience are considered reversible and negligible to minor in magnitude.

Heritage Resources

A Historical Resources Impact Assessment (HRIA) was completed by Bison Historical Services Ltd. in 2016. Bison obtained a Research and Collection Permit from Parks Canada (JNP-2016-22519) which prescribed the necessary survey method and reporting conditions. The purpose of the 2016 HRIA was to revisit known existing historical resources and to identify any new historical resources within the Project Footprint, with the intent to prevent or mitigate impacts to historical resources. The complete HRIA was provided to Park Canada Terrestrial Archaeology for review and final acceptance and summary of the HRIA results and recommendation are provided in Section 5.9.

Socio-economic Impacts

The Socio-economic study area for the Project extends to include the municipal boundaries of Jasper and the Town of Hinton. The latest municipal census of the Municipality of Jasper completed in June 2011 concluded that the population of town is 5,236; however, it should be noted that the town population experiences seasonal fluctuation as a result of high and low tourism seasons. The town is a fully serviced community, has ample amenities and over 1,400 hotel rooms, over 100 home accommodations, and over 2,000 seasonally available campsites to serve the needs of its residents and seasonal occupants. The latest municipal census of the Town of Hinton (from 2011) found that the population of the town is 9,640. Hinton also experiences seasonal fluctuations in population due to tourism. Hinton is a full service community with 1,139 hotel rooms and is well equipped to handle large influxes of visitors. The transmission facilities will be designed to meet or exceed the standards of the AIES. ATCO Electric has incorporated additional features to the proposed electrical facilities that are anticipated to improve their reliability including: redundant transformers at the proposed Sheridan Substation and existing Watson Creek Substation, co-locating existing distribution lines and portions of the proposed transmission line to reduce the risk of equipment failure, and use of covered conductor technology on portions of the proposed transmission line to reduce the potential for strike induced outages. Incorporating selective vegetation removal during construction and operations will further reduce the potential for strike induced outages on the proposed transmission system. The effects assessment for Socio-economic impacts considered the following potential effects, potential residual effects, and potential cumulative effects during construction and operations of the Project (Table ES-10).

Table ES-10. Summary of Potential Effects on Socio-Economics

Potential Effects	Potential Residual Effects	Potential Cumulative Effects
Access to Alberta Interconnected Electrical System	• No negative residual effect identified	• The socio-economic impact effect assessment for the Project did not identify any adverse potential residual effects and as a result an assessment of cumulative effects is not required
Increase demand for accommodation and services	• No negative residual effect identified	
Increased traffic volumes as a result of transporting workers, supplies and equipment	• No negative residual effect identified	
Disruption of Community life by temporary workers	• No negative residual effect identified	

Key mitigation measures identified to reduce the potential effects on Socio-Economics such as constructing outside peak tourist season and adherence to traffic safety regulations. With the implementation of key mitigation measures, Project planning and scheduling, no potential residual effects on Socio-Economics were identified.

Accidents and Malfunctions

The potential effects of construction and operations of the Project related to accidents and malfunctions were identified by the assessment team and include: spill of hazardous materials during construction and operations, fire during construction and operations, damage to foreign utilities during construction, transportation accidents, and electrical shock. Key mitigation measures to reduce or eliminate potential effects arising from accidents and malfunctions have been developed in accordance with ATCO Electric standards, the Health & Safety Management System and the Environmental Management System, industry and provincial regulatory guidelines, and ATCO Electric's EPP for JNP. The assessment of residual effects concludes that there are no situations arising from accidents or malfunctions that cannot be technically or economically mitigated. Consequently, the potential residual effects of Accidents and Malfunctions having a major magnitude is considered rare.

Effects of the Environment on the Project

Environmental conditions including wildfire, high winds, heavy precipitation, lightning, and winter icing, have the potential to damage Project infrastructure and cause scheduling delays. ATCO Electric has extensive experience in transmission line operation and construction throughout northern and central Alberta, and has considered the range of potential environmental conditions that can cause potential effects to the Project in their engineering design. The assessment of potential residual effects concludes that all situations related to effects of the environment on the Project are rare and minor to moderate in magnitude.

Reclamation and Remediation

Reclamation measures will be implemented in areas affected by Project activities during construction and will consider the amount and type of Project disturbance and site specific issues. Reclamation measures during construction target soil handling and water and erosion control activities and post-construction measures focus on reclaiming the natural topography, re-vegetating disturbed soils and removing temporary access. Section 6 provides information on the reclamation measures.

Supplemental environmental site assessments will be conducted in the area of the proposed substation and remaining areas of the Palisades facility. Following equipment removal, as the former operational areas become accessible, further environmental site assessment with be conducted as recommended in the Advisian report and Section 6. Remediation and closure of all areas of environmental concern (AECs) with operational impacts will be obtained prior to site reclamation of Palisades or construction of the Sheridan Substation.

Monitoring and Follow-up

ATCO Electric will complete a pre-construction assessment along the proposed route ahead of construction activities in order to catalogue the existing environmental conditions, and identify any areas of concerns, such as sensitive terrain, high quality wildlife habitat, presence of weeds or invasive species, steep slopes, areas prone or at risk of erosion, or areas already disturbed or affected by human activity. The findings in this pre-construction assessment will be used, along with the Best Available Methods for Common Leaseholder Activities Guidelines (Axys and Walker, 1998), the Project EPP, and the Management Objectives and Desired End Results (MO/DERs), to assist with reclamation and remediation through the development of a Reclamation Release Plan (RRP). A RRP will be provided to Parks Canada on an annual basis for 5 years (includes 2 years of post-construction reclamation and 3 years of monitoring following completion of construction) until reclamation is determined to be on a trajectory to meet the MO/DERS established in the terms of reference, or baseline environmental conditions. The MO/DERs will be verified prior to construction to establish a baseline of pre-disturbance status and conditions. Annual monitoring results will be reviewed by ATCO Electric and Parks Canada on a yearly basis to determine if additional actions are required, or to obtain sign-off when MO/DERS have been met.

Conclusions

ATCO Electric is proposing to construct and operate the Project connecting JNP with the Alberta electrical network. ATCO Electric conducted a feasibility study to determine the best solution to continue providing safe and reliable power to JNP. ATCO Electric submitted the results of the study to the Alberta Electrical System Operator who supported that the Project, as presented, is the preferred solution.

The Project incorporates many special design and routing considerations to reduce potential adverse effects on the environment, visual resources, visitor experience, heritage resources and the socio-economic environment. Special design and routing considerations included the following.

- Reducing new disturbance to environmental features by routing the proposed transmission line to follow existing transportation, utility, or oil and gas corridors for 99 percent of the total route length. Where feasible, the Project reuses the existing distribution power line alignment and has the distribution line understrung on the same structure.
- Further reducing new disturbance by locating the new substation within the existing fence line of the Palisades facility on previously disturbed land and decommissioning Palisades. As well as utilizing existing roadways and previously disturbed access routes and laydown areas for temporary workspace to support Project construction.
- Eliminating emissions associated with the operation of the diesel and natural gas-fueled Palisades facility.
- Preserving natural viewscapes by utilizing a specialized structure type in the proposed transmission line design that minimizes the height and width of the required structures.
- Reducing the impact of the Project on visitor experience in JNP by scheduling the proposed transmission line construction during off-peak season.
- Reducing fire risk and the risk of line contacts by using covered conductor technology on some portions of the proposed transmission line.

ATCO Electric concludes that potential effects of the Project can be avoided or reduced to acceptable levels.

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Acronyms and Abbreviations

AAAQO	Alberta Ambient Air Quality Objectives
ABMI	Alberta Biodiversity Monitoring Institute
ACIMS	Alberta Conservation Information Management System
AENV	Alberta Environment
AEP	Alberta Environment and Parks
AESO	Alberta Electrical System Operator
AESRD	Alberta Environment and Sustainable Resource Development
AIES	Alberta Interconnected Electric System
ANPC	Alberta Native Plant Council
APLIC	Avian Power Line Interaction Committee
AR	Alberta Regulation
ASRD	Alberta Sustainable Resource Development
AST	aboveground storage tank
ATCO Electric	ATCO Electric Ltd.
ATPR	Alberta Tourism Parks and Recreation
AUC	Alberta Utilities Commission
AVI	Alberta Vegetation Inventory
AWCS	Alberta Wetland Classification System
BMA	Bear Management Area
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAAQS	Canadian Ambient Air Quality Standards
CACs	Criteria Air Contaminants
CEAA	Canadian Environmental Assessment Agency
CCME	Canadian Council of Ministers of the Environment
CH2M	CH2M HILL Canada Limited
CN	Canadian National Railway
CNC	Consultative Notation Company
CNPA	*Canadian National Parks Act*
CNRL	Canadian Natural Resources Limited
CNT	Consultative Notation
cm	centimetre(s)
CO	carbon monoxide
CO_2e	carbon dioxide equivalents

Conservation Status	Species that are assessed by COSEWIC as Endangered or Threatened, are listed on a *SARA* Schedule, are designated as S1 or S2 by ACIMS, or are assessed as Sensitive, Threatened, May Be At Risk, or At Risk by GSAWS
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWCS	Canadian Wetland Classification System
CWS	Canada-wide Standard
DFO	Fisheries and Oceans Canada
DML	Department Miscellaneous Lease
DUC	Ducks Unlimited Canada
DWD	Drilling Waste Disposal
EC	Electrical Conductivity
ECCC	Environment and Climate Change Canada
EIA	Environmental Impact Assessment
ELC	Ecological Land Classification
EO	Element Occurrences
EPEA	*Alberta Environmental Protection and Enhancement Act*
ESA	Environmentally Significant Area
ESCC	Endangered Species Conservation Committee
Fiera	Fiera Biological Consulting Limited
FMA	Forest Management Area
FNA	Flora of North America
FPWC	Federal Policy on Wetland Conservation
FWIMT	Fish and Wildlife Internet Mapping Tool
FWMIS	Fisheries and Wildlife Management Information System
GLIMPS	Geographic Land Information Management and Planning System
GWh	Gigawatt
GWP	global warming potential
ha	hectare(s)
HEEA	*Hydro and Electric Energy Act*
HRA	*Historical Resources Act*
HRIA	Historical Resources Impact Assessment
HRV	Historical Resource Value
IPCC	Intergovernmental Panel on Climate Change
IPM	Integrated Pest Management
JNP	Jasper National Park
km	kilometre(s)

KMC	Kinder Morgan Canada Inc.
kV	kilovolt(s)
LPU	Local Population Unit
m	metre(s)
mm	millimetre(s)
MBCA	*Migratory Birds Convention Act*
MO/DERs	Management Objectives and Desired End Results
MPB	Mountain pine beetle
MSL	Mineral Surface Lease
N_2O	nitrous oxide
NAWMP	North American Waterfowl Management Plan
NO_x	nitrogen oxides
NPA	*Navigation Protection Act*
NRC	Natural Regions Committee
NRCan	Natural Resources Canada
NWWG	National Wetland Working Group
PCA	Parks Canada Agency
PCM	post-construction monitoring
Pedocan	Pedocan Land Evaluation
PHC	petroleum hydrocarbon
PIP	Participant Involvement Program
$PM_{2.5}$	respirable particulate matter
PM_{10}	course particulate matter
ppm	parts per million
Project Footprint	The area directly disturbed by Project activities, including associated physical works and activities.
QAES	Qualified Aquatic Environment Specialist
QWAES	Qualified Wetland Aquatic Environmental Specialist
QWSP	Qualified Wetland Science Practitioner
R&R	Rules and Regulations
RA	Regional Area
RAP	Restricted Activity Period
RDL	regulatory detection limit

Right-of-way	A right-of-way is the use of a strip of land acquired for the construction and operation of a transmission line. The term right-of-way is also used to refer to the physical space a transmission line encompasses including areas on either side of the line.
RMWB	Regional Municipality of Wood Buffalo
RSA	Regional Study Area
SA	Study Area
SARA	*Species at Risk Act*
SAR	Sodium Absorption Ration
SCA	Soil Classification Area
SML	Surface Mineral Lease
Study Area	An area approximately 9.0 km by 4.0 km based on the Project Footprint
Thurber	Thurber Environmental Consultants Ltd.
TLRU	traditional land and resource use
TMPL	Trans Mountain Pipeline
TMX	TMX Anchor Loop Project
Total	Total E&P Canada Ltd.
TPA	Registered trapping area
Trans Mountain	Trans Mountain Pipeline ULC
UNESCO	United Nations Educational, Scientific and Cultural Organization
VC	valued component
WHSRN	Western Hemisphere Shorebird Reserve Network
ZOI	zone of influence

SECTION 1

Introduction

1.1 Background

ATCO Electric Ltd. (ATCO Electric) is proposing to construct and operate the ATCO Electric Jasper Interconnection Project (the Project) which will connect Jasper National Park (JNP) with the Alberta electrical network. The current electrical distribution network for the municipality of Jasper and JNP operates as an isolated system, disconnected from the Alberta Interconnected Electric System (AIES). Electricity for Japer National Park and the town site is currently produced at the 967 Palisades Power Plant, a natural gas generating station with diesel backup generators, and the 782 Astoria Generating Station. The existing Palisades Power Plant is nearing its end of life and by 2017, much of the Plant will need to be replaced or completely refurbished.

ATCO Electric conducted a feasibility study to determine the best solution to continue providing safe and reliable power to JNP. ATCO Electric submitted the results of the study to the Alberta Electrical System Operator (AESO) who supported that the Project, as presented, is the preferred solution.

To connect JNP, ATCO Electric is proposing to construct a new 69 kilovolt (kV) transmission line (the transmission line), designated as 6L530, spanning approximately 44.7 km from a new 69 kV substation, the Sheridan Substation 2085S to an AIES interconnection point at the JNP boundary at SW 14-49-27 W5M. The Sheridan Substation 2085S (the substation) will be located within the existing 967 Palisades Power Plant (Palisades) site at NW 2-46-1 W6M (Figure 1.2-1). When the substation is commissioned, ATCO Electric will decommission Palisades.

To complete the interconnection with the AIES, AltaLink Management Ltd. (AltaLink) will seek approvals to construct and operate approximately 12 km of 69 kV transmission line, designated as 530L (from the JNP Boundary to the existing Watson Creek 104S substation), situated within AltaLink's service area (Alberta Electric System Operator, 2016). This Detailed Impact Analysis does not include the transmission line outside of the JNP boundary. AltaLink will be applying the Alberta Utilities Commission (AUC) to construct and operate this segment of transmission line.

Pending regulatory approval, ATCO Electric anticipates the substation construction to commence in Q3 2017 and right-of-way clearing and line construction to commence in Q4 2017. The proposed interconnection of the transmission line and substation is estimated for May 2018. Decommissioning of Palisades will begin after interconnection and is estimated to take 12 months.

The Project is not considered a 'designated project' under the *Canadian Environmental Assessment Act*, 2012 as per the *Regulations Designating Physical Activities*. Parks Canada Agency (PCA) is the responsible authority for assessing the Project in accordance with Section 67 of the *Canadian Environmental Assessment Act, 2012*. A Detailed Impact Analysis (DIA) is required for the Project in accordance with *Parks Canada Directive on Impact Assessment, 2015.* PCA has developed a Terms of Reference for the Project (Parks Canada, 2015) which outlines the requirements of the DIA. ATCO Electric retained CH2M HILL Canada Limited (CH2M) to conduct the DIA for the Project.

1.2 Regulatory Framework

The following subsections provide information on the regulatory context for the Project within JNP.

1.2.1 Canada National Parks Act

In JNP, this Project is allowable under Section 38(a) of the *National Parks General Regulations*, whereby the Minister may enter into an agreement for the development, operation and maintenance in the Park of electrical services for use only in the Park.

As part of the decommissioning of Palisades, ATCO Electric will reduce the current fence line to a smaller area around the substation. Under Section 15(2) of the *Canada National Parks Act*, lands outside the new reduced fence line will revert to the Crown.

In addition, the Project will require a development permit and other authorizations under the *Canada National Parks Act*.

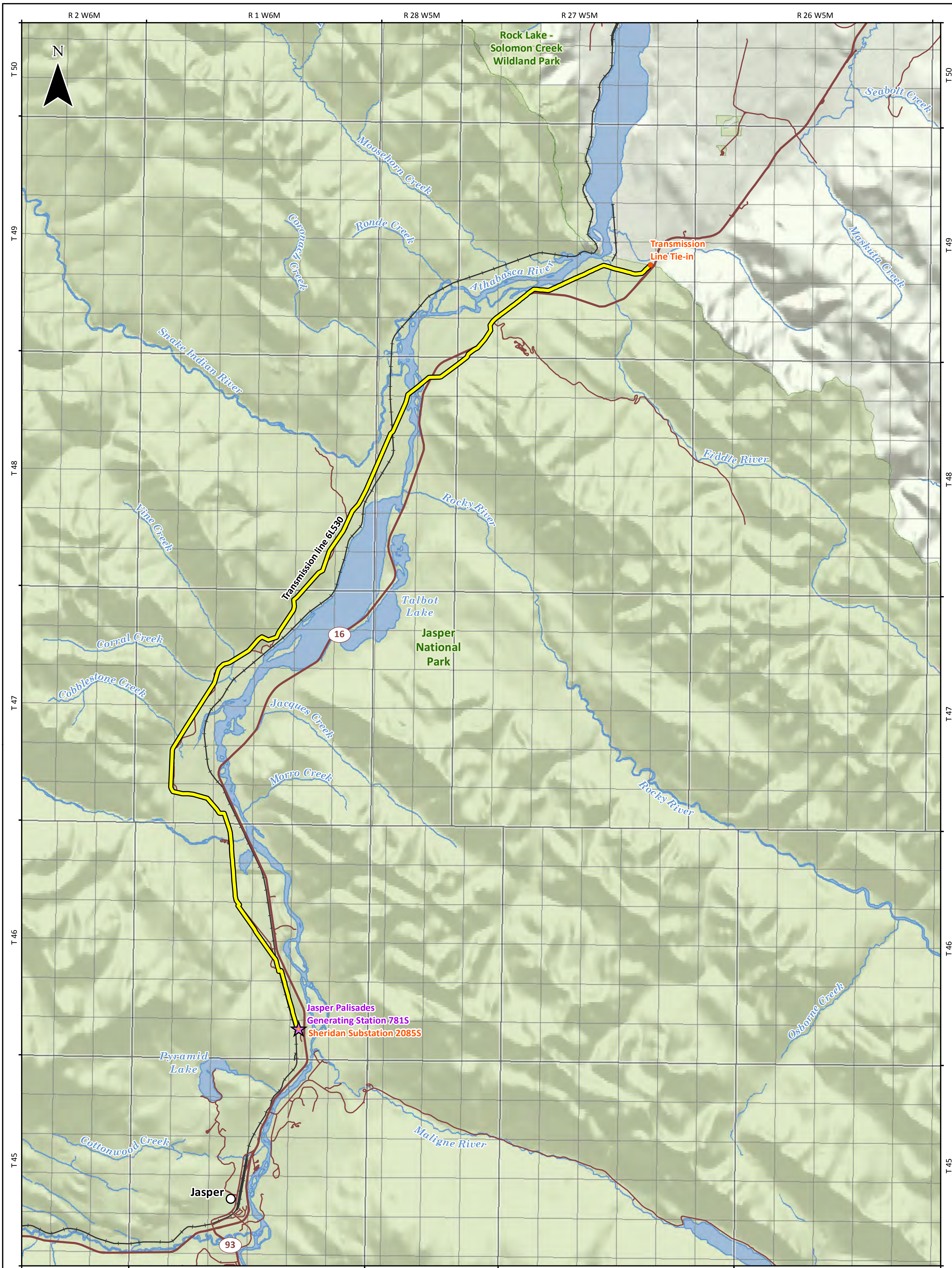
1.2.2 Canadian Environmental Assessment Act

The Project is not considered a 'designated project' under the *Canadian Environmental Assessment Act*, *2012* as per the *Regulations Designating Physical Activities*. PCA is the responsible authority for assessing the Project in accordance with Section 67 of the *Canadian Environmental Assessment Act, 2012*. The Project is assessed in accordance with *Parks Canada Directive on Impact Assessment, 2015* which prescribes that projects involving the expansion of regional or community power supply, power lines, pipelines, or other regional utilities infrastructure are subject to a DIA (Parks Canada, 2015).

1.2.3 Alberta Hydro and Electric Energy Act

ATCO Electric is additionally applying to the AUC pursuant to the *Hydro and Electric Energy Act*, for permits to construct and licenses to operate the Project. Alberta's electrical system is regulated by the AUC which is an agency of the Province that ensures the services provided by ATCO Electric and other Alberta utilities take place in a fair and responsible manner and are in the public's interest and in accordance with the *Hydro and Electric Energy Act.* Before ATCO Electric can begin construction on a project, the AUC must approve the facilities application, which includes details such as the location of transmission facilities and routes. When upgrades to Alberta's electrical system are needed, they are identified by the AESO. The AESO is an independent, not-for-profit organization responsible for the safe, reliable and economic planning and operation of the provincial transmission grid. Information on why the Project is needed is found in the Project specific AESO Need Overview document (see Section 2.3). The AESO is required to submit a Needs Identification Document to the AUC for approval. The AESO's Needs Identification Document and ATCO Electric's facilities application are typically reviewed in tandem by the AUC.

ATCO Electric received formal directions from the AESO to commence the Project facility application on December 4, 2015, which included all activities related to the AUC processes. Under the AUC processes, ATCO Electric is required to complete a Participant Involvement Program (PIP) as a requirement of AUC Rule 007, as well as to submit a facilities application seeking approval for the project. ATCO Electric's PIP is well underway and any feedback received as part of the program will be included in the facilities application scheduled to be submitted with the AUC in December, 2016. Following the AUC review process, which may include a public hearing if required, the AUC will issue a decision on the Facilities Application and Needs Identification Document. If approved, the AUC will issue ATCO Electric the appropriate Permits and Licenses to construct and operate the electrical facilities. Following the issuance of the AUC approvals, ATCO Electric will commence construction assuming all regulatory or land authorities are in place.



Proposed Route
Highway (892)
Road
Railway
Watercourse
Waterbody
Park/Protected Area

ATCO Electric

SCALE: 1:150,000

0 1 2 3 4 5 km

(All Locations Approximate)

FIGURE 1.2-1

REGIONAL LOCATION

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Hillshade: TERA 2008; Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Parks/Protected Areas: NRCan 2016, ATPR 2012; Jasper: NRCan 2003; Generating Station, Substation, Proposed Route: ATCO Electric Ltd. 2016.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

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1.3 Purpose of the Document

ATCO Electric developed the DIA to meet Parks Canada's requirements under the *Parks Canada Directive on Impact Assessment, 2015*. In alignment with the Terms of Reference for the Project (Parks Canada, 2015), the DIA provides information on environmental conditions within the Footprint and Study Area (SA), identifies potential effects, and recommends mitigation measures. The DIA provides information on the characterization of the potential residual effects that remain following mitigation measures, and describes proposed monitoring and follow-up studies.

1.4 Contributors to the Detailed Impact Analysis

CH2M prepared the DIA with input from ATCO Electric. Table 1.4-1 provides details on the specialists responsible for the supporting information, and assessment to support ATCO Electric in developing the Project. Discipline leads are the individuals responsible for reviewing and, in some cases, writing effects assessments to ensure consistency and accuracy.

Table 1.4-1. DIA Contributors

Component of Application	Contributors	Discipline Leads and Writers
Sections 1 and 2 – Introduction and Project Description	CH2M	Shawn Martin (B.Sc., P.Biol. R.P.Bio., EP)
Section 3 – Public and Indigenous Engagement	ATCO Electric	Landon Bawol, (B.Sc., P. Biol)
Section 4 – Effects Assessment Methodology	CH2M	Shawn Martin (B.Sc., P.Biol. R.P.Bio., EP)
Section 5 – Effects Assessment	CH2M	Shawn Martin (B.Sc., P.Biol. R.P.Bio., EP)
Section 5.1 – Landforms and Soils	CH2M	Jennifer Keller (BAEM, RT(Ag), CET), Julian Singer (PhD.)
Section 5.2 – Vegetation	CH2M	Mari Decker (B.Sc., P.Biol.)
Section 5.3 – Aquatic Wildlife and Ecosystems	CH2M	Michelle Pask (B.Sc., P.Bio., R.P.Bio.)
Section 5.4 – Wetlands, Hydrology and Hydrogeology	CH2M	Joanne Mauthner (M.Sc.) Julie Koloff (M.Sc., P.Biol., R.P.Bio.)
Section 5.5 – Wildlife and Wildlife Habitat	CH2M]	Jody Bremner (P.Biol., R.P.Bio.)
Section 5.6 – Air Quality and GHGs	CH2M	Darryl Chartrand (PhD, Chartered Chemist)
Section 5.7 – Aesthetics and Visual Resources	CH2M	Natalie Schell (M.Phil., B.Sc.)
Section 5.8 – Visitor Experience	ATCO Electric	Landon Bawol, (B.Sc., P. Biol.)
Section 5.9 – Heritage Resources	Bison Historical Services Ltd.	Michelle Wichham, M.A.
Section 5.10 – Socio-Economics	ATCO Electric	Landon Bawol, (B.Sc., P. Biol.)
Section 5.11 – Accidents and Malfunctions	CH2M	Alana May (B.Sc., EP)
Section 5.11 – Effects of the Environment on the Project	CH2M	Alana May (B.Sc., EP)
Section 6 – Reclamation and Remediation	CH2M	Jennifer Keller (BAEM, RT[Ag], CET), Julian Singer (PhD.)
Section 7 – Monitoring and Follow-up	ATCO Electric	Foster Karcha (B.Sc., P.Biol)

Note:

GHG = greenhouse gas

1.5 References

1.5.1 Literature Cited

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1.5.2 GIS Mapping and Data References

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Project Description

2.1 Scope of the Project

ATCO Electric proposes to construct and operate an approximately 44.7 km transmission line designated as 6L530, from an AIES interconnection point at the JNP boundary at SW 14-49-27 W5M to the proposed ATCO Electric Sheridan Substation 2085S located within Palisades site at NW 2-46-1 W6M. ATCO Electric will construct and operate a new substation within the existing Palisades site that is required to convert the 69-kV transmission line to a lower voltage for use in the distribution system, which operates at 25-kV or lower.

ATCO Electric is intending to use the existing distribution line alignment at locations where the two alignments overlap. The distribution line will be under strung on the new transmission line in these locations.

In addition, due to the alignment of the Project at the east end of JNP, ATCO Electric will be able to decommission the existing distribution line connecting Pocahontas Cabins across the Athabasca River directly north to the Canadian National Railway (CN Railway) line.

ATCO Electric is also proposing to decommission and salvage the existing Palisades once the transmission line and substation are energized. ATCO Electric is working with Parks Canada to complete all required environmental assessments and to return the land to the desired state before returning it to Parks Canada.

A minimum right-of-way width is required for construction, as well as operations access of the transmission line. The width and structure placements will vary with structure type. Typical right-of-way width for the new line is 10 metres (m). The structures will be either wooden, steel, or composite with a typical structure height of approximately 13-20 m, and a typical span of 90-150 m.

The transmission line will be a combination of 69-kV conventional bare wire three-phase design and insulated cable, situated on similar structures. The insulated cable design reduces power outages caused by the environment, such as storm damage and temporary tree contact. The insulated cable is planned to be used in areas where there is a high concentration of trees, and for most of the new right-of-way. This will reduce the potential effects (e.g., less tree clearing), while maintaining reliable customer service.

2.2 Overview of Existing Operations (Current Situation)

ATCO Electric operates both generation facilities and distribution facilities within JNP. The Municipality of Jasper, and surrounding facilities and operators, are isolated from the Alberta Interconnected System (i.e., no transmission link to the AIES), with the exception of distribution lines at the east end of JNP including the East Park Gate line (5L215) and Miette Line, which are connected to the AIES (ATCO Electric, 2011).

2.2.1 Electrical Generation

Electrical energy is generated from two sites within the park: the Astoria Hydroelectric Generating Station (Astoria), and Palisades, which, together on average, generate 50 gigawatt (GWh) hours of electric energy. Palisades is the primary energy source, while the Astoria contributes a lesser amount of energy to the JNP electrical network. The distribution lines originate from these two locations and distribute electricity to the Municipality of Jasper and surrounding areas (ATCO Electric, 2011). ATCO Electric will maintain the current electrical distribution system in addition to the Project.

The 967 Palisades Power Plant Palisades (which has a generating capacity of approximately 20 Megawatts [MW]) is a thermal diesel and natural gas-fueled generating plant with ten units ranging in size from 0.625 Megavolt ampere (MVA) to 4.125 MVA. The total installed capacity of Palisades is 26.35 MVA (ATCO Electric, 2011).

Palisades currently consists of nine permanent and two skid-mounted generation units. Nine of the generation units are internal combustion driven power generating units, and two units are gas turbine driven. Six of the generation units are housed in the main generation building and the other five units are located north of the main generation building. Exhaust from the units located in the generation building is directed into one main stack, while the units located outside the building have their own individual stacks. Two generation units are skid-mounted on portable enclosures. One mobile unit is stored at the site (ATCO Electric, 2011).

Palisades includes a number of radiators and compressors used in the power generation process. Three above-ground storage tanks (AST) containing diesel fuel, glycol, and waste oil are located north of the radiators. A building housing all the switchgear equipment is located south of the radiators. A fire-suppression building with a 400 m^3 reservoir is on site to protect the power plant and surrounding area. A 25 kV substation is located on the west side of the site in order to transmit power to the Jasper community. In addition, a water injection system is used to operate one or two of the generation units (ATCO Electric, 2011).

2.2.1.1 Astoria Hydroelectric Generating Station

Astoria, which has a generating capacity of approximately 1.8 MW is a hydroelectric generating plant on the Astoria River with two units. The total installed capacity of the Astoria is 1.79 MVA (ATCO Electric, 2011). ATCO Electric is exploring future options at Astoria but these were not a part of the Project and therefore have not been evaluated. The Project will not affect the capability of Astoria to produce electricity.

2.3 Need and Purpose of the Project

The generation infrastructure at Palisades is nearing the end of its operational life. By 2017, a large number of the generating units must be replaced or completely refurbished. ATCO Electric completed a feasibility study that determined the best solution to continue providing safe and reliable power to JNP. ATCO Electric submitted the results of the feasibility study to the AESO through a System Access Services Request which the AESO used to create the Functional Specification. The AESO Functional Specification outlined what electrical facilities are required and would form the basis for the Project. The AESO has prepared a Needs Identification Document for the Project which will be reviewed concurrently with ATCO Electric's facility proposal by the AUC. The AESO provided a Need Overview to stakeholders in April 2016 and an updated Need Overview in August 2016.

2.4 Alternatives to the Project

ATCO Electric evaluated the benefits of maintaining JNP as an isolated distribution network versus interconnecting it to the Alberta electrical network. ATCO Electric conducted a feasibility study to determine the best solution to continue providing safe and reliable power to JNP. ATCO Electric submitted the results of the study to the AESO who supported that the Project, as presented, is the preferred solution.

Another alternative to the construction and operation of the proposed transmission line and substation in JNP is to maintain the existing isolated generation infrastructure and distribution network and is essentially the ‘do nothing’ alternative. Alternatively, ATCO Electric could maintain the existing network with upgrades to the generating units at Palisades. ATCO Electric has completed substantial upgrades to Palisades over the years of the plant’s operation. In ATCO Electric’s opinion, and for the reasons provided in Section 2.3, connecting JNP to the Alberta electrical network is the preferred option over upgrading Palisades.

Another alternative to the proposed Project design is to install the transmission line underground as opposed to using overhead structures. As part of the routing evaluation, ATCO Electric determined that burying the transmission line would have a greater environmental impact when compared to that of the overhead option. This is in large part due to the ground conditions found in the Project area. Installing the transmission line underground would require blasting in rocky areas (e.g., Windy Point) and disturbing a greater area of sensitive soils that present potential reclamation issues (e.g., calcareous soils and Aeolian dunes). In addition, installing the proposed transmission line underground would have a greater impact on extended distances of important habitat features such as riparian areas, wetlands and watercourses that otherwise could be largely avoided or spanned by the overhead transmission line option. The immediate impact of this activity and the subsequent reclamation requirements related to the ground disturbance carries greater environmental impact and risk than overhead lines and pole installation. ATCO Electric determined that employing sections of buried transmission line in JNP was not a suitable option.

2.5 Project Description

ATCO Electric currently owns and operates Palisades and Astoria in addition to 250 km of distribution lines as part of the electrical network in JNP. As part of the Project, ATCO Electric proposes to construct and operate a new transmission line into JNP to connect the existing distribution network to the AIES. As part of the Project, Palisades will be decommissioned. The following subsections provide information on the Project components.

2.5.1 Project Components

A brief summary of Project components is provided below. Please refer to Figure 1.2-1 in Section 1 for the location of the various Project components.

2.5.1.1 Transmission Line 6L530

The Project will consist of one 69 kV single-circuit transmission line (known as 6L530), approximately 44.7 km in length. The proposed transmission line will depart from an AIES interconnection point at the JNP east boundary at SW 14-49-27 W5M and continue west to the proposed substation located within Palisades site. Design details are summarized in Table 2.5-1.

Table 2.5-1. Project Design Details

Design Type	Typical Conventional/Insulated 69-kV Single-Pole Structure
Nominal voltage	69-kV
Number of electrical circuits	1 to 2[a]
Typical structure height	13-20 m
Typical span between structures	90-115 m
Typical right-of-way width	10 m in total

[a] Distribution line to be understrung in specific locations along the alignment

Non-typical structures and non-typical rights-of-way with taller or additional poles, and/or anchors, and additional guy wires may be required to accommodate site-specific conditions, where the line bends, at corners, and over obstacles. In these areas, minimum clearance will meet, or exceed, the requirements of provincial safety regulations. Final structure specifications will be determined following survey, line design, and consultation with Parks Canada.

2.5.1.2 Sheridan Substation 2085S

The proposed transmission line will terminate at the proposed Sheridan Substation 2085S located within Palisades site at NW 2-46-1 W6M. The Footprint of the new substation will be approximately 0.5 hectares (ha). The new substation is required to convert the 69-kV power to a lower voltage for use in the distribution system, which operates at 25-kV or lower. The primary components of the proposed substation are listed below:

- One 69 kV disconnect switch for the proposed new 69 kV line from the AIES interconnection point (existing Watson Creek Substation)
- One 69 kV bus
- Two 15/20/25 MVA, 69/25 kV LTC transformers
- Two 69 kV breakers with associated disconnect switches for the transformers
- Six 25 kV circuit breakers
- One 25 kV bus and three 25 kV feeders and other 25 kV equipment as required for the operation and connection purposes

2.5.1.3 Palisades Power Plant

Upon commissioning of the transmission line and the substation, the Palisades power plant will be decommissioned and salvaged. All Palisades components described in Section 2.2.1 will be removed. The current fence line will be reduced to a smaller area around the substation.

2.5.1.4 Right-of-Way and Temporary Workspace

The transmission line will have a typical width of 10 m, and the Footprint of the proposed right-of-way is approximately 46.1 ha. ATCO Electric has identified several temporary workspace areas (occupying approximately 7.9 ha). These temporary workspace areas are required for non-typical structures such as at corners, in wetlands or saturated soils, and at watercourse crossings, for anchors, additional guy wires, additional poles, wider spacing and for transmission line stringing and tensioning. Selective tree clearing in areas adjacent to the right-of-way (approximately 20.7 ha) will be required to prevent present or future risk of trees contacting the transmission line (see Section 2.7.1.1).

ATCO Electric is planning to use four temporary laydown sites along the transmission line (Table 2.5-2). Temporary laydown sites will be located outside of the transmission line right-of-way for material hauling and storage, structure laydown, assembly, and installation of anchors and conductor at deflections and corners. Temporary workspaces were situated on previously disturbed lands to the extent practical.

Table 2.5-2. Temporary Laydown Site Locations

Location	Description	Area (ha)
Pocahontas	This is site is located on the south side of Highway 16 prior to the transmission line crossing of Highway 16 and the Athabasca River.	0.5
Devona	This site is located west side of the CN Railway in the Devona area.	2.3
Snaring	This site is located on the west side of the railway, highway 16 and the Athabasca River, north of the Snaring River.	2.3
Palisades	This site is located within the existing Palisades fence line.	2.4

2.5.2 Access

Existing roadways, access roads for existing rights-of-way, and previously disturbed areas will be used, where practical, to access the Project. Existing roadways include Highway 16, Celestine, Snaring, and Palisades Roads. Temporary access may be required to the transmission line right-of-way in areas where no existing roads are adjacent to, or crossing, the transmission line right-of-way or where terrain conditions, wetlands, or other barriers prevent travel along the proposed transmission line right-of-way. Permanent access will be required for transmission line maintenance and emergency response purposes.

2.5.3 Site Description

The Project is located within JNP, which is a designated United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. JNP, a protected area for terrestrial and aquatic ecosystems, was established in 1907. The park is 11,228 km^2, being the largest of the mountain national parks, spanning mountain landscapes that include broad valleys, mountain peak, glaciers, forests, alpine meadows, and rivers (Parks Canada, 2010).

The Project is located in the Athabasca River Valley and has one crossing over the Athabasca River, a designated Canadian Heritage River. The Athabasca River Valley is considered the main corridor through JNP, linking travel routes over the continental divide at Yellowhead Pass (Parks Canada, 2010). The Athabasca River Valley contains transportation routes including Highway 16 and the CN Railway; utility infrastructure including Telus Corporation, ATCO Pipelines, and ATCO Electric; and the Kinder Morgan Trans Mountain Pipeline (TMPL). The Municipality of Jasper is located in the three valley confluence of the Athabasca, Miette, and Maligne Rivers (Parks Canada, 2010). The Municipality of Jasper and outlying commercial accommodation and operations serve as a hub for park visitors and a home for Jasper residents.

Information on atmospheric environment, geology and geomorphology, soil, hydrogeology and hydrology, vegetation, aquatic resources, wildlife and wildlife habitat, wetlands and aesthetic values is provided in Section 5 of this DIA.

2.5.4 Land Use and Indigenous Traditional Land Use

Parks Canada manages land use within JNP. The Project Footprint is in Zone IV - Outdoor Recreation, as identified by the JNP of Canada Management Plan. Zone IV encompasses less than 1 percent of JNP and includes front country facilities; and rights-of-way of transportation, communication and utility corridors. Zone IV areas accommodate a broad range of opportunities for understanding, appreciating and enjoying JNP s’s heritage, while allowing direct motorized access. The Project is not within the Wilderness Area Declaration (Zone II) in JNP (Parks Canada, 2010).

Indigenous Traditional Land Use in the Park is focused on cultural and spiritual activities that reconnect Indigenous communities with the Park. Parks Canada regularly engages with a number of Indigenous communities who practice traditional uses within the park and the Valued Components considered within this DIA intend broadly to minimize impacts to these uses.

2.6 Routing and Site Selection

Routing and site selection considered the electricity requirements, the examination of alternatives involved identifying start and end points for the transmission line, developing, revising and refining the route, and identifying the location of the new substation. ATCO Electric consulted with Parks Canada and leaseholders on the best route option for the transmission line. In early route selection investigations, ATCO Electric evaluated existing linear disturbances in JNP including Highway 16, CN Railway, the TMPL, existing ATCO Electric distribution lines, an ATCO natural gas pipeline, and a Telus fibre optics cable.

2.6.1 Proposed Route Selection Criteria

ATCO Electric's route selection process started with identifying a Project area that accounted for large scale geographic, environmental, and social constraints. A sufficient geographic area was selected in order to identify and avoid sensitive environmental features and land constraints. The Project area is bound by the Athabasca River Valley entering JNP from the north, terminating at Palisades to the south.

The following criteria were applied to transmission line routing:

- Minimize potential impacts with other land uses such as roads, railway, communication, oil and gas facilities, and transportation infrastructure
- Using existing linear developments to reduce new disturbance and clearing
- Utilizing existing distribution lines where practical
- Following existing road rights-of-way where possible, affording access, reducing new clearing, and avoiding potential impacts
- Respecting electrical system and construction constraints
- Keeping routes as straight as possible to reduce transmission line length and the number of costly corner structures
- Minimizing transmission line length along environmentally sensitive areas such as watercourses and wildlife habitat
- Minimizing transmission line length through wet areas and steep slopes for better access, and to reduce potential effects
- Minimizing impacts to visual aesthetics and visitor experience

2.6.2 Corridor Option Development

Aerial photography under snow-free conditions was used to assist in identifying and capturing the present (pre-project) conditions and features of the landscape along and immediately adjacent to the conceptual routes. This data was also used to help identify landscape characteristics (i.e., timber types and condition, wetland boundaries/extents and class, existing developments, etc.) which have been incorporated into refining route selection. LiDAR data was obtained along the conceptual routes, which is imperative to understanding landscape characteristics and incorporation into line design and structure placement. The above data was confirmed during multiple site visits (both aerial and ground) and routing was further refined based on these results.

Features identified from field reconnaissance were added to previously mapped and aerial imagery data and compiled in a geographic information system (GIS) for the development of constraint mapping. Constraint data was reviewed and areas with severe or abundant constraints were flagged for avoidance. Areas with relatively few constraints were viewed as opportunities for potential route options and were subject to further examination for the selection of the conceptual routes.

Routes along existing corridors such as existing rail, road, distribution corridors, and pipeline corridors provide better access, straighter alignments, and potential right-of-way abutment to reduce new clearing. These also provide opportunities to combine linear disturbances and share seasonal access.

ATCO Electric conducted conceptual routing to consider paralleling the CN right-of-way and this was the basis for initial Project discussions with Parks Canada. In some locations, the CN right-of-way parallels wetlands and watercourses. ATCO Electric was directed by CN to maintain 15.24 m distance from the centerline of the tracks as this constitutes CN's right-of-wat. This setback had the potential to require transmission line infrastructure in watercourse or wetlands areas and had the potential to cause potential effects to sensitive aquatic ecosystems. Following multiple site visits to assess conceptual routing, ATCO Electric deemed the conceptual routing paralleling the CN right-of-way not feasible due to the CN setback requirements and the resulting construction constraints and impacts to adjacent aquatic features. For these reasons, ATCO Electric rejected locating the alignment along the CN Railway.

In addition, ATCO Electric conducted site visits with Parks Canada to review routing with a focus on the TMPL corridor. The site visits engaged Parks Canada representatives for a local perspective on Visitor Experience and Aesthetics, Wildlife, Vegetation, Cultural and Historical Resources and Aquatics.

2.6.3 Preferred Route

ATCO Electric used routing criteria described in Section 2.6.1 for developing conceptual routing options. ATCO Electric has collaborated with Parks Canada and other line and leaseholders in JNP on routing options and determined preference for the following.

- Utilize the existing electrical distribution right-of-way from the JNP boundary to the Pocahontas area.
- Cross Highway 16 in the Pocahontas area and parallel a portion of Highway 16. This option reduces the amount of tree removal required and the potential effects on the trail system.
- Utilize the existing TMPL alignment from the Pocahontas Cabins area to the Snaring Road area.
- Follow Snaring Road as opposed to following the existing TMPL or the ATCO Pipeline's natural gas pipeline. The TMPL is located along a rocky cliff face that is directly adjacent to environmentally sensitive wetland and watercourse features. The potential effects related to construction and operations could be greater than a route alignment along Snaring Road. The natural gas pipeline is located approximately 100 m off the Snaring Road in some locations and would provide a potential visual aesthetics barrier to the park visitor. However, the gas pipeline is buried at a shallow depth, and the potential effects related to construction and operations could be greater than a route alignment along Snaring Road.

ATCO Electric presented routing to stakeholders during the AUC public involvement process and during a Project Information Session. ATCO Electric and Parks Canada will conduct additional public consultations prior to finalizing Project specific details. See Section 3 for a description of public and Indigenous and consultation completed to date.

Table 2.6-1 provides information on the preferred route and rationale for the proposed alignment.

Table 2.6-1. Preferred Route and Rationale

Route Description (Route Reference Node)	Rationale for Route Selection
JNP Boundary to Pocahontas (A6 to A10)	This section of the alignment generally parallels the existing TMPL pipeline and ATCO Pipeline's natural gas pipeline, and uses the existing electrical distribution line right-of-way. This alignment reduces the potential effects to sensitive soils and has reduced construction constraints. Parks Canada has indicated that it prefers this alignment, as it is located in an area that is scheduled for a prescribed burn. Minimal brushing is required, as the alignment uses existing cleared areas to the extent possible.
Pocahontas (A10 to A12)	This section of the alignment generally parallels existing pipeline and reduces potential effects to sensitive aquatic ecosystem (Pocahontas Ponds). Minimal brushing is required, as this alignment uses existing cleared areas to the extent possible. This alignment reduces visibility of the transmission line and provides the shortest overall line length. ATCO Electric will work with Parks Canada to reduce potential visual effects of the transmission line crossing of the highway corridor.

Table 2.6-1. Preferred Route and Rationale

Route Description (Route Reference Node)	Rationale for Route Selection
Athabasca River Crossing (A12 to A13)	This alignment uses the existing TMPL corridor and does not require brushing within the river boundaries. This alignment would meet height and clearing requirements. ATCO Electric will work with Parks Canada to determine best structure arrangement for crossing over the Athabasca River.
TMPL (A13 to A29)	This section of the alignment uses the existing TMPL corridor. Minimal brushing is required as route uses existing clearing to the extent possible. This alignment reduces potential effects to sensitive aquatic ecosystems, as the routing is further away from wetlands and watercourses. Structures will not be required within wetlands or watercourses.
Celestine and Snaring Road A29 to A33)	This section of the alignment generally parallels a portion of Celestine and Snaring Roads, using the existing road corridors. Designing a straighter line alignment reduces the number of corner structures, which reduces costs. This alignment avoids aquatic ecosystems around the area of Snaring Road and a sensitive tributary system. This alignment has good constructability and easy access.
Trans Mountain to Palisades A33 to A37)	This section of the alignment uses the existing TMPL and existing electrical distribution alignments and requires minimal brushing. This alignment has reduced maintenance costs and good access.

Note:

Trans Mountain = Trans Mountain Pipeline ULC

ATCO Electric's preferred route integrates existing infrastructure to the greatest extent practical. New clearings are reduced by using existing clearings created by the TMPL, Celestine Road, and Snaring Road. The preferred route reduces requirements for new access, minimizes potential effects on wetlands and sensitive aquatic ecosystems, and considers the ongoing cycle of constructability, reliability, and maintenance for a transmission line. The proposed route has been routed adjacent to existing disturbance for 44.1 km of its 44.7 km total length (99 percent). Existing linear disturbance includes the Highway 16, Snaring Road, Celestine Lake Road, CN Railway, Kinder Morgan TMPL and TMX Anchor Loop Project (TMX) pipeline rights-of-way, ATCO Pipelines, and existing distribution line rights-of-way. Table 2.6-2 provides a breakdown of the existing disturbance types adjacent to the preferred route.

Table 2.6-2. Existing Disturbance Tyles Adjacent to the Preferred Route

Existing Disturbance Type	Length Adjacent to the Preferred Route[a]
Pipelines	34.1 km (approximately 76% of route total length)
Railway	0.9 km (approximately 1.9% of route total length)
Roads	16.9 km (approximately 38% of route total length)
Electrical Distribution Line	17 km (approximately 38% of route total length)[b]

Source: Alberta Biodiversity Monitoring Institute (ABMI), 2015; IHS Inc., 2016a, 2016b; Natural Resources Canada (NRCan), 2012, 2015.

[a] All distances are approximate and will not sum to the total route length since existing disturbance types overlap on the landscape.

[b] Distance provided by ATCO Electric.

2.7 Project Execution

2.7.1 Construction Phases and Activities

Pending regulatory approval, the Project will be conducted in two main phases: construction and decommissioning. Construction activities for the substation are anticipated to commence in Q3 2017 and in Q4 2017 for the transmission line, with an anticipated in-service date of May 2018. Decommissioning of Palisades will begin once the transmission line and substation are commissioned and energized, and is estimated to be completed by May 2019. This schedule assumes that activities including survey, geotechnical assessment (where warranted), land approvals (where warranted), and detailed engineering will occur prior to issuance of AUC approval so that construction can begin as soon as possible after necessary approvals are received. The general activities associated with these phases are outlined in Table 2.7-1.

Table 2.7-1. General Activities

Phase	Activity
Construction of Transmission Line	• Equipment cleaning station deployment (where warranted) • Right-of-way preparation (including brushing, logging, filling or grading, and flagging of environmentally sensitive features, as needed) • Travel lane construction (as needed) • Temporary workspace preparation (as needed) • Structure foundation installation (may need grading or levelling, and soil stripping) • Materials hauling • Temporary structure installation at crossings • Structure assembling • Foundations • Structure erection and setting • Conductor stringing and tensioning (including shield wire and wire travel device installation) • Clipping or tie-in (attaching conductors to insulators) • Structure and transmission line inspection • Temporary structure dismantling • Energizing • Temporary workspaces, equipment cleaning stations, and right-of-way travel lane decommissioning (where warranted) • Land reclamation, fence installation, and weed control (where warranted)
Construction of Substation	• Equipment cleaning station deployment (where warranted) • Site preparation • Building foundation installation (may need grading or levelling, and soil stripping) • Energizing • Land reclamation and weed control (where warranted)
Decommissioning	• Removal of permanent and mounted generation units. • Removal of building such as those used for main generation, switchgear building, water injection and fire-suppression equipment • Removal of above ground storage tanks • Removal of the 25 kV substation • Land reclamation, fence reduction and weed control (where warranted)

Equipment used during construction will be low pressure rubber tire or track mounted equipment in order to minimize the ground impact in JNP. Potential equipment types used during construction include diggers nodwells, cranes, bucket trucks, loaders, hoes, excavators, dump trucks, skid steers, dozers, grader, puller trucks and pick-up trucks. During geotechnical work, the contractor will be expected to use a track mounted drilling rig and support vehicles. During construction, the existing road and rail network will be used to the extent practical for transporting materials to the right-of-way.

2.7.1.1 Selective Hazard Tree Management

The right-of-way will be cleared with emphasis on retaining compatible shrub species, minimizing forest floor disturbance, salvaging firewood, and chipping spreading remaining vegetation. Desktop analysis of LiDAR and provincial Alberta Vegetation Inventory (AVI) has been completed to identify hazard tree areas of concern adjacent to right-of-way. LiDAR provides vegetation height and AVI provides vegetation growth data. ATCO Electric has identified approximately 20.7 ha of area adjacent to the proposed right-of-way that will require some level of treatment for the reduction of adjacent hazard trees. Hazard tree management will be planned with consideration to Parks Canada's plans for upcoming fire and pest management activities, as these initiatives may benefit from more intensive initial clearing.

ATCO Electric estimated that approximately 14,972 stems greater than 2.5 m in height will be removed within the proposed right-of-way and approximately 1,958 stems will be removed for temporary workspaces. ATCO Electric also estimated that approximately 10,010 stems will be managed for the reduction of hazard trees. Of the total stems to be removed, approximately 2,700 fall within the area scheduled for prescribed burn.

Hazard trees adjacent to right-of-way will be field confirmed and marked for management based on the guidelines set out in the Best Available Method for Common Leaseholder Activities (Axys and Walker, 1998). Field confirmation includes height, distance from right-of-way centre line, slope, and tree values. Tree values include but are not limited to, species, health, lean, wildlife habitat, riparian habitat, slope stability, and visual impacts. Based on tree values, hazard to the transmission line, and worker safety several management options are considered. Options include, but are not limited to, mechanical single stem removal, individual hand felling with forestry bucking, and tree trimming.

Where hazard trees must be managed adjacent to right-of-way, all non-hazard trees and stumps will be retained. All hazard tree marking and removal will occur under direct supervision of ATCO Electric. Where hazard trees are salvaged for firewood, hazard trees will be mechanically removed by feller bunchers or harvesters. Equipment will reach from right-of-way edge to remove as many hazard trees as possible without leaving right-of-way.

Where firewood salvage hazard trees are beyond equipment reach (i.e., beyond 5 m), equipment would make a single pass in and out along path of least disturbance to non-hazard vegetation and forest floor. Equipment will mechanically fell and carry hazard trees back onto right-of-way No other equipment will be required to operate off right of way. Firewood will be processed and remaining tree debris will be chipped according to the Best Available Method for Common Leaseholder Activities (Axys and Walker, 1998).

2.7.2 Workforce

ATCO Electric estimates a maximum of 150 workers during peak construction of the transmission line and substation. In addition, 25 workers are anticipated for the decommissioning of Palisades. ATCO Electric will not be requesting a work camp for the Project as the construction and decommissioning workforce will be accommodated in either Jasper or Hinton, AB.

2.8 Reclamation and Remediation

2.8.1 Reclamation

Reclamation measures will be implemented in areas affected by Project activities during construction and will consider the amount and type of Project disturbance and site specific issues. Reclamation measures during construction target soil handling and water and erosion control activities and post-construction measures focus on reclaiming the natural topography, re-vegetating disturbed soils and removing temporary access. Section 6 provides information on the reclamation measures.

2.8.2 Remediation

Supplemental environmental site assessments will be conducted in the area of the proposed substation and remaining areas of the Palisades facility. Following equipment removal, former operational areas will become accessible and further environmental site assessments will be conducted as recommended in Advisian (2016) and Section 6. Remediation and closure of all areas of environmental concern (AECs) with operational impacts will be obtained prior to site reclamation of Palisades or construction of the Sheridan Substation.

2.9 Operations

ATCO Electric will conduct routine operations activities on the new transmission line and substation in addition to the existing distribution lines. The types of operations activities include:

- Access road maintenance
- Right-of-way maintenance
- Wood pole maintenance, repair, and replacement
- Outage repairs
- Emergency events

Access to the new transmission line would be by road (mobile equipment, radial boom, derrick trucks, Utility Terrain Vehicle [UTV], snowmobile), rail (train), or helicopter. Most common access is by mobile equipment, radial boom derrick trucks, UTV, snowmobile, or foot. Current transmission line clearances are designed and constructed, at a minimum, in accordance with the Alberta Electrical Utility Code.

2.10 Decommissioning

It is difficult at this time to predict precisely when or how the transmission lines and related facilities will be decommissioned at the end of the Project's useful life. At that time, it is expected that the AESO will review and consider current options, issues, and regulatory requirements of the day in consultation with landowners, occupants, government representatives, and other participants having interest in the proposed works. In addition, decommissioning activities require prior approval by the AUC and other applicable agencies.

As mentioned in 2.7.1, decommissioning of the Palisades power plant for the construction of the Sheridan Substation is considered part of the construction phase.

2.11 References

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Public and Indigenous Engagement

ATCO Electric is required to undertake comprehensive Public and Indigenous Engagement program for the Jasper Interconnection Project in support of DIA for review and approval by Parks Canada. This DIA has been prepared to provide Project information to the public, Indigenous groups, government agencies, applicable municipalities, and other interested parties. Following a period of public review and engagement activities, which may include open houses and information sessions with interest groups, all submitted comments will be considered by ATCO Electric. These comments will provide direction to ATCO Electric regarding any specific Project mitigation efforts required, as well as any required revisions to the DIA. Following examination of suggested mitigations and/or revisions required, the DIA will be finalized and submitted by ATCO Electric to Parks Canada as part of the documentation required for Parks Canada's approval of the Project.

Engagement with the public routinely leads to improvements on ATCO Electric projects. As such, ATCO Electric endeavors to provide accessible and approachable project information, to provide opportunities for information sharing and consultation, and to communicate questions, concerns and suggested mitigation measures in a transparent way. ATCO Electric's intended Public and Indigenous Engagement program, approved by Parks Canada, is being completed in two phases.

- Phase One: Information – Information regarding the Project, the planning process and the proposed facilities will be made available to all interested parties. Information sessions were held in advance of the DIA Engagement program to introduce interested parties to the Project, facilitate early discussions and document comments and concerns, as well as to communicate the process for public review of the DIA.

  Parks Canada is ultimately responsible for the conduct of Indigenous consultation for the Project and has delegated certain aspects of the consultation process to ATCO Electric. ATCO Electric's main responsibilities with respect to Indigenous consultation for the Project are to share information about proposed activities with Indigenous communities, gather information about the impacts of the proposed activities on Indigenous interests and potential asserted rights, and identify approaches to avoid or reduce potential impacts. Individual consultations with Indigenous communities commenced in February 2016 and are ongoing.

- Phase Two: Public and Indigenous Communities Review and Comment – The DIA will be made available to the public review and comment. Interested parties will have opportunity to review the DIA and supporting Project information, and comment in writing or electronically to ATCO Electric. Consultation with Indigenous groups will continue throughout Phase Two.

After the conclusion of Phase Two, ATCO Electric will analyze all the feedback received. ATCO Electric will consider and respond to the degree possible, the feedback received from the public and Indigenous groups including revisions to the Project (adjustments to Project footprint, timing of construction, mitigation measures). Proposal revisions or additional mitigation measures will be reflected in the final version of the DIA submitted to Parks Canada.

As the Jasper Interconnection Project involves electric transmission power facilities, ATCO Electric must also apply to the AUC for approval to construct and operate the proposed facilities. A separate engagement undertaking referred to as a PIP is required under AUC Rule 007: Applications for power plants, substations, power line, industrial system designations and hydro development. ATCO Electric has conducted a PIP in accordance with AUC Rule 007 and consultation regarding the Project will continue in parallel with the DIA Public and Indigenous Engagement program. ATCO Electric will utilize feedback from the PIP as part of their finalization of the DIA.

3.1 Phase One: Information

In May 2016, ATCO Electric mailed written information about the Project, the preliminary route option and route variances and substation location to identified stakeholders, occupants, agencies and other interested parties within 1000 m of the Project as well as key stakeholders as identified and directed by Parks Canada. Other interested parties, such as municipalities and government departments were also mailed the information package. Over 50 information packages were distributed. ATCO Electric held information sessions for all interested parties on May 26, 2016 and attended the Jasper Chamber of Commerce Annual General Meeting on June 14, 2016. These events provided ATCO Electric and interested parties an opportunity to meet and discuss the Project. It also provided interested parties a forum to voice questions or concerns to the ATCO Electric Project team.

3.1.1 Information Session – May 26, 2016

ATCO Electric held a Project information session in the Municipality of Jasper on May 26, 2016. Three information sessions were held: a session for existing employees of the Palisades Power Plant; a session for Town Council and the Chamber of Commerce; and a public session for the general public. Information session invitations were sent out via email to Town Council and Chamber of Commerce as well as advertised to members of the public in the “Jasper Fitzhugh” newspaper. The advertisements provided contact information for ATCO Electric and encouraged people to attend the information session to share their opinions on the Project.

The purpose of the information session was to provide participants with an opportunity to obtain information about the Project and share their concerns. ATCO Electric representatives were available to speak with attendees and respond to their questions and concerns regarding the Project, as well as to conduct personal consultation with any attendee who opted to do so. Attendees were invited to register on the optional sign-in sheet, which ATCO Electric used to document attendance.

The following information items were made available to participants during the Information Session events:

- Typical Structure Diagram (display board)
- Project Key Map (display board)
- Project Route Mosaic Maps (display board)
- Structure Size Comparison (display board)
- Environmental Alignment Sheet sample (display board)
- Five Project Visualizations: Celestine, Snaring, Pocahontas 1, Pocahontas 2, and Jasper Lake (display board)
- Project Notification Package entitled The Jasper Interconnection Project
- Project Technical Details entitled The Jasper Interconnection Project
- Project Site Plan entitled 2085S Sheridan Substation Planned Site Layout
- Route Mosaic entitled Jasper Interconnection Route Concepts Mosaic
- Public Engagement Handout
- Route Selection Handout
- Transmission Line Conductor sample

- AESO document entitled Need for the Sheridan 2085S Substation and a New Transmission Line in the Jasper Area
- AUC brochure entitled Public Involvement in Proposed Utility Development
- Canadian Electrical Association Perspectives Newsletter (March 2010) – Electric and Magnetic Fields
- Health Canada It's Your Health Newsletter (January 2010) – Electric and Magnetic Fields at Extremely Low Frequencies
- World Health Organization Fact Sheet (March 2006) – Electromagnetic Fields and Public Health, Static Electric and Magnetic Fields

There were 36 people that attended the information session. This total includes 5 representatives from Town Council, 1 representative from the Chamber of Commerce, 1 reporter from the Jasper Fitzhugh, 7 employees of Parks Canada, and 22 members of the public. Of the 22 members of the public that attended, two represented key stakeholder groups as identified by Parks Canada: the Jasper Environmental Association and Mountain Park Lodges.

The feedback received at the information session generally fell into two categories: operations/reliability, and environmental impacts.

Concerns around the operations and reliability of the new substation and transmission line were centred on outage frequency and duration. ATCO Electric provided feedback to the stakeholders about the standard procedure for remedying an outage and the steps ATCO Electric is taking to ensure that the substation and transmission line will be as reliable as possible. Interested parties were generally satisfied with the steps ATCO Electric is taking but stressed the importance of reliable power to JNP.

Concerns around the environmental impacts of the Project of were brought forth by a small number of interested parties. Concerns about environmental impacts included suggestions to bury the transmission line, concerns about specific segments of the route where ATCO Electric has deviated from the Kinder Morgan pipeline alignment, and specific feedback on the two route variations under consideration at Pocahontas. These concerns are further discussed below.

Questions around the possibility and feasibility of burying the transmission line were brought forth. The differences between construction methods for an overhead transmission line and underground transmission line were discussed and it was generally accepted that based on construction and maintenance requirements, an overhead transmission line would have less impact on the environment.

Concerns around the segments of the route where ATCO Electric deviates from the Kinder Morgan pipeline alignment, such as Snaring Road, were brought to ATCO Electric’s attention. ATCO Electric described the rationale behind the alignment and why certain areas are being avoided and why other areas are not suitable for construction, highlighting findings from field visits along with ATCO Electric’s engagement with Parks Canada on routing.

Feedback received on the route options at Pocahontas was mixed. Some interested parties preferred the route follow Highway 16 to reduce the amount of tree removal and environmental impact. Other interested parties indicated that they would like the route to be behind the trees, suggesting that ATCO Electric follow the existing trail to reduce visual impact from Highway 16.

3.1.2 Chamber of Commerce Annual General Meeting – June 14, 2016

ATCO Electric was invited to attend the Jasper Chamber of Commerce Annual General Meeting on June 14, 2016. ATCO Electric took this opportunity to share Project details with the members of the Chamber of Commerce and answer any questions that they may have.

ATCO Electric set up a table at Robson House in Jasper from 4:15 p.m. to 5:15 p.m. to provide the Chamber of Commerce members an opportunity to meet members of the ATCO Electric Project team and get more information on the Project. ATCO Electric had the following items available to participants at Robson House:

- Project Key Map (display board)
- Structure Size Comparison (display board)
- Project Visualization: Snaring (display board) available at Robson House
- Project Visualization: Celestine (display board) available at Maligne Lake
- Project Notification Package entitled *The Jasper Interconnection Project*
- Project Technical Details entitled *The Jasper Interconnection Project*
- Project Site Plan entitled *2085S Sheridan Substation Planned Site Layout*
- Route Mosaic entitled *Jasper Interconnection Route Concepts Mosaic*
- Public Engagement Handout
- Route Selection Handout
- Transmission Line Conductor sample

ATCO Electric set up a table at Maligne Lake from 6:00 p.m. to 9:15 p.m. to provide the Chamber of Commerce members an opportunity to meet members of the ATCO Electric Project team and get more information on the Project. ATCO Electric had the same items available to participants as were available at Robson House (listed above), with the exception of the visualization, which ATCO Electric changed from Snaring to Celestine to show a new vantage point to attendees.

Throughout the course of the evening, 15 people engaged with ATCO Electric to learn more about the Project and ask questions. ATCO Electric was also provided the opportunity during round table discussion to address all attendees and give a quick summary of the Project. Between the one-on-one conversations and the round table presentation, all attending Chamber members where provided key information about the Project and provided an opportunity to express concerns, provide comments or ask questions.

Some questions and concerns were common among the 15 Chamber members who engaged directly with ATCO Electric. Questions regarding where the transmission line will be routed, what the environmental impacts may be, what the structures will look like, as well as reliability of the transmission line and the future of the Astoria Hydro Generation Plant were brought forth.

General questions around the routing of the transmission line were brought to ATCO Electric's attention. ATCO Electric described the rationale behind the alignment and why certain areas are being avoided and why other areas are not suitable for construction, highlighting findings from field visits along with ATCO Electric's engagement with Parks Canada on routing.

Concerns around the environmental impacts of the Project included suggestions to bury the transmission line. The differences between construction methods for an overhead transmission line and underground transmission line were discussed and it was generally accepted that based on construction and maintenance requirements, an overhead transmission line would have less impact on the environment.

ATCO Electric provided feedback to the interested parties about the standard procedure for remedying an outage and the steps ATCO Electric is taking to ensure that the substation and transmission line will be as reliable as possible.

3.1.3 Municipality of Jasper Newspapers

Following the Information sessions, ATCO Electric received requests for additional interviews with The Jasper Fitzhugh newspaper, and a request for an interview from the Jasper Local newspaper.

Interviews were conducted via telephone on May 30, 2016. Newspaper articles were published in The Jasper Fitzhugh on June 1, 2016, and in the Jasper Local on June 1, 2016 and July 1, 2016.

3.1.4 Summary

ATCO Electric's engagement program is well underway for the Project and numerous consultation events have occurred to date. Feedback received to date has been primarily positive with overall acceptance that the Project is needed and will be beneficial to JNP. ATCO Electric will continue to engage and encourage feedback on the Project. All feedback will be included in the facilities application to the AUC and the DIA for Parks Canada. All feedback received during Phase One has been incorporated into the DIA in support of Phase Two commencement.

3.2 Phase Two: Review and Comment

ATCO Electric and Parks Canada made the DIA available for Review and Comment on March 24, 2017. The DIA was provided to interested parties through ATCO Electric's website as well as hard copies provided to Parks Canada. Parties were able to provide feedback and comments through a multitude of forums including ATCO Electric's consultation phone number and email address, Parks Canada's consultation phone number and email address and ATCO Electric's DIA Open House held on April 6, 2017. The DIA was available for review until April 21, 2017 as indicated on ATCO Electric's website and notification letter as well as Parks Canada's Project website. Public feedback received on the DIA was reviewed and incorporated into the DIA as deemed necessary by ATCO Electric and Parks Canada, and discussed in sections 3.2.1, 3.2.2 and 3.2.3.

3.2.1 Detailed Impact Analysis Open House – April 6, 2017

ATCO Electric held an Open House which focused on receiving feedback to the DIA. The Open House was located in the Municipality of Jasper on April 6, 2017. Open House invitations were sent out via mail as well as advertised to members of the public in the "Jasper Fitzhugh" newspaper. The advertisements provided contact information for ATCO Electric and encouraged the public to attend and provide feedback on the DIA.

The purpose of the Open House was to provide participants with an opportunity to provide feedback on the DIA. ATCO Electric representatives were available to speak with attendees and respond to their questions and concerns regarding the Project, as well as to conduct personal consultation with any attendee who opted to do so. Attendees were invited to register on the optional sign-in sheet, which ATCO Electric used to document attendance.

The following information items were made available to participants during the Information Session events:

- Copies of the DIA
- Typical Structure Diagram (display board)
- Project Key Map (display board)
- Project Route Mosaic Maps (display board)
- Structure Size Comparison (display board)
- Environmental Alignment Sheet sample (display board)
- Five Project Visualizations for locations along the Project Route: Celestine, Snaring, Pocahontas 1, Pocahontas 2, and Jasper Lake (display board)
- Transmission Line Conductor sample

There were 21 people in attendance at the Open House. This total includes one reporter from the "Jasper Fitzhugh" newspaper, five employees of Parks Canada, and 15 members of the public. Of the 15 members of the public that attended, two represented a key stakeholder group as identified by Parks Canada; the Jasper Environmental Association.

The feedback received at the information session generally fell into three categories: operations and reliability, potential environmental effects and Project need or alternatives.

Concerns surrounding the operations and reliability of the new substation and transmission line were centred on outage frequency and duration. ATCO Electric referenced the DIA and provided feedback to stakeholders about the standard procedure for remedying an outage and the steps ATCO Electric is taking to ensure that the substation and transmission line will be as reliable as possible.

Concerns surrounding the potential environmental effects of the Project of were brought forth by interested parties. Questions around the possibility and feasibility of burying the transmission line were brought forth. ATCO Electric discussed the differences between construction methods for an overhead transmission line and underground transmission line with interested parties. ATCO Electric indicated that an underground transmission line would have greater potential environmental effects compared to an overhead transmission line due to the construction and operation requirements such as increased ground disturbance in areas with sensitive soils, blasting in rocky areas, and greater disturbance to habitat features that could otherwise be largely avoided. In addition, ATCO Electric indicated that an underground transmission line would potentially have maintenance and reliability implications.

Concerns around the Project need and other alternatives were brought forward by a number of individuals, including questions on why the Project is required and if a transmission line is the only option to provide JNP with power. ATCO Electric referenced the DIA and the feasibility study indicating that the best solution is to construct a transmission line and connect JNP to the AIES. Some individuals inquired to the future of Astoria Hydroelectric Generating Station. ATCO Electric indicated that the future of Astoria is being reviewed and is not a part of the Jasper Interconnection Project. As directed by the AESO, any individuals with outstanding questions regarding the Project need were directed to contact the AESO for additional information.

3.2.2 Municipality of Jasper Newspapers

An interview was conducted at the DIA Open House on April 6, 2017. Newspaper articles were published in the "Jasper Fitzhugh" on April 12, 2017.

3.2.3 Additional Public Comments

ATCO Electric received additional feedback on the DIA through ATCO Electric's Project website and through Parks Canada. Feedback received was related to concerns regarding the Project Need and alternatives, specifically, that renewables would be a more preferential option to connecting Jasper to the AIES. ATCO Electric and Parks Canada directed the interested parties to the AESO for questions regarding the Project need and provided both the interested parties and the AESO with each appropriate contact information.

3.3 Indigenous Engagement Summary

ATCO Electric's relationship with Indigenous groups has evolved over the years and we continue to strive to enhance our relationships with these groups. ATCO Electric believes that responsible development must take into account the issues and concerns of all interest holders, including Indigenous groups. Through information sharing, consultation and collaboration, ATCO Electric works with Indigenous groups to understand issues and concerns to avoid and mitigate impacts within areas of Traditional Land Use where possible.

The consultation process began formally when Parks Canada provided notification of the Project on December 18, 2015 to all recipients on the Parks Canada approved notification list. Included in the notification letter were details regarding the proposed Project, Parks Canada's role as the regulator and the regulatory process, the aspects of consultation that have been delegated to ATCO Electric, ATCO Electric's contact information, Parks Canada's contact information, and a deadline for contacting the proponent or regulator to express interest in further involvement.

In early February 2016, ATCO Electric met with the 19 Indigenous groups who expressed an interest in engagement to Parks Canada, to discuss the steps required to ensure the groups have a full understanding of the Project. ATCO Electric's Indigenous Relations Liaisons have provided each interested organization with pertinent Project information containing a plain language description of the Project and maps in mosaic form. ATCO Electric has also provided digital copies of Project these same materials including computer generated files.

Since the start of initial engagement efforts in February 2016, 3 additional communities have been included as per Parks Canada's direction. The most recent addition being in October 2016. ATCO Electric will continue to engage with the 3 additional parties accordingly. In total, ATCO Electric has engaged with 23 Indigenous groups for the Project.

ATCO Electric has been working closely with these Indigenous groups to tailor engagement in a meaningful way so that the Project is understood and all feedback and/or concerns that may arise are communicated to the Project team and addressed appropriately. Possible engagement activities include community-specific open houses, mapping sessions with Elders, flyovers of the proposed route and ground based site visits. ATCO Electric's goal is to ensure that each organization has had every opportunity to review the Project and have any and all questions and concerns addressed.

3.3.1 Detailed Impact Analysis

ATCO Electric provided Indigenous Communities with a hard copy of the DIA for review and comment. In addition, ATCO Electric offered to provide capacity funding to ensure that each communities' comments and feedback were received and integrated into the DIA.

ATCO Electric has engaged with all of the Indigenous communities in Table 3.3-1. To date ATCO Electric has not received any objections to the Project and has received feedback on the DIA from many of the Indigenous communities. Some Indigenous communities have indicated that they support the ATCO Electric proposed routing methodology of following existing disturbances.

ATCO Electric will continue to attend or hold community meetings as necessary to review activities and ensure identified issues or concerns are mitigated. Further, ATCO Electric will continue to provide Project updates on an ongoing basis up to and including construction and reclamation. Table 3.3-1 provides a summary of engagement with Indigenous communities.

Table 3.3-1. Summary of Engagement with Indigenous Communities to Date

Community	Status
Alexis Nakota Sioux Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: Project Information Package review meeting and delivery of DIA. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Aseniwuche Winewak Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit, and DIA review. ATCO Electric has received feedback from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.

Table 3.3-1. Summary of Engagement with Indigenous Communities to Date

Community	Status
Asini Wachi Cree (Mountain Cree Band)	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit, and DIA review. ATCO Electric has received feedback from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Bighorn Chiniki Stoney Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit, and DIA review. ATCO Electric has received feedback from the community on the DIA, and a letter of no objection. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Ermineskin Cree Nation	Engagement activities with communities commenced September 2016 as per Parks Canada direction. Upon confirmed receipt of project information, specific engagement activities included: site visit, mapping session, and DIA review. ATCO Electric has received feedback from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Foothills Ojibway First Nations	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: Project Information Package review meeting and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Grande Cache Local 1994	Engagement activities with communities commenced July 2016 as per Parks Canada direction. Upon confirmed receipt of project information, specific engagement activities included: site visit, and DIA review. ATCO Electric has received feedback from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Gunn Metis Local 55	Engagement activities with communities commenced June 2016 as per Parks Canada direction. Upon confirmed receipt of project information, specific engagement activities included: site visit, mapping session, and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Horse Lake First Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Kelly Lake Cree Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visits, mapping session, and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Kelly Lake Metis Settlement Society	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric has received feedback and letter of no concern from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
MNA and Metis Region 4	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric has received feedback and a letter of no concern from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.

Table 3.3-1. Summary of Engagement with Indigenous Communities to Date

Community	Status
Metis Nation of British Columbia	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: project review and DIA delivery. ATCO Electric has received feedback of no concerns from the community, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Nakcowinewak Nation of Canada	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit, mapping session, and DIA review. ATCO Electric has received feedback of no concerns from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
O'Chiese First Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: DIA delivery. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Paul First Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visits and DIA review. ATCO Electric has received feedback from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Simpcw First Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Mountain Cree (Smallboy's Camp)	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric has received feedback from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Samson Cree Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit, mapping session, and DIA review. ATCO Electric has received feedback of no concern from the community on the DIA, ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Stoney Nakoda Nations	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visits, mapping session, and DIA review**.** Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Sucker Creek First Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Swan River First Nation	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: site visit and DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.
Upper Athabasca Valley Elders	Engagement activities with communities commenced December 2015 through Parks Canada engagement process. Upon confirmed receipt of project information, specific engagement activities included: DIA review. ATCO Electric will continue to work with the community to identify and mitigate any concerns, as is reasonably practical.

3.3.2 Engagement Results

3.3.2.1 Responding to Concerns

ATCO Electric believes that issue identification and resolution is most effectively achieved through an open and transparent dialogue and exchange of information. During consultation, ATCO Electric's objective is to interact and meet with Indigenous groups to identify areas of cultural and environmental importance and gain information to assist in route and Project development. Where concerns are raised, throughout any stage of the Project, mitigation efforts will take on a collaborative approach and endeavour to ensure both parties are satisfied with next steps to resolve concerns, where practicable. Methods and tools for resolving and managing issues of concern may include:

- Adjusting the transmission line routing
- Modifying the placement of structures
- Modifying Project timing and/or sequencing of activities (to the extent permitted by the terms of the other approvals or agreements)
- Exploring alternate access to the transmission line right-of-way to address concerns regarding access
- Developing mitigation strategies and approaches to protect sites identified as having cultural importance

ATCO Electric will continue to work with each Indigenous group to obtain further information regarding its specific interests and concerns (if any) to ensure efforts to avoid or mitigate any potentially adverse impacts are identified. ATCO Electric will continue to communicate with each Indigenous group to provide regular updates about the Project and address other concerns, as necessary, if they arise.

3.3.2.2 Engagement Results

To determine Project-specific sites of interest, ATCO Electric requested that each Indigenous group provide specific information about their historical and current traditional pursuits and cultural or sacred sites within the Project study area. Knowledge Holder Project review and mapping sessions provided an opportunity for the community's Knowledge Holders to review a map of the Project study area with ATCO Electric and to identify areas where historical and current pursuits were and are undertaken by the community.

In addition to the information shared by the Indigenous groups during consultation activities, written submissions received have also been reviewed for consideration by the Project team. The information shared such as Indigenous Traditional Land Use information, Project-specific concerns, and suggested mitigation measures have and will continue to be reviewed to determine if any mitigation or avoidance measures are required.

Upon review of the information received, there are concerns common across the Indigenous groups. These concerns, along with ATCO Electric's response and potential mitigation measures are listed below.

Impacts to Traditional Land and Resource Use Sites

Some Indigenous groups expressed concerns regarding the potential impact of the Project on traditional land and resource use (TLRU) sites within JNP, such as impacts to trails and travelways, plant gathering sites and spiritual or ceremonial sites located within the Project area. During route development, specific sites of importance were identified by Parks Canada, based on feedback previously provided by Indigenous communities. The proposed route alignment avoids impacts to these specifically identified sites. Additionally, the alignment of the proposed route along existing linear disturbance minimizes clearing requirements, thereby reducing potential effects to other TLRU areas.

Some Indigenous groups have provided ATCO Electric with information about TLRU and additional sites of cultural and spiritual importance in the vicinity of the Project and potentially impacted by Project activities. ATCO Electric will continue to engage with the organization to assess the nature of the potential impact and determine appropriate measures to mitigate the impacts during construction and operation of the Project. Where required, general mitigation measures may include, but not be limited to, avoidance by means of minor route alignment or structure placement adjustments; preventative measures such as fencing to protect sensitive TLRU features or locations, or matting of sensitive vegetation during construction; and tailored remediation efforts.

Impacts to Land Availability to Exercise Traditional Land and Resource Use

The proposed transmission line will follow existing cleared linear development for 99 percent of the route length and the proposed substation will be positioned within the existing Palisades Power Plant site. There may be disruption to some traditional land users during construction. Due to safety concerns, TLRU activities along the proposed right-of-way cannot occur while construction activities are taking place. ATCO Electric will work with the Indigenous groups to accommodate for TLRU activities along the proposed right-of-way. Construction activities will be limited to off-season (winter season) which should further reduce impacts to seasonal TLRU activities such as plant harvesting.

Impacts to Culturally Important Resources

Wildlife

With regard to wildlife, the proposed route, substation site and related workspace integrates or co-locates with existing linear disturbance to a large extent, which greatly reduces clearing requirements and ground disturbance. ATCO Electric will avoid construction in specific areas during sensitive wildlife periods (e.g., mountain goat rutting and kidding), and will allow for natural revegetation of shrubs and trees to a height that does not impede the safe and practical operation of the proposed transmission line. These measures are expected to reduce instances of direct and indirect habitat loss.

Vegetation and Gathering Areas

Some Indigenous groups expressed concerns regarding impacts to vegetation of cultural and spiritual importance. As the proposed route and substation are integrated with existing linear disturbance, clearing and vegetation disturbance are reduced. Where avoidance of cultural and spiritual vegetation of importance is not practical and clearing is required, key mitigation measures developed for the Project include limiting vegetation disturbance through winter construction and use of access matting and snow packing along the proposed right-of-way. ATCO Electric will restore native vegetation along the disturbed Project area by allowing natural regeneration or by seeding in non-wetland areas. ATCO Electric will maintain compatible vegetation and the vegetated ground mat within the vegetated buffer zone of watercourses and wetlands, to the extent possible.

To date, Indigenous groups consulted have not identified specific traditional plant harvesting sites that may be directly impacted by the proposed right-of-way. However, should specific plant harvesting sites along the right-of-way be subsequently identified, ATCO Electric will work with the Indigenous group to understand the location and species of concern, and discuss possible mitigation measures.

Fish Species and Fishing Locales

Some Indigenous groups expressed concerns about impacts to fish species and fishing locales. Potential mitigation measures include methods by which to control sedimentation and other deleterious materials from entering surface water to maintain water quality, and methods by which to limit blockage of fish movement. ATCO Electric anticipates that there will be limited impacts to fishing as the proposed transmission line will clear span watercourses and is not routed within close proximity to any fishing lakes.

Heritage Resources

As part of the proposed route development, ATCO Electric worked closely with Parks Canada to understand known features of historical and cultural significance that required mitigation or avoidance. The proposed transmission line route avoids impacts to these specified features. Additionally, ATCO Electric utilized a third-party consultant to complete a Historical Resources Impact Assessment (HRIA) for the Project. In addition to these activities, ATCO Electric has engaged with Indigenous groups and conducted site visits and mapping sessions with traditional knowledge keepers to understand areas of cultural and historical importance. Should areas be identified as part of ongoing consultation, ATCO Electric will work with the Indigenous groups to determine appropriate mitigation measures, including, but not limited to minor route re-alignments and structure placements.

Indigenous Access

Some Indigenous groups expressed concern that Project construction could inhibit group member access to lands for traditional use, such as gathering and harvesting, and fishing. ATCO Electric recognizes that construction will temporarily restrict access for traditional use purposes. As construction will occur in the late fall and winter months, the timing of construction should not conflict with most traditional uses on the proposed right-of-way. However, ATCO Electric will work closely with the Indigenous groups to understand the timing of their traditional uses to better understand how these uses can be accommodated during construction.

Indigenous groups will be able to access the proposed right-of-way during operations for Traditional Land Use activities.

Noise and Dust

Some Indigenous groups expressed concern that Project construction would result in noise and dust. Noise and dust will be greatest during construction of the proposed transmission line. As construction will occur in late fall and winter months, limited dust generation is expected since conditions during this time are typically wet or frozen. For areas where construction may extend into non-frozen periods, dust control measures will be implemented as appropriate. Noise will be generated during construction activities associated with the proposed transmission line and substation. Once the proposed transmission line and the substation are constructed, there will be very little noise anticipated from ATCO Electric's operations of the facilities. The overall noise profile of the proposed Sheridan Substation will be greatly decreased compared to the current operating noise levels from Palisades.

Water

Some Indigenous groups have expressed concerns about potential impacts of the Project on water resources and watersheds. ATCO Electric took impacts to watercourses and wet areas into consideration as part of route development and, where practical, reduced routing through environmentally sensitive areas such as wetlands and watercourses. In addition to routing decisions, ATCO Electric has outlined mitigation measures to reduce or eliminate impacts to waterbodies in the EPP (see Appendix 1). ATCO Electric is also aware that some watercourse crossings have significant importance to Indigenous groups. ATCO Electric will provide notification of when watercourse crossing work is occurring if requested by the Indigenous groups.

Herbicide Use

Some Indigenous groups have expressed concerns regarding herbicide use. Where herbicide application is required (for instance, to control non-native and Noxious weed species), ATCO Electric will follow the Parks Canada Integrated Pest Management (IPM) Plan (Shepherd, 2016) as further discussed in Section 5.2.

Ungulate Protection

Some Indigenous groups expressed concern about the impact of the proposed transmission line on ungulate habitat and activities. The proposed transmission line route, substation and related workspace integrates or co-locates with existing linear disturbance to a large extent, which greatly reduces clearing requirements and ground disturbance. ATCO Electric will avoid construction in specific areas during sensitive wildlife periods (e.g., mountain goat rutting and kidding), and will allow for natural revegetation of shrubs and trees to a height that does not impede the safe and practical operation of the proposed transmission line. These measures are expected to reduce instances of direct and indirect habitat loss for ungulate populations.

Reclamation

Some Indigenous groups expressed concerns with regard to the final reclamation activities following Project construction, and expressed interest in having input into what the final reclamation plan will entail. ATCO Electric's planned reclamation activities, developed in collaboration and in accordance with Parks Canada, are outlined in Sections 6 and 7, as well as in the EPP (Appendix 1).

Construction Monitors

Some Indigenous groups have expressed a preference to have group member(s) present to monitor construction and reclamation activities. ATCO Electric will continue to engage with these groups to understand the full extent of the requested involvement before determining whether this is a safe and practical option. Compliance officers from Parks Canada will be present during key activities on the Project to assess adherence to their governing best practices for the Jasper National Park.

ATCO Electric's engagement with Indigenous groups is ongoing and where further Project-specific concerns are identified, ATCO Electric will continue to work with such groups to respond, and identify mitigation measures, where warranted. ATCO Electric will endeavour to meet with each Indigenous group to demonstrate how their concerns and information provided to ATCO Electric has been considered and /or incorporated into the Project planning.

3.4 References

3.4.1 Literature Cited

Shepherd, L. 2016. *Jasper National Park Integrated Pest Management Plan 2016 Front Country and Wilderness Areas*. Jasper National Park, Jasper AB. 15 pp.

Effects Assessment Methodology

4.1 Overview

Parks Canada has developed the *Guide to the Parks Canada Environmental Impact Analysis Process* (Parks Canada, 2015) to ensure that all projects within national parks follow the terms and conditions of *CEAA, 2012*. The Guide stipulates that:

> "A DIA, is intended for complex projects that require in-depth analysis of project interactions with valued components; that may affect a particularly sensitive environmental setting or threaten a particularly sensitive valued component."

The DIA follows the Guide, as well as the Terms of Reference provided by Parks Canada for the Project (Parks Canada, 2015).

This section provides the approach and methods used to carry out the effects assessment for the Project. The assessment method applies the following process:

1. Identify the valued components (VC) (Section 4.2)
2. Determine the geographic extent and temporal boundaries for the assessment (Section 4.3)
3. Describe the Project setting (Section 5)
4. Identify the potential effects (Section 5)
5. Develop appropriate general and site-specific mitigation (Section 5)
6. Identify anticipated potential residual effects (Section 5)
7. Characterize the potential residual effects (Section 5)
8. Identify potential cumulative effects (Section 5)

Although methodology has been developed based, in part, on the document, *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (CEA Agency, 2015a); Parks Canada has advised that it will determine the significance of the potential residual effects of the Project, as identified in the Terms of Reference (Parks Canada, 2015). Parks Canada has also advised that it will use factors of magnitude, geographic extent, duration, frequency, reversibility, and ecological context as criteria for the determination of significance of potential residual effects of the Project. Therefore, the DIA characterizes the potential residual effects using the criteria mentioned, but does not provide a determination of the significance of the residual effects.

The effects assessment associated with the Project was a collaborative effort of several qualified professionals with VC-specific expertise; experience gained during previous projects with similar conditions or potential issues; regulator input, and professional judgment of the study team.

4.2 Selection of Valued Components

The VCs selected for consideration in the DIA were identified in the Terms of Reference provided by Parks Canada (Parks Canada, 2015). The VCs identified for this Project include the following:

- Landforms and Soils
- Vegetation
- Aquatic Wildlife and Ecosystems
- Wetlands
- Wildlife and Wildlife Habitat (including sensitive or unique ecosystem features)
- Air Emissions and GHG Emissions
- Aesthetics and Visual Resources
- Public/Visitor Safety
- Visitor Experience and Aesthetics

- Archaeological, cultural and historical resources
- Socio-economic Impacts
- Indigenous use and interests

4.3 Assessment Boundaries

The DIA considers the potential effects of the Project on the environment within defined geographic extents and temporal boundaries. These boundaries will vary with the VCs to be considered, and will reflect the following:

- Baseline setting within the geographic extent of the Project
- Construction, decommissioning, and operations phases of the proposed physical works and physical activities
- Time required for an effect to become evident
- Time required for a VC to recover from an effect and return to a pre-effect condition
- Area directly affected by proposed physical works and physical activities
- Area in which a VC functions and within which a Project effect may be felt

4.3.1 Geographic Extent

Geographic extents were determined by the distribution, movement patterns, or potential zones of interaction between the VC and the Project. The geographic extent used to assess the potential residual effects may be limited to the Project Footprint or may extend beyond the physical boundaries of the Project Footprint, since the interaction of the Project with a VC can be local, regional, national or international in extent.

The geographic extents used in the effects assessment considered one or more of the following areas.

- The Project Footprint is the area directly disturbed by Project activities, including associated physical works and activities (i.e., right-of-way, structure locations, permanent access and temporary workspace, laydown areas, temporary access, substation and decommissioning activities at Palisades).
- The Study Area (SA) varies with the VC being considered and is based on the area in which a VC functions and within which the potential effects of the Project are most likely to occur. The VC specific SAs are defined in Section 5.
- The Regional Area (RA) is the area beyond the SA. A residual effect may extend beyond the SA to have effects that cross regional, provincial, interprovincial, national or international boundaries. The VC specific RAs are defined in Section 5, where applicable.

The SA boundary reflects a balance between choosing a large area that would mask or dilute the potential effects of the Project, versus choosing a smaller area where the effect under consideration may no longer be meaningful.

4.3.2 Temporal Boundaries

The time frames used in the assessment of the Project includes construction of the transmission line and substation. The construction phase of the Project includes the decommissioning of the Palisades power plant for the construction of the Sheridan Substation. The operations phase will follow the construction phase. Construction activities for the substation are anticipated to commence in Q3 2017 and in Q4 2017 for the transmission line. The anticipated in-service date is May 2018. Decommissioning of Palisades will begin once the transmission line and substation are commissioned in May 2018, and is estimated to be completed in May 2019. The operations phase was considered to commence in

May 2018 following the completion of construction and extend for a term estimated to exceed 40+ years. There will be overlap of the construction and operations phase during the decommissioning of Palisades.

4.4 Setting

The assessment team conducted studies to establish the existing conditions (i.e., setting) of the VCs considered, from which the potential effects of the Project can be determined. To gather pertinent background information for each VC, the assessment team used relevant regulatory context and information gathered from the following:

- Topographic maps
- Aerial photography
- Literature Review
- Reference books
- Municipal, provincial, and federal government maps and registries
- Reports
- Websites
- Available local information
- Engagement with Parks Canada

Setting information sources also included publicly available information submitted in support of regulatory applications for similar projects, consultation outcomes, field studies and surveys, and the professional judgement of the assessment team.

Field studies or surveys were conducted in 2015 for the following VCs: Landforms and Soils, Vegetation, Aquatic Wildlife and Ecosystems, Wetlands and Hydrology, Wildlife and Wildlife Habitat, Aesthetics and Visual Resources and Heritage Resources. A supplemental early season vegetation survey was conducted in June 2016. Refer to Section 5 for a description of each field survey or study.

Route modifications occurred in October 2016 following the field studies and surveys. The modifications were minor in most cases (i.e., less than a 10 m change from the 2015 right-of-way centreline) and cross similar existing conditions as those previously surveyed. Therefore, further surveys were not considered necessary for all VCs with the exception of Heritage Resources (see Section 5.9 for a description of the supplemental survey planned for 2017).

4.5 Potential Effects

The potential effects resulting from the Project were identified through experience gained during other construction programs in nearby areas with similar conditions, and through the professional experience of the assessment team. The potential effects arising from the construction and operations of the Project are identified in Sections 5 of the DIA.

4.6 Mitigation Measures

Mitigation, as defined under the *CEAA*, *2012* is considered to be the “elimination, reduction, or control of a project’s adverse environmental effects, including restitution for any damage to the environment caused by such effects through replacement, restoration, compensation, or any other means”.

To reduce the severity of potential adverse effects and enhance potential positive effects during Project construction and operations, general and site-specific mitigation have been identified based upon ATCO Electric’s experience on similar projects, current industry-accepted standards and best management practices, consultation with regulatory agencies, and the professional experience of the assessment team.

Mitigation measures are outlined throughout Sections 5, as well as in ATCO Electric's Project-specific Environmental Protection Plan (EPP) (Appendix 1). Mitigation measures were developed in accordance with applicable regulations, industry standards and guidelines, as well as from the Best Available Methods for Common Leaseholder Activities (Axys and Walker, 1998) are also included in Sections 5. Qualified Environmental Inspectors will be retained by ATCO Electric to confirm that the identified mitigation and contingency measures are understood and properly implemented during construction.

4.7 Evaluation of Potential Residual Effects

Residual effects are the effects remaining following the implementation of mitigation measures. In many situations, the potential mitigation measures will completely mitigate the potential adverse effects, while in other situations, the mitigation measures will lessen the effects, but not entirely eliminate them. VCs for which no residual effects are predicted require no further analysis.

Some residual effects can be assessed quantitatively using regulatory standards and guidelines. 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 based on available literature is considered to be the appropriate method for characterizing most of the identified potential residual effects.

4.7.1 Effect Characterization

Potential residual effects were characterized according to a set of qualitative criteria based on those identified by Hegmann et al., (1999). These criteria and their definitions are presented in Table 4.7-1.

Table 4.7-1. Characterization of Residual Effects

Assessment Criteria		Definition
GEOGRAPHIC EXTENT		
Project Footprint		The Project Footprint is the area directly disturbed by Project activities, including associated physical works and activities (i.e., right-of-way, structure locations, permanent access and temporary workspace, laydown areas, temporary access, substation and decommissioning activities at Palisades). The construction Project Footprint is approximately 61.9 ha.
SA (Study Area)		The SA varies with the VC being considered and is based on the area in which a VC functions and within which the potential effects of the Project are most likely to occur. The VC specific SAs are defined in Section 4.
RA (Regional Area)		The RA is the area beyond the SA. A residual effect may extend beyond the SA to have effects that cross regional, provincial, interprovincial, national or international boundaries. The VC specific RAs are defined in Section 5, where applicable.
TEMPORAL CONTEXT		
Duration	Immediate	The residual effect is limited to 2 days or less.
	Short-term	The residual effect is limited to the construction phase or any 1 year during the life of the Project.
	Medium-term	The residual effect extends into the operation phase for up to 10 years.
	Long-term	The residual effect extends into the operation phase for more than 10 years, but ceases during the operational life of the Project.
	Extended-term	The residual effect extends beyond the operational life of the Project.

Table 4.7-1. Characterization of Residual Effects

Assessment Criteria		Definition
Frequency	Rare	The residual effect occurs uncommonly or unpredictably (e.g., as a result of an accident or malfunction) over the assessment period.
	Isolated	The residual effect is confined to specified phase of the assessment period.
	Occasional	The residual effect occurs intermittently and sporadically over the assessment period.
	Periodic	The residual effect occurs intermittently but repeatedly over the assessment period.
	Continuous	The residual effect occurs throughout the assessment period.
Reversibility	Reversible	Residual effect is reversible to pre-construction or equivalent conditions.
	Irreversible	Residual effect is permanent.
MAGNITUDE[b,c] – of Biophysical Environmental Effects		
Negligible		The residual effect has no measurable change to the biophysical component.
Minor		The residual effect may result in some measurable change to the biophysical component but no measurable loss in function or value, and is within environmental or regulatory standards.
Moderate		The residual effect may result in measurable change to the biophysical component with measurable loss in function or value such that environmental or regulatory standards are not exceeded.
Major		The residual effect will result in measurable change to the biophysical components with measurable loss in function or value that exceeds environmental or regulatory standards.
MAGNITUDE[c] - of the Aesthetic and Visual Resources, Visitor Experience and Socio-economic Residual Effects		
Negligible		No detectable change from existing (baseline) conditions.
Minor		Change is detectable, and results in a minor modification from the existing (baseline) conditions.
Moderate		Change is detectable and results in moderate modification from the existing (baseline) conditions.
Major		Change is detectable and is large enough to result in a severe modification from the existing (baseline) conditions.

[a] The areas adjacent to the proposed right-of-way which will require some level of treatment for the reduction of hazard trees (see Section 2.7.1.1) are not considered part of the Project Footprint.

[b] Environmental or regulatory standards are not limited to specific, explicit, or quantitative thresholds or standards. If these are not available for a particular VC the determination of magnitude was based on consideration of previous assessment of magnitude (i.e., precedence), best practices, management/recovery/conservation objectives, regional/land use/development plans, and the professional experience and judgement of the assessment team.

[c] The magnitude rating for a given potential residual effect may be increased based on the professional judgement of the assessment professional. Where this occurs, rationale is provided for the departure from this effects characterization methodology in the VC- specific assessment.

The characterization of residual effects using the criteria ratings in Table 4.7-1 took into consideration ecological and regulatory context. Context is informed by the setting information provided in Section 5, as well as regulatory policy, guidelines, standards, thresholds, or targets and levels of existing disturbance. Context provides an indication of the resilience of the receiving environment and socio-economic environment to effects, and is summarized for each applicable residual effect. Context is particularly influential in the determination of magnitude ratings. For VCs where quantitative thresholds or targets are available, the magnitude rating is determined by or strongly influenced by the Project’s effects relative to the threshold or target.

For many VCs and construction and operations issues under evaluation, there are no environmental standards, guidelines, thresholds, targets, or objectives. Therefore, the determination of magnitude of the residual effects was based on professional judgement and considered previous assessments of magnitude.

4.8 Cumulative Effects

As per the Terms of Reference for the Project, the DIA includes consideration the Project's contribution to cumulative effects. Where there is likelihood for the Project to contribute to cumulative effects on one or more VCs, further evaluation and discussion of the potential cumulative effects will be provided.

4.8.1 Assessment Methodology

The cumulative effects assessment will evaluate the likely residual effects directly associated with the Project in combination with the likely residual effects arising from other reasonably foreseeable developments and activities that have been, or will be carried out, in the Project Footprint, SA or RA of the Project (Table 4.7-1). Reasonably foreseeable developments considered in the assessment do not include proposed or hypothetical projects where formal plans have not been disclosed.

The assessment methodology used to evaluate the potential cumulative effects of the potential residual effects of the Project contained the following steps:

- Identification of potential residual effects of the Project
- Determination of spatial and temporal boundaries for each VC where residual effects have been identified for the Project
- Identification of other existing and reasonably foreseeable developments with residual effects that may act in combination with the residual effects of the Project
- Identification of potential cumulative effects
- Development of technically and economically feasible mitigation measures where required

The cumulative effects assessment methodology has been developed based on the CEA Agency's Assessing Cumulative Environmental Effects Under the *CEAA, 2012* (CEA Agency, 2015b) and Canadian Environmental Assessment (CEA) Agency's Cumulative Effects Assessment Practitioners Guide (Hegmann et al., 1999). A qualitative approach was deemed to be the most appropriate method to evaluate the potential cumulative effects given the scope of the Project. Cumulative effects have been assessed for each VC in Section 5 where a residual effect was identified.

4.8.2 Existing Activities and Reasonably Foreseeable Developments

Existing activities within the RA surrounding the Project include visitor experience activities (e.g., hiking, sightseeing, camping), utility activities (e.g., electrical distribution lines, communication lines), transportation activities (e.g., road maintenance and upgrades), oil and gas pipelines and utility activities, as well as various residential and commercial developments (e.g., Municipality of Jasper and outlying commercial accommodation).

The criteria used to select projects that may act cumulatively with the Project, located within JNP in the Athabasca River Valley up to and including the Municipality of Jasper are as follows:

- The project or activity has already been built or conducted in the vicinity of the Project.
- The project is either proposed (public disclosure) or has been approved to be built (but is not yet built) in the vicinity of the Project.

Sources that were searched for projects that could have cumulative interactions with the Project include websites for the Municipality of Jasper, JNP, Kinder Morgan Trans Mountain, ATCO Electric, ATCO Gas, and ATCO Pipelines. Table 4.9-1 provides information on reasonably foreseeable developments in the RA that share the same the temporal boundary as the Project.

4.9 References

4.9.1 Literature Cited

ATCO Electric Ltd. 2011. *Environmental Protection Plan for Jasper National Park*. 323 pp.

Axys Environmental Consulting Ltd. and David Walker & Associates 1998. *Best Available Methods for Common Leaseholder Activities*. Jasper, Alberta. 144 pp.

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Canadian Environmental Assessment Agency. 2015b. *Operational Policy Statement: Assessing Cumulative Environmental Effects Under the Canadian Environmental Assessment Act, 2012.* Ottawa, ON. ii + 8 pp. Website: https://www.ceaa-acee.gc.ca/Content/1/D/A/1DA9E048-4B72-49FA-B585-B340E81DD6AE/Cumulative%20Effects%20OPS%20-%20EN%20-%20March%202015.pdf. Accessed: May 2015.

Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling and D. Stalker. 1999. *Cumulative Effects Assessment Practitioners' Guide*. Prepared by AXYS Environmental Consulting Ltd. and the CEA Working Group for the Canadian Environmental Assessment Agency. Hull, QC. xii + 119 pp.

Parks Canada. 2015. *Terms of Reference for ATCO Electric's Jasper Interconnection Power Line Project Detailed Impact Analysis*. August 2015. Jasper, Alberta. 26 pp.

Parks Canada. 2015. *Guide to the Parks Canada Environmental Impact Analysis*. 25 pp. Website: http://www.pc.gc.ca/progs/eie-eia/itm1/itm1b/itm1b-2.aspx. Accessed: May 2016.

Table 4.9-1 Reasonably Foreseeable Developments

Primary Applicant	Project	Status	Location	Development Type	Sources	Project Description
Municipality of Jasper	Infrastructure and building maintenance	2016 - ongoing	Municipality of Jasper	Facility	Municipality of Jasper: http://www.jasper-alberta.com/DocumentCenter/View/466 http://www.jasper-alberta.com/DocumentCenter/View/754	Maintenance of municipality infrastructure including roads, parking lots, sidewalks, waterworks, and buildings.
Parks Canada	Infrastructure upgrades	Proposed for 2016-2020	JNP outside the Municipality of Jasper	Transportation	Parks Canada: http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/carte-FII-map.aspx Fitzhugh: http://www.fitzhugh.ca/feds-invest-200-million-in-jasper-park-infrastructure-and-conservation-projects/	Paving and slope stabilization to the Miette Road, Highway 93, Highway 93A, and Highway 16. Repairs to bridges on Snaring River, Fiddle River, Clarivaux Creek, and Meadow Creek.
Parks Canada	Infrastructure upgrades	Proposed for 2016-2020	JNP outside the Municipality of Jasper	Facility	Parks Canada: http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/carte-FII-map.aspx Fitzhugh: http://www.fitzhugh.ca/feds-invest-200-million-in-jasper-park-infrastructure-and-conservation-projects/	Paving and washrooms renovations in Whistlers, Wapiti and Wabasso campgrounds. Rehabilitation of Cabin Lake Dam. Replacement of fencing and weigh scale at the Waste Transfer Station.
Parks Canada	Icefields Trail (North)	Consultation complete. DIA under development	JNP	Recreational Trail	Parks Canada: http://www.pc.gc.ca/en/pn-np/ab/jasper/info/plan/sentierdesglaciers-icefieldstrail Fitzhugh: http://www.fitzhugh.ca/public-weighs-in-on-icefields-trail-project/	Paved recreational trail form the Municipality of Jasper to the Icefield Centre

Table 4.9-1 Reasonably Foreseeable Developments

Primary Applicant	Project	Status	Location	Development Type	Sources	Project Description
Kinder Morgan Trans Mountain	Reactivation of pipeline	Proposed for 2016 to 2019	JNP	Pipeline	Trans Mountain: http://www.transmountain.com/reactivation	The proposed Trans Mountain Expansion Project requires reactivation of a pipeline segment in JNP that has been maintained in a deactivated state. Returning these segments back into service is needed to complete the twinning of the pipeline system. Reactivation includes Inline Inspections tool runs, potential pipeline repairs, a hydrostatic pressure test, and automated valves.
Marmot Basin	Ski Hill Infrastructure	Proposed for 2016 to 2030	Marmot Basin Ski Area	Recreation	Marmot Basin: http://www.skimarmot.com/long-range-plan-direct-impact-analysis Parks Canada: http://www.pc.gc.ca/eng/pn-np/ab/jasper/plan/marmot-basin.aspx	Long Range Plan for development to include: • Expanded snowmaking in the mid-mountain area • Enhanced parking and transportation access • Upgrades to the Caribou Chalet • Glading on the slopes west of the mid-mountain chalet

Table 4.9-1 Reasonably Foreseeable Developments

Primary Applicant	Project	Status	Location	Development Type	Sources	Project Description
AltaLink Management Ltd.	New Transmission Line	Proposed for Fall 2017 to Spring 2018	East Boundary of JNP to existing substation near Hinton, Alberta	Transmission Line	AltaLink Management Ltd.: http://www.altalink.ca/projects/view/241/atco-jasper-interconnection	Part of the infrastructure identified in the AESO's Needs Identification Document entitled *Need for the Sheridan 2085S Substation and a New Transmission Line in the Jasper Area.* AltaLink's scope includes: • constructing approximately 9 km of new 69 kV transmission line • upgrades at the existing Watson Creek Substation
Municipality of Jasper	Infrastructure and building maintenance	2016 - ongoing	Municipality of Jasper	Facility	Municipality of Jasper: http://www.jasper-alberta.com/DocumentCenter/View/466 http://www.jasper-alberta.com/DocumentCenter/View/754	Maintenance of municipality infrastructure including roads, parking lots, sidewalks, waterworks, and buildings.
Municipality of Jasper	Municipal Library and Cultural Center	2016 - ongoing	Municipality of Jasper	Facility	Jasper Library: http://www.jasperlibrary.ab.ca/content/expansion Fitzhugh: http://www.fitzhugh.ca/more-delays-for-jaspers-overdue-library-and-cultural-centre/	Construction and renovation of the library within the Municipality of Jasper

Table 4.9-1 Reasonably Foreseeable Developments

Primary Applicant	Project	Status	Location	Development Type	Sources	Project Description
Parks Canada	Infrastructure upgrades	Proposed for 2016-2020	JNP outside the Municipality of Jasper	Transportation	Parks Canada: http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/carte-FII-map.aspx Map: http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/carte-FII-map.aspx#InsfrastructureImprovementList Fitzhugh: http://www.fitzhugh.ca/feds-invest-200-million-in-jasper-park-infrastructure-and-conservation-projects/	Paving and slope stabilization to the Miette Road, Highway 93, Highway 93A, and Highway 16. Repairs to bridges on Snaring River, Fiddle River, Clarivaux Creek, and Meadow Creek.
Parks Canada	Infrastructure upgrades	Proposed for 2016-2020	JNP outside the Municipality of Jasper	Facility	Parks Canada: http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/carte-FII-map.aspx Map: http://www.pc.gc.ca/eng/pn-np/ab/jasper/ne/carte-FII-map.aspx#InsfrastructureImprovementList Fitzhugh: http://www.fitzhugh.ca/feds-invest-200-million-in-jasper-park-infrastructure-and-conservation-projects/	Paving and washrooms renovations in Whistlers, Wapiti and Wabasso campgrounds. Rehabilitation of Cabin Lake Dam. Replacement of fencing and weigh scale at the Waste Transfer Station.
Kinder Morgan Trans Mountain	Reactivation of pipeline	Proposed for 2016 to 2019	JNP	Pipeline	Trans Mountain: http://www.transmountain.com/reactivation	The proposed Trans Mountain Expansion Project requires reactivation of a pipeline segment in JNP that has been maintained in a deactivated state. Returning these segments back into service is needed to complete the twinning of the pipeline system. Reactivation includes Inline Inspections tool runs, potential pipeline repairs, a hydrostatic pressure test, and automated valves.

Table 4.9-1 Reasonably Foreseeable Developments

Primary Applicant	Project	Status	Location	Development Type	Sources	Project Description
Marmot Basin	Ski Hill Infrastructure	Proposed for 2016 to 2030	Marmot Basin Ski Area	Recreation	Marmot Basin: http://www.skimarmot.com/long-range-plan-direct-impact-analysis Parks Canada: http://www.pc.gc.ca/eng/pn-np/ab/jasper/plan/marmot-basin.aspx	Long Range Plan for development to include: • Expanded snowmaking in the mid-mountain area • Enhanced parking and transportation access • Upgrades to the Caribou Chalet • Glading on the slopes west of the mid-mountain chalet
AltaLink Management Ltd.	New Transmission Line	Proposed for Fall 2017 to Spring 2018	East Boundary of JNP to existing substation near Hinton, Alberta	Transmission Line	AltaLink Management Ltd.: http://www.altalink.ca/projects/view/241/atco-jasper-interconnection	Part of the infrastructure identified in the AESO's Needs Identification Document entitled *Need for the Sheridan 2085S Substation and a New Transmission Line in the Jasper Area.* AltaLink's scope includes: • constructing approximately 9 km of new 69 kV transmission line • upgrades at the existing Watson Creek Substation

SECTION 5

Effects Assessment

5.1 Landforms and Soils

5.1.1 Existing Conditions and Context

This subsection describes the existing conditions of landforms and soils encountered by the Project.

5.1.1.1 Landforms and Soils Study Area

The Project components were considered in relation to the Project Footprint study area, as defined in Section 4.3.1.

The Landforms and Soils SA generally consists of a 2 km wide band of the proposed right-of-way, with 1 km on both sides of the centre line of the proposed right-of-way, and a 1 km radius extending outwards from the proposed Sheridan Substation.

The Landforms and Soils SA is defined such that it provides a representative analysis of the effects of the Project on both landforms and soils. The Landforms and Soils SA also represents the area where the direct and indirect influence of other land uses and activities could interact with Project-specific effects, which may contribute to cumulative effects on vegetation.

5.1.1.2 Physiography

The Project is located predominantly within the Montane Natural Subregion (Natural Regions Committee [NRC], 2006), with smaller portions located within both the Front Ranges Subprovince of the Rocky Mountain Physiographic Region (Pettapiece, 1986) and the Subalpine Natural Subregion of the Rocky Mountain Natural Region (NRC, 2006). The variable geologic and topographic characteristics of the Rocky Mountain Natural Region strongly influence both physiographic features and soils.

5.1.1.3 Geology

The proposed Project route crosses four geologic units: the Miette Formation from the Hadrynian Group, which is composed of primarily argillite and sandstone with minor dolomite, limestone, and shale components; the Upper Paleozoic Formation from the Paleozoic Group, composed primarily of argillaceous limestone and dolomite; the Lower Mesozoic-lower Cretaceous Formation from the Lower Cretaceous, Jurassic, and Triassic Group which is composed primarily of siltstone, dolomitic siltstone and limestone, limestone, breccia, and gypsum; and the Lower Paleozoic Formation from the Paleozoic Group which is primarily composed of quartz and quartzose sandstone with shale and limestone lenses. Limestone and dolomitic dominant parent material can contribute to calcareous surficial deposits within the SA (Hamilton et al., 1999).

5.1.1.4 Landforms and Soils

Previous soil mapping within the SA identified five soil orders within the Montane Natural Subregion and Subalpine Natural Subregion: brunisolic; luvisolic; regosolic; gleysolic; and organic (Holland and Coen, 1983a). Relative to other orders in the Montane Natural Subregion, the brunisolic order is the most extensive. Brunisols typically form under forest soils, with calcareous surface soils ranging from being low to highly weathered, depending on the steepness of the slope and drainage, and are often an intergrade order between regosolic soils and other orders (Soil Classification Working Group, 1998). Gray Luvisols generally occur throughout the Montane Natural Subregion, often in association with Eutric Brunisols. Gray Luvisols commonly occur on calcareous glacial and glacial lacustrine materials with rapidly to moderately well-drained soil regimes. Regosolic soils are broadly distributed on the landscape in areas where active geomorphic processes limit pedogenic development beyond the formation of a minimal Ah horizon formation. Gleyed soils are generally found in depressions and valleys over glaciolacustrine, fluvial, and fluvial lacustrine deposits that are imperfectly to poorly-drained. Organic soils occur in association with gleysolic soils under poorly to very poorly-drained conditions, primarily on glacial, fluvial, and fluviolacustrine landforms. Anthropomorphically disturbed soils within the SA may be found on roads and adjacent (existing) pipeline rights-of-way, landing areas, and other areas associated with construction and maintenance of infrastructure. As a result of previous disturbance, these soils may be characterized by having indistinct horizon development decreased soil structure, increased soil density, and/or increased stoniness.

5.1.1.5 Permafrost

Permafrost occurs when soil remains at or below freezing (i.e., 0°C) for a minimum period of 2 consecutive years (Burn, 2004). Although frozen soils may be present in winter, permafrost is not expected to occur in soils located within the Project Footprint (Smith, 2011).

5.1.1.6 Ecological Land Classification

Previous biophysical land classification and mapping conducted within JNP (Holland and Coen, 1983b) described typical terrain and soil relationships for defined ecosite types. Terrain and soil relationships associated with ecosites identified within the Project Footprint and SA are presented in Table 5.1-1.

Table 5.1-1. Typical Terrain and Soil Characteristics Encountered in the Project Footprint and SA

Ecosection	Ecosite	Typical Terrain	Typical Soil Characteristics and Classification
Athabasca	AT	• Glaciofluvial terraces which occur on valley bottoms and adjacent terrace locations with little or no slope	• Characterized by their coarse-textured glaciofluvial deposits supporting well to rapidly-drained Brunisolic soils (Holland and Coen, 1983a) • Thin veneer of calcareous, medium textured eolian material (Eolian material A) occurs in the Athabasca River valley downstream from Jasper town site
Hillsdale	HD	• Developed on well-drained fluvial aprons with slopes ranging from 1 to 15%	• Rapidly-drained Regosolic soils • Stratified fluvial deposits (alluvial fans, floodplain deposits) at valley bottom locations; they are flat, poorly-drained and generally support wet Gleysolic soils • Wetter sites are typically underlain by organic matter
Patricia	PT	• These ecosites characteristically are developed on well-drained glacial till (morainal deposits) with slopes ranging from 2 to 45%	• Brunisolic or Luvisolic soils
Devona	DV	• Ridged and dune landforms on valley bottoms with slopes ranging from 5 to 30%	• Well-drained ecosites which are predominantly Regosolic soils
Talbot	TA	• Eolian-veneer over morainal material on inclined bedrock with slopes ranging from 5 to 70%	• Well-drained ecosites which are predominantly Regosolic soils
Fireside	FR	• Fluvial fan or apron with slopes ranging from 2 to 30%	• Well-drained ecosites which are predominantly Brunisolic soils

Table 5.1-1. Typical Terrain and Soil Characteristics Encountered in the Project Footprint and SA

Ecosection	Ecosite	Typical Terrain	Typical Soil Characteristics and Classification
Norquay	NY	• Steep morainal deposits on slopes ranging from 15 to 70%	• Brunisolic (north aspect) and Regosolic soils (south aspects • Stratified drift material underlay these thinly-developed soils)
Vermillion Lake	VL	• Fluviolacustrine or Fluvial apron or fan on flat slopes	• Poorly-drained Regosolic Gleysols; wetter sites may develop organic soils

5.1.2 Regulatory Requirements

Projects in JNP fall under the *Canada National Parks Act* (*CNPA*) (2013) The *CNPA* is enforced by the PCA, and provides legal protection for the national parks of Canada so that “the parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations”. Under Section 16(1b), the *CNPA* supports “the protection of flora, soil, waters, fossils, natural features, air quality, and cultural, historical and archaeological resources”.

5.1.3 Field Studies

A field survey characterizing landforms and soils was conducted concomitantly with vegetation sampling in July 2015 to augment previous biophysical classification and mapping efforts (Holland and Coen, 1983b) and confirm desktop Ecological Land Classifications (ELC) within the SA.

Soil-specific survey procedures were modified for Alberta from the *Field Manual for Describing Terrestrial Ecosystems* (British Columbia Ministry of Forests and Range and British Columbia Ministry of Environment, 2010) and previous biophysical surveys within JNP (Holland and Coen, 1983a). Soil surveys were conducted using standard methods described in *The Canadian System of Soil Classification, Third Edition* (Soil Classification Working Group, 1998) at survey locations representative of the range of ecosystem units within the SA and distributed along the proposed route

At each survey location, characteristic soil profile morphology, parent material, colour, texture, structure, consistence, stoniness, and water table depth (if present) were identified to a maximum depth of 30 centimetres (cm). In addition to soil characteristics, the landform and biological parameters including slope, aspect, rooting depth, and abundance were noted and recorded. Soil features relevant to the study including, soil classification, or morphology features which may require special management or soil handling were also noted if not otherwise recorded. Soils disturbed through previous activities (e.g., pipeline) were characterized and indications of resulting soil profile disturbance or admixing were noted.

Landform and soil data from the field study augmented vegetation surveys used to determine the ecosite type for surveyed locations and ground truth the desktop ELC. Details of the methods and results used to confirm the desktop ELC are provided in Appendix 5.2-1 and Section 5.2.1.4, respectively.

Mapped soils within the Project Footprint are presented in Figure 5.1-1. Soils surveyed within the SA and subsequently mapped using the ELC methodology were generally consistent with soils mapped in the previous ELC (Holland and Coen, 1982b) and are presented in Table 5.1-2.

Table 5.1-2. Soil Characteristics by Ecosite Encountered by the Transmission Line Right-of-Way

Ecosection/Ecosite	Area of Proposed Right-of-Way and Percent of Route Ecosite Encountered[a]	Associated Soil Classification[b]	Parent Material	Soil Texture Class	Erosion Hazards[c]			Key Soil Features
					Topsoil Depth (cm)	Wind/ Water	Soil Compaction and Rutting	
Athabasca/AT 1, 3	6.8 ha (15.2%)	Orthic Eutric Brunisols	Glaciofluvial	Gravelly sandy loam - loamy sand	0-20	H/S to H	No	• Typically forested sites with relatively stable soils
Fireside/FR 1	0.5 ha (1.1%)	Eluviated and Orthic Eutric Brunisols	Fluvial	Sandy loam - gravelly sandy loam	5 -15	H/S to M	No	• Well-drained, relatively stable • Calcareous surface material
Devona/DV 2	2.6 ha (5.7%)	Calcareous Orthic and Calcareous Cumulic Regosols	Eolian	Silt loam - very fine sandy loam	13-22	H/S to H	No	• Calcareous surface material • Well-drained ecosites
Hillsdale/HD 1, 2, 3	18.7 ha (41.6%)	Calcareous Orthic and Calcareous Cumulic Regosols	Fluvial	Very fine sandy loam - gravelly loamy sand	0 - 25	H/S	No	• Calcareous surface material
Norquay/NY 3	1.6 ha (3.5%)	Orthic and Eluviated Eutric Brunisols	Eolian/till	Loam - silt loam/stony loam	0 - 15	H/H	No	• Highly erodible
Talbot/TA 2, 3	2.2 ha (4.8%)	Calcareous Orthic and Calcareous Cumulic Regosols	Eolian/fluvial or till	Silt loam/gravelly sandy loam - gravelly loamy sand	10 -35	M/S to H	No	• Calcareous surface material
Vermillion Lakes/VL 1, 3, 4, 5	8.7 ha (19.3%)	Calcareous Rego Gleysol Organic	Fluvial	Silt loam	0 -22	H/S	Yes	• Potentially calcareous surface material
Patricia/PA 1, 5	3.1 ha (6.8%)	Orthic and Eluviated Eutric Brunisols	Till	Silt loam and loamy sand	0 - 10	M/S to H	No	• Moderate slopes (2-45%),

[a] Area of proposed right-of-way may not add due to rounding.

[b] Soils occur intermittently along proposed route

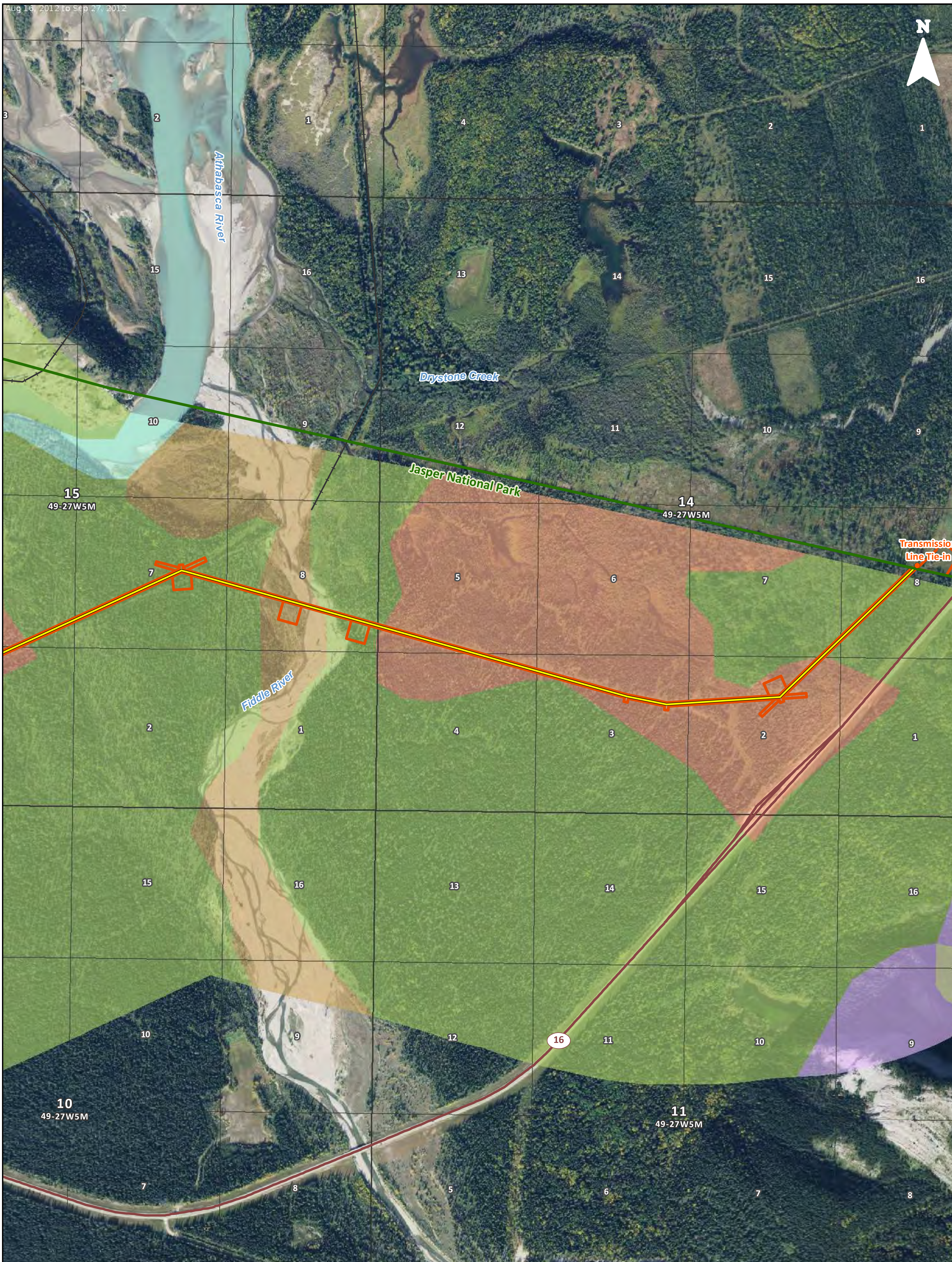
[c] Erosion Hazard

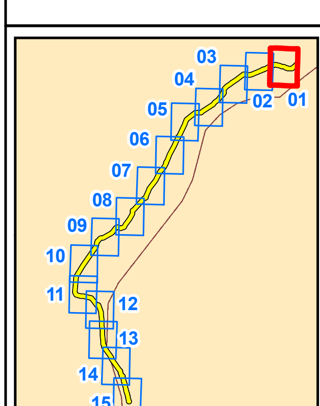
Notes:

S = Slight

M = Moderate

H = High





- Proposed Route
- Temporary Workspace and Easement
- Laydown Area
- Service Lane
- Collector
- Expressway / Highway
- Railway
- Park/Protected Area

Soil Description

- Cumulic Regosol
- Misc. Landscapes
- Orthic Eutric Bruinisol
- Orthic Regosol
- Rego Gleysol
- Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 01 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

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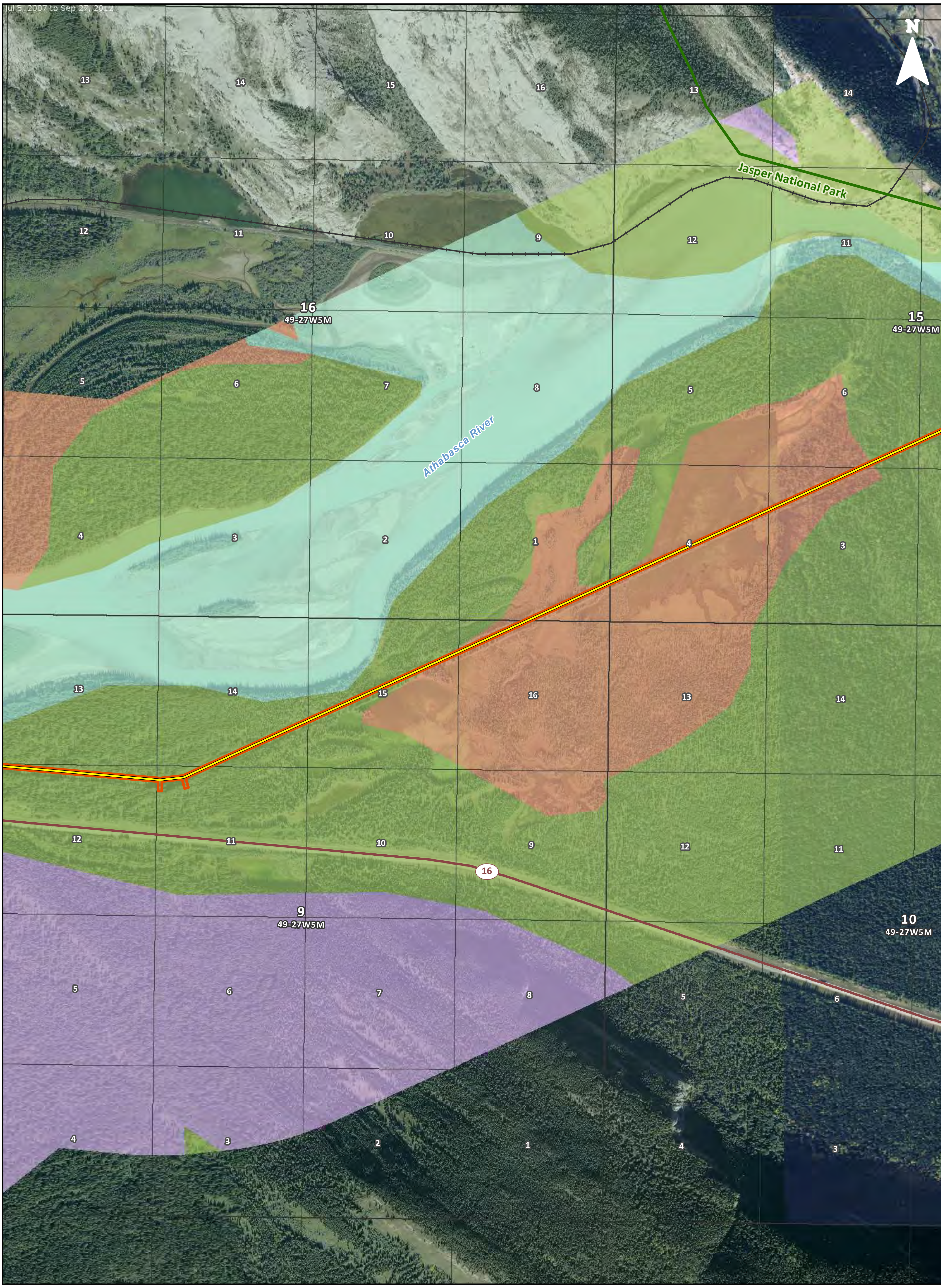

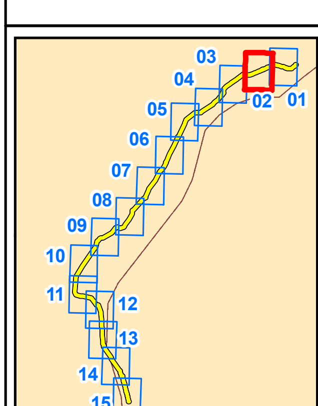

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway

Park/Protected Area

Soil Description

Cumulic Regosol
Orthic Regosol
Rego Gleysol
Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 02 OF 15

JASPER INTERCONNECTION PROJECT

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UTM Zone 11N
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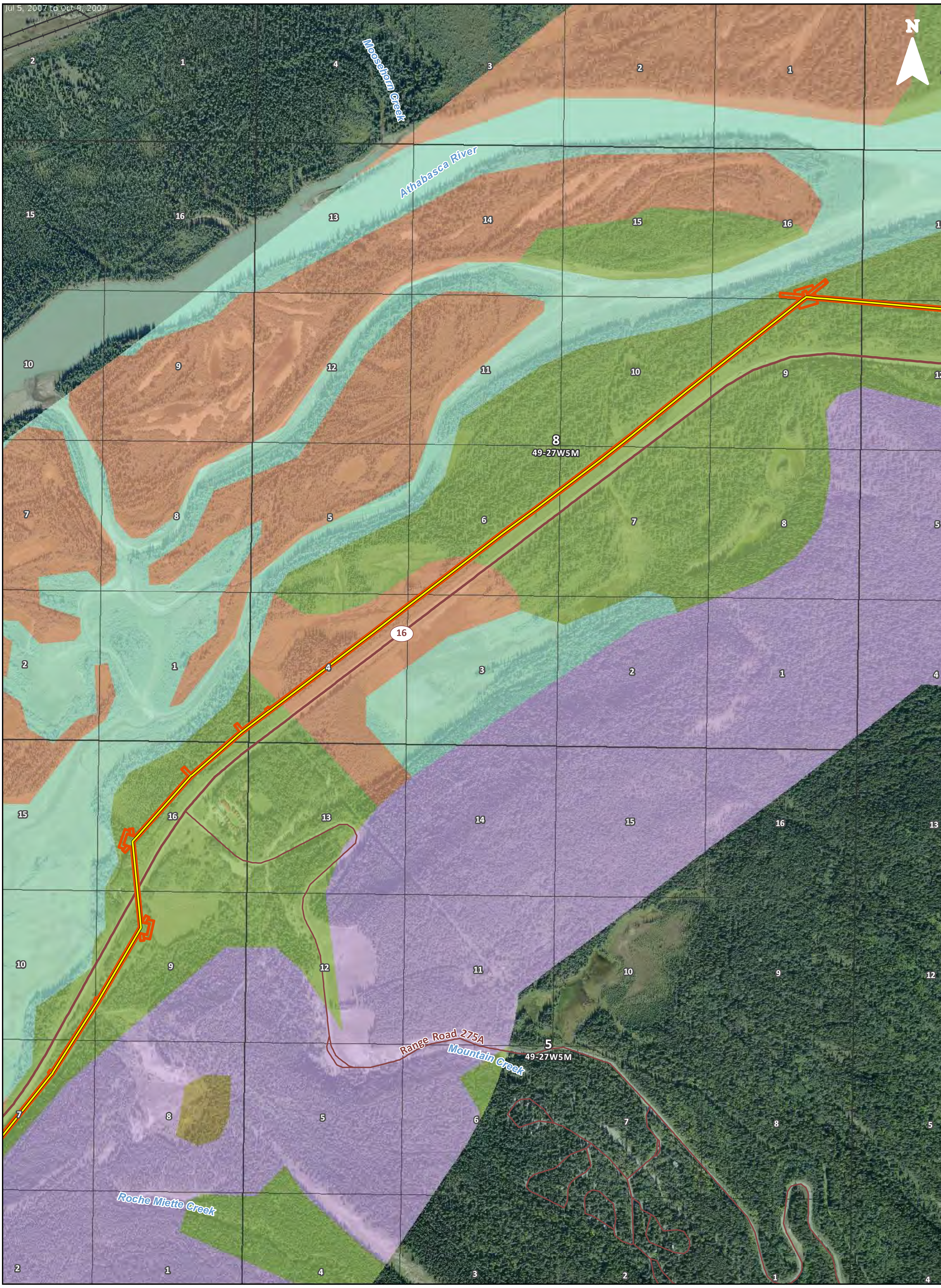

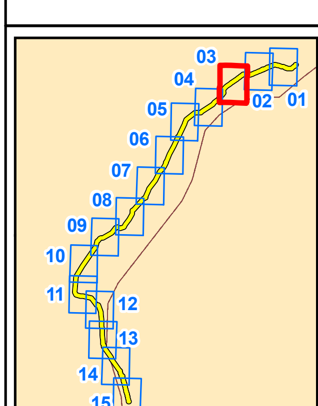

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway

Park/Protected Area

Soil Description

Cumulic Regosol
Misc. Landscapes
Orthic Regosol
Rego Gleysol
Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 03 OF 15

JASPER INTERCONNECTION PROJECT

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UTM Zone 11N
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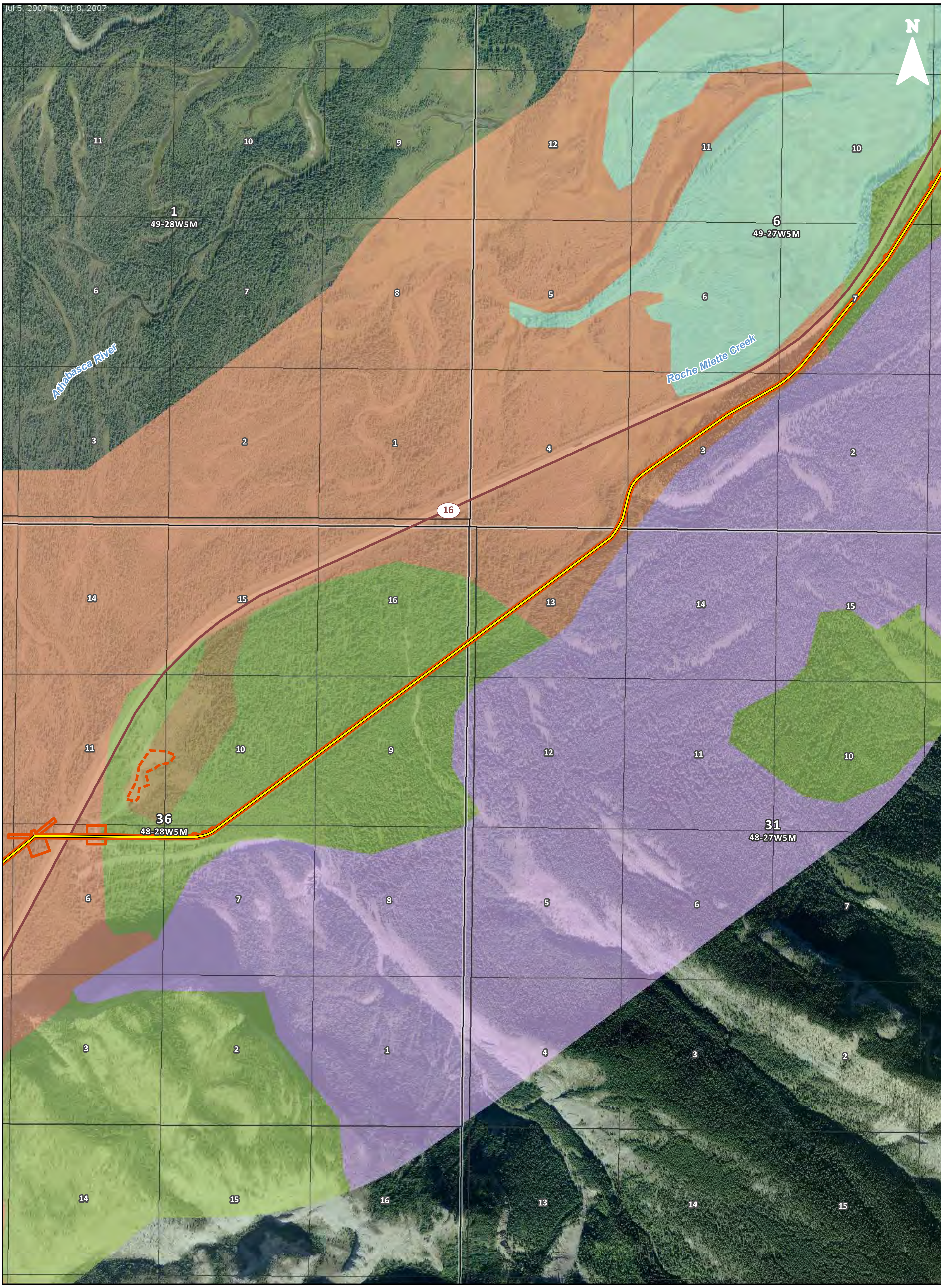

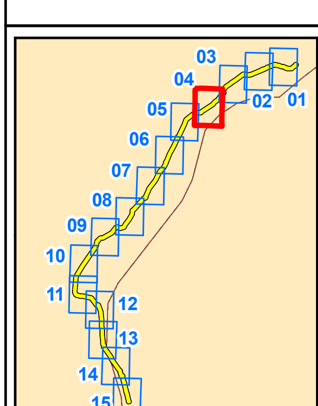

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway

Park/Protected Area

Soil Description

Cumulic Regosol
Misc. Landscapes
Orthic Regosol
Rego Gleysol
Water

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 04 OF 15

JASPER INTERCONNECTION PROJECT

UTM Zone 11N
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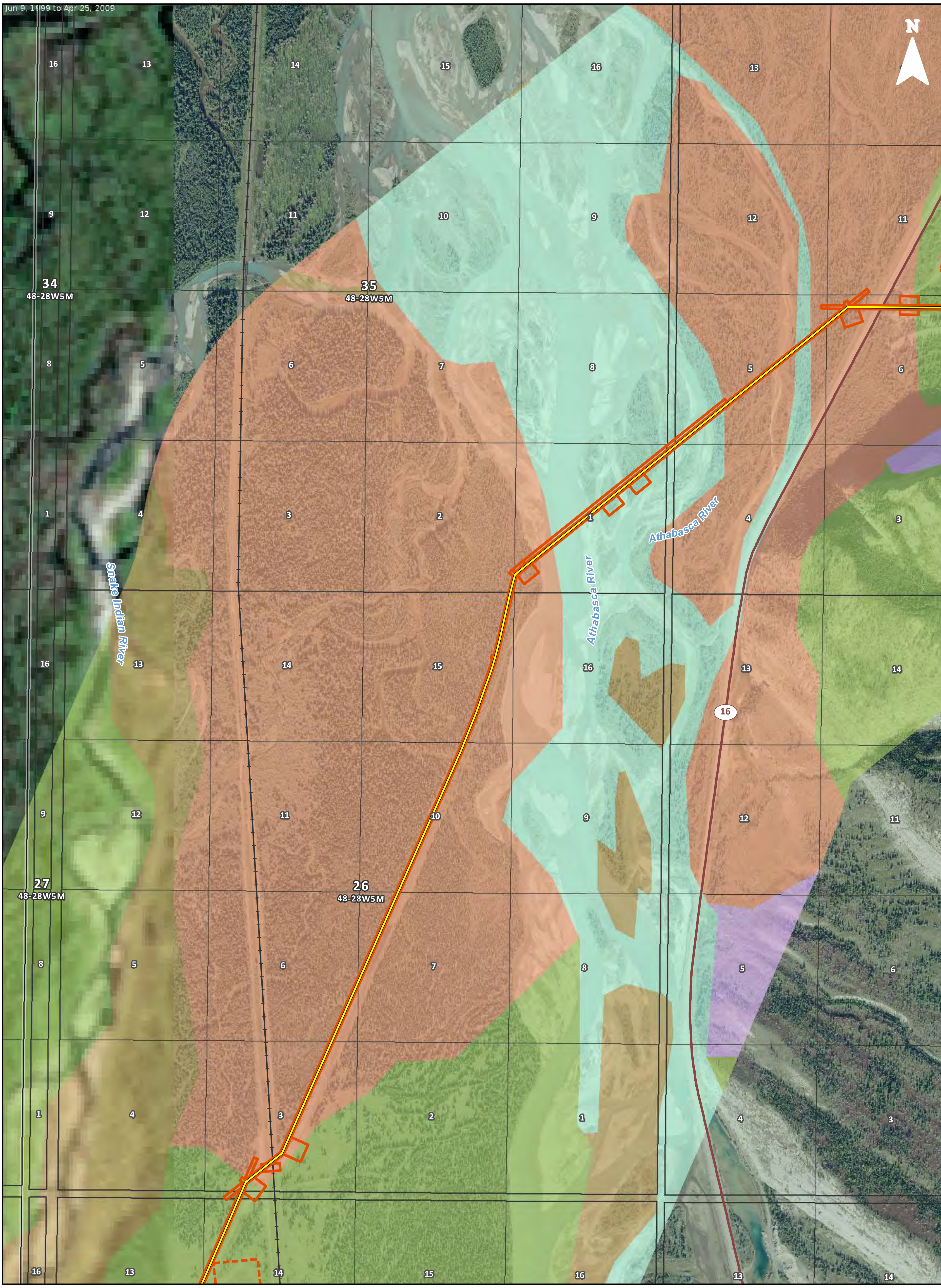

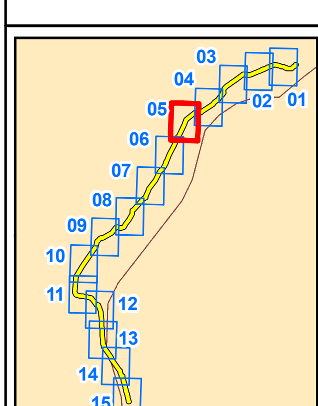

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway
Park/Protected Area

Soil Description

Cumulic Regosol
Misc. Landscapes
Orthic Regosol
Rego Gleysol
Water

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 05 OF 15

JASPER INTERCONNECTION PROJECT

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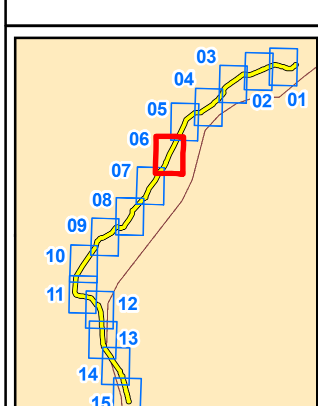

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway
Park/Protected Area

Soil Description

Misc. Landscapes
Orthic Eutric Bruinisol
Orthic Regosol
Rego Gleysol
Water

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 06 OF 15

JASPER INTERCONNECTION PROJECT

UTM Zone 11N
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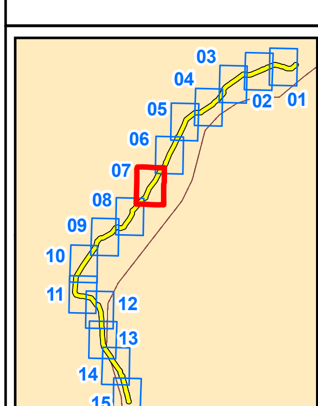

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway

Park/Protected Area

Soil Description

Orthic Eutric Bruinisol
Orthic Regosol
Rego Gleysol
Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 07 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
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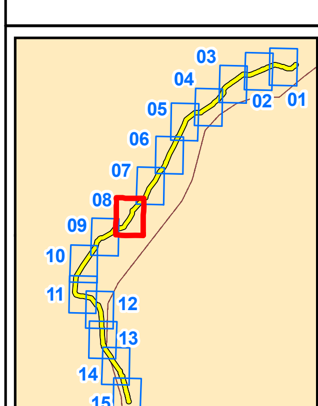

- Proposed Route
- Temporary Workspace and Easement
- Laydown Area
- Service Lane
- Collector
- Expressway / Highway
- Railway
- Park/Protected Area

Soil Description

- Cumulic Regosol
- Orthic Eutric Bruinisol
- Orthic Regosol
- Rego Gleysol
- Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 08 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
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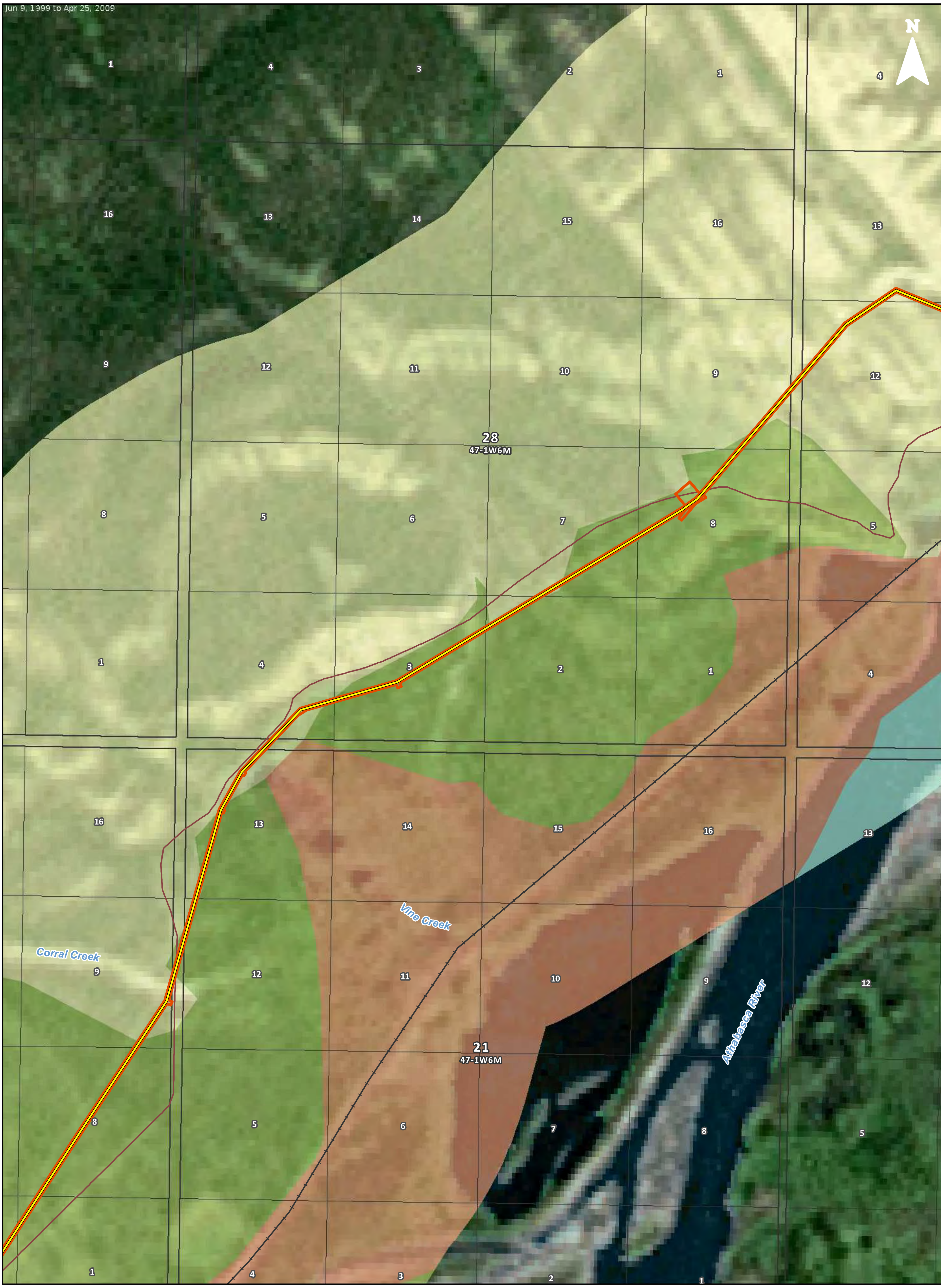

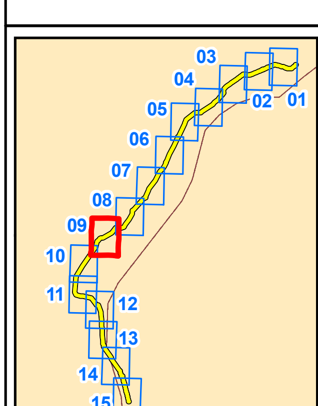

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway
Park/Protected Area

Soil Description

Orthic Eutric Bruinisol
Orthic Regosol
Rego Gleysol
Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 09 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
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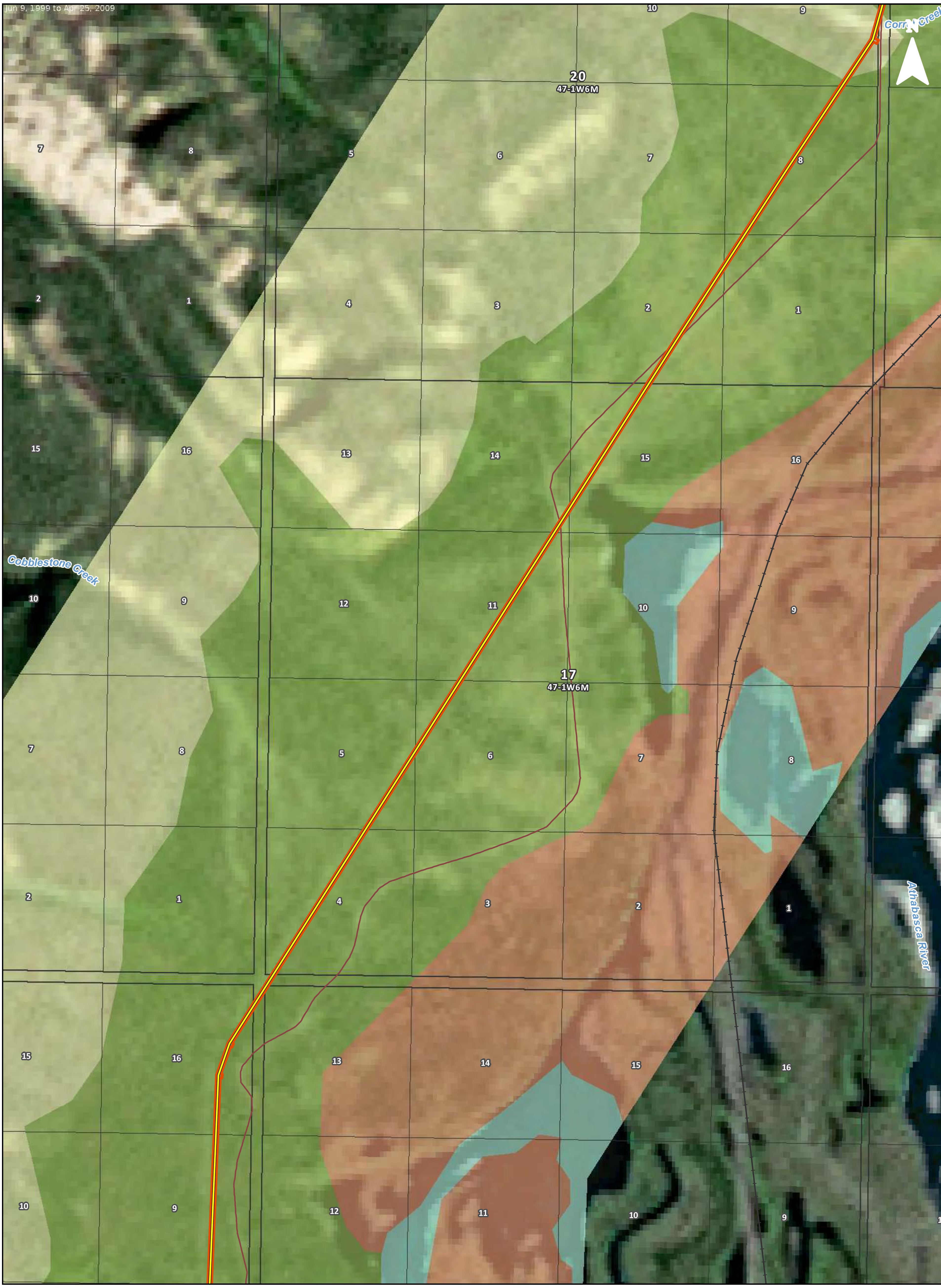

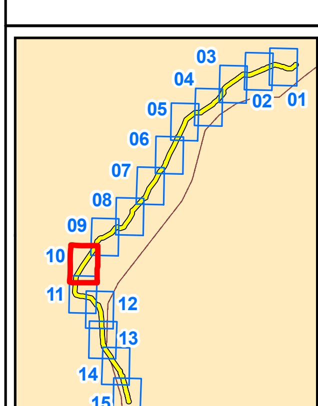

- Proposed Route
- Temporary Workspace and Easement
- Laydown Area
- Service Lane
- Collector
- Expressway / Highway
- Railway
- Park/Protected Area

Soil Description

- Orthic Eutric Bruinisol
- Orthic Regosol
- Rego Gleysol
- Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 10 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N

Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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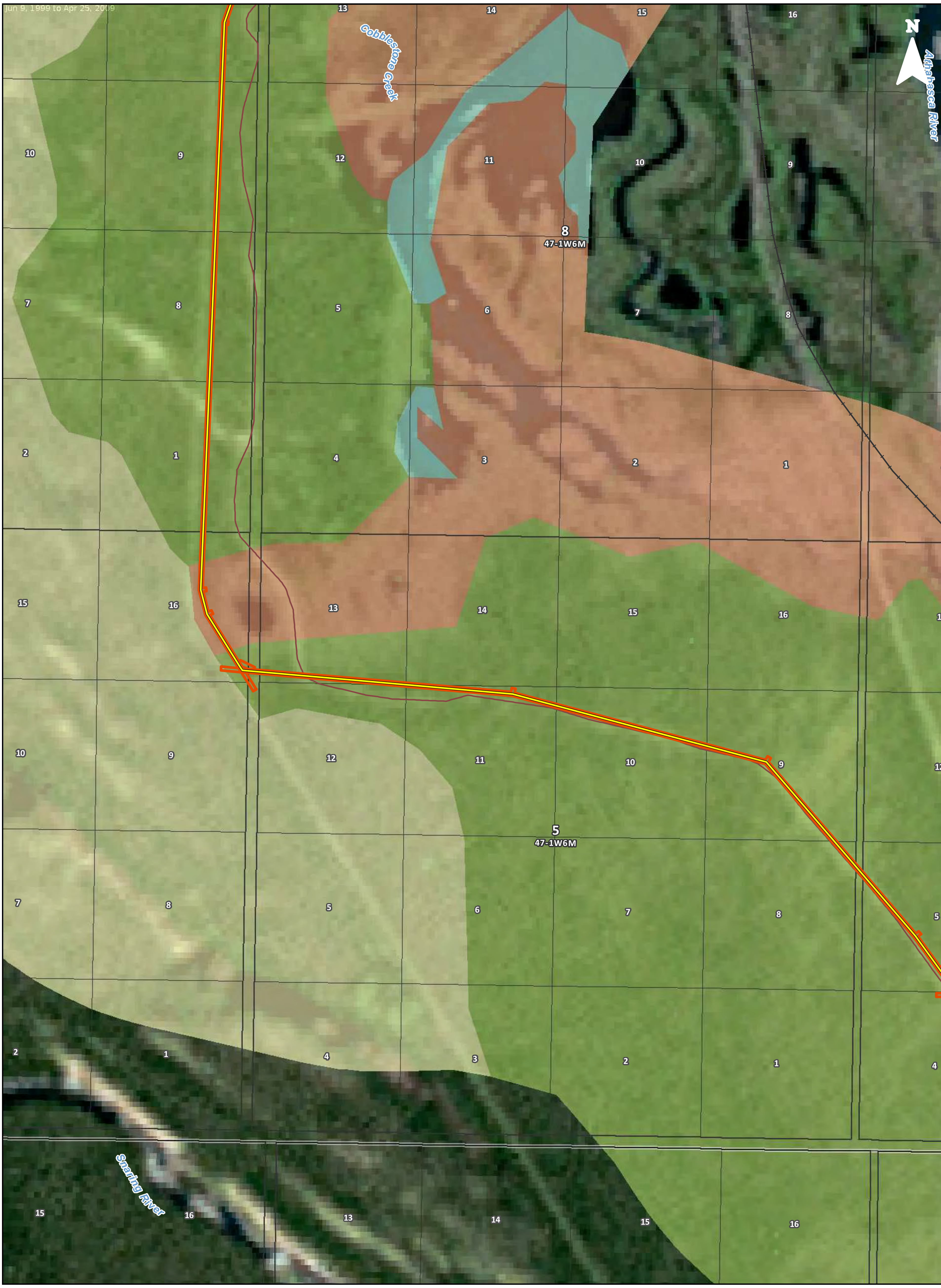

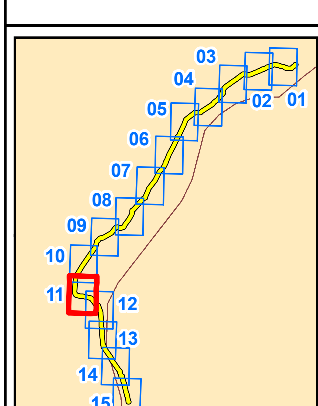

Legend	
Proposed Route	Park/Protected Area
Temporary Workspace and Easement	**Soil Description**
Laydown Area	Orthic Eutric Bruinisol
Service Lane	Orthic Regosol
Collector	Rego Gleysol
Expressway / Highway	Water
Railway	

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 11 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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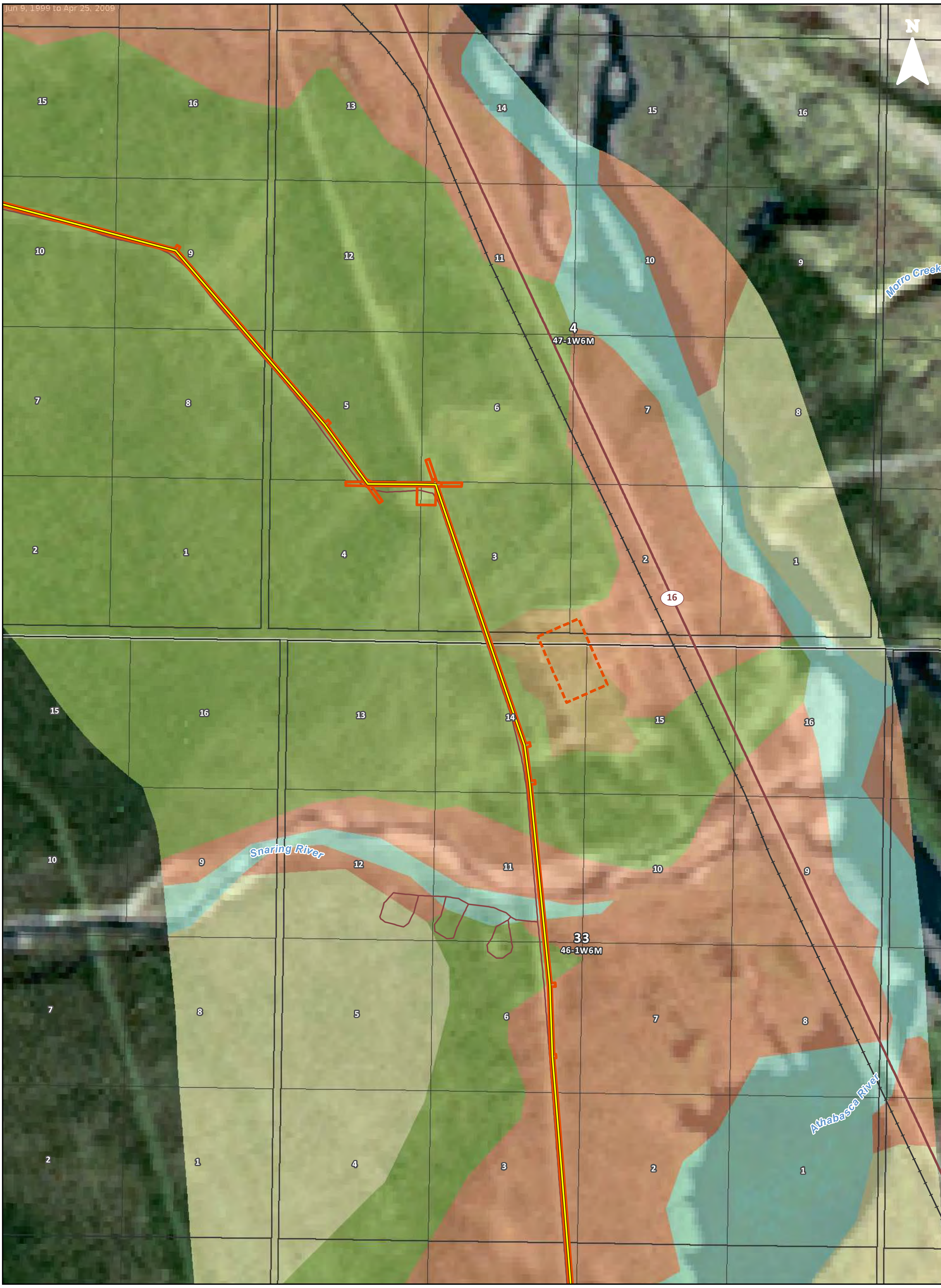

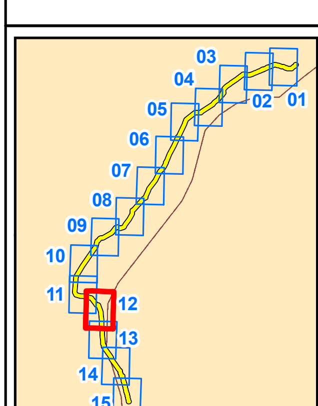

Proposed Route

Temporary Workspace and Easement

Laydown Area

Service Lane

Collector

Expressway / Highway

Railway

Park/Protected Area

Soil Description

Misc. Landscapes

Orthic Eutric Bruinisol

Orthic Regosol

Rego Gleysol

Water

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

UTM Zone 11N

Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 12 OF 15

JASPER INTERCONNECTION PROJECT

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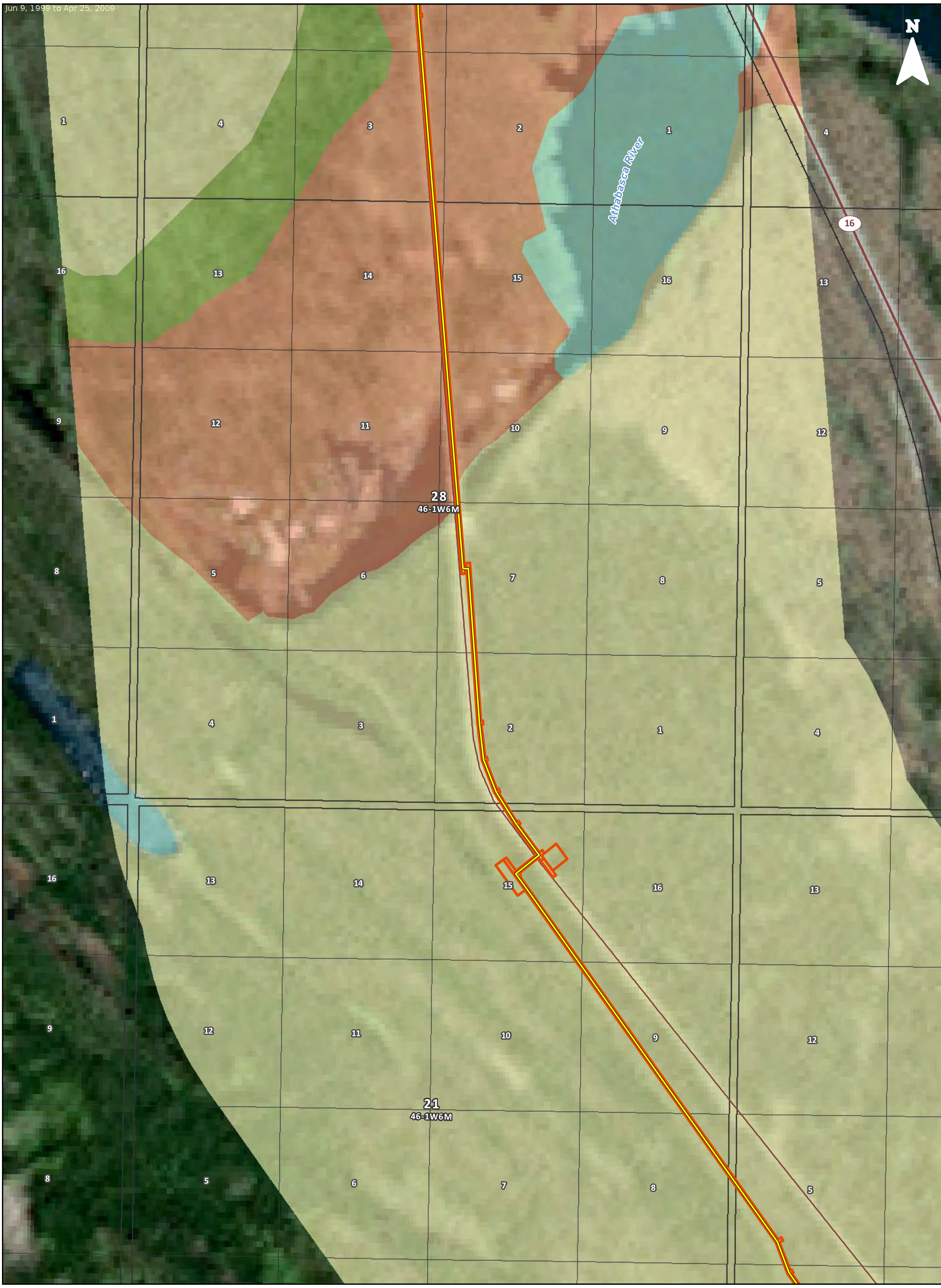

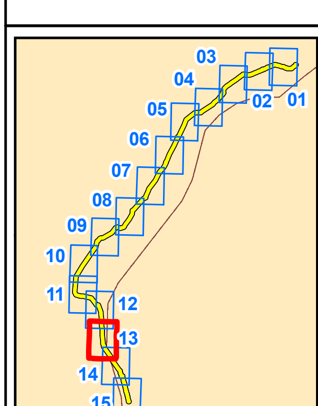

- Proposed Route
- Temporary Workspace and Easement
- Laydown Area
- Service Lane
- Collector
- Expressway / Highway
- Railway
- Park/Protected Area

Soil Description

- Orthic Eutric Bruinisol
- Orthic Regosol
- Rego Gleysol
- Water

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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.

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 13 OF 15

JASPER INTERCONNECTION PROJECT

June 2017	660380
Mapped By: JDR	Checked By: MB

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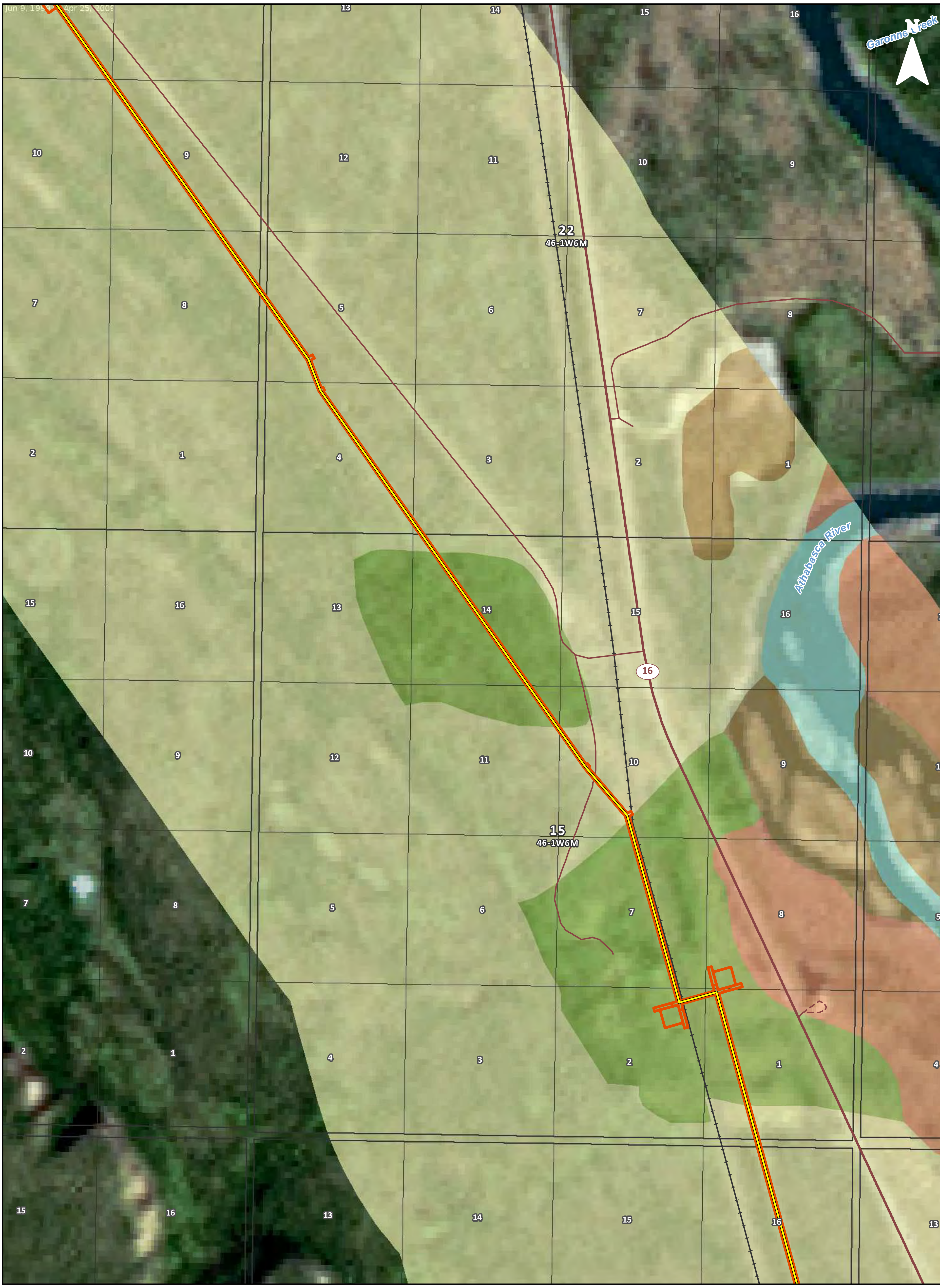

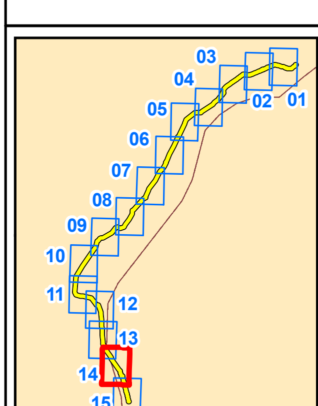

Proposed Route	Park/Protected Area
Temporary Workspace and Easement	**Soil Description**
Laydown Area	Misc. Landscapes
Service Lane	Orthic Eutric Bruinisol
Collector	Orthic Regosol
Expressway / Highway	Rego Gleysol
Railway	Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 14 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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.

June 2017	660380
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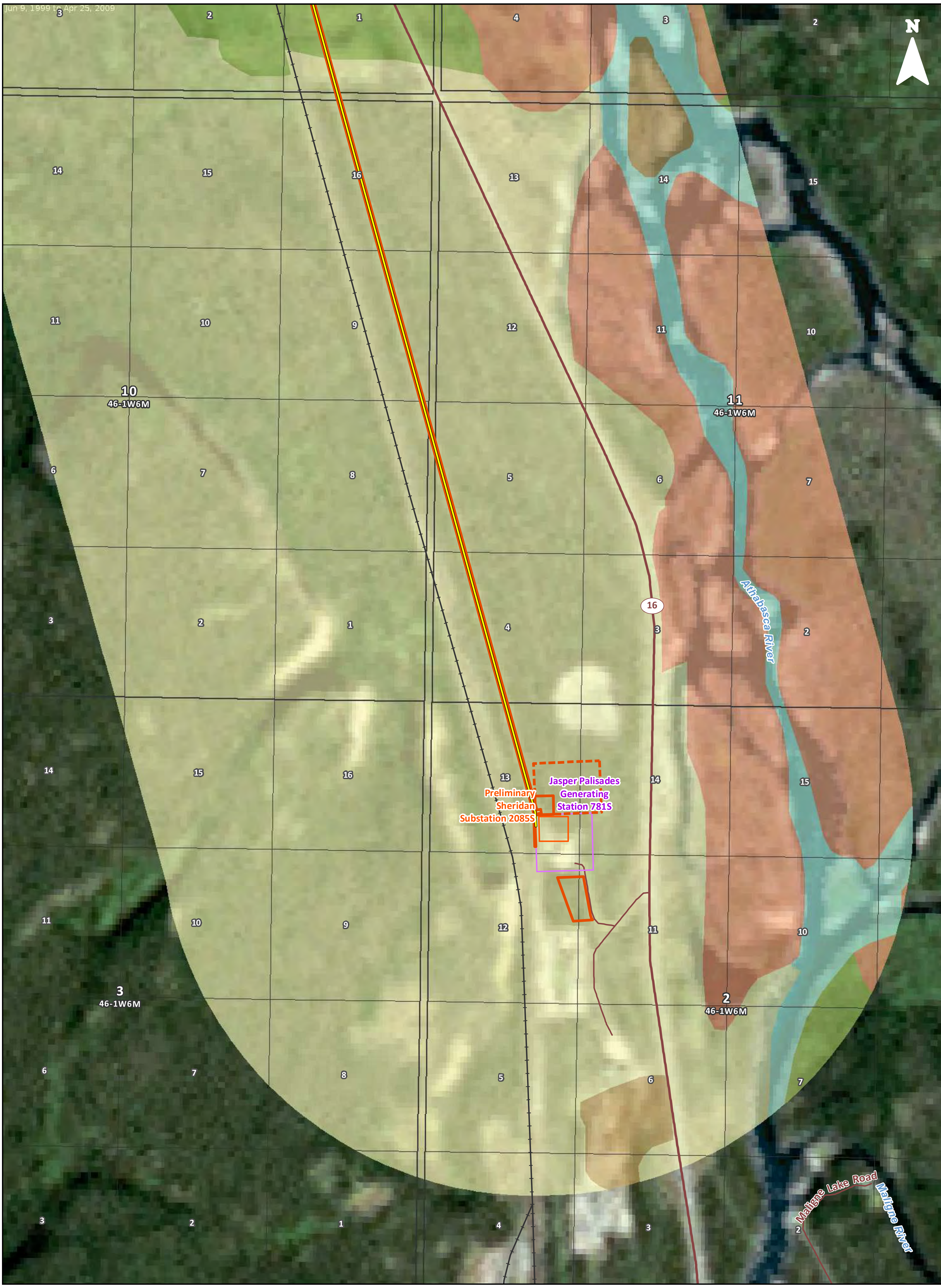

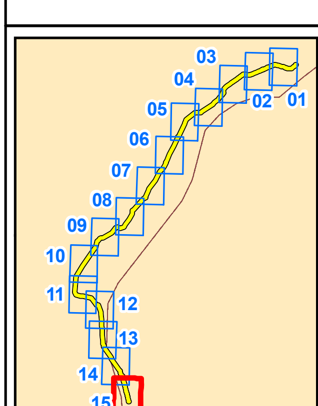

Proposed Route
Temporary Workspace and Easement
Laydown Area
Service Lane
Collector
Expressway / Highway
Railway

Park/Protected Area

Soil Description

Misc. Landscapes
Orthic Eutric Bruinisol
Orthic Regosol
Rego Gleysol
Water

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.1-1

ECOLOGICAL LAND CLASSIFICATION MAPPING - SOILS

SHEET 15 OF 15

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Imagery, ELC: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Park and Protected Areas: ATPR 2012, NRCan 2016.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

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5.1.4 Landforms and Soils Effects Assessment

This subsection presents the assessment of the potential effects of the Project on landforms and soils. The potential effects are identified in consideration of the existing conditions information presented in Section 5.1.1 and the potential residual effects are characterized and assessed according to the methods presented in Section 4.

5.1.5 Ecological and Regulatory Context for Landforms and Soils

The *CNPA* under Section 16(1b) supports "the protection of flora, soil, waters, fossils, natural features, air quality, and cultural, historical, and archaeological resources". Although landform components are generally resistant to effects of Project-related activities, soils with certain characteristics can be sensitive to disturbances associated with construction and maintenance activities and may require specialized management practices to meet recovery objectives. The proposed route intersects soil types that are typically considered calcareous (pH>8). Calcareous soils, if disturbed, may require additional effort to revegetate. Additionally, slow vegetative recovery on disturbed ground, regardless of limiting factors, contributes to increased risk of water erosion for soils on sloped landforms and wind erosion if soils are fine-textured or unconsolidated.

The Project encounters areas which are the subject of various municipal and regional development plans. These plans provide broad strategic direction for land use planning within their defined areas. The objectives of these management plans were considered in the development of mitigation measures for the potential effects related to landforms and soils identified for the Project. A review of these documents did not identify any objectives related to landforms and soils that may be incompatible with the Project.

5.1.6 Identification of Potential Effects, Key Mitigation Measures and Potential Residual Effects

The potential effects associated with the construction and operation of the Project on landforms and soils were identified by the assessment team and are listed in Table 5.1-3.

The key mitigation measures proposed in Table 5.1-3 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys and Walker, 1998) and are detailed in the Project EPP (Appendix 1).

Routing is the primary mechanism for avoiding or reducing potential adverse effects of the Project on landforms and soils. Criteria used during the route selection process are described in detail in Section 2.6. Limited ground disturbance anticipated on the Project Footprint and will primarily occur at structure locations and the substation which is previously disturbed. In all other areas, frozen ground conditions, matting, or snow packing will be the primary mitigation measures to limit ground disturbance along the Project Footprint.

Table 5.1-3. Potential Effects, Key Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Soils

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project-specific EPP Reference]	Potential Residual Effect(s)
1. Decreased soil productivity from surface disturbance of calcareous soils	Entire Project	Project Footprint	• Avoid topsoil stripping wherever feasible and limit topsoil stripping to structure locations and the substation. • To the extent practical, work under frozen conditions in areas with calcareous surface soils and where topsoil stripping is not required (temporary workspaces, travel lanes, access roads, steep slopes). • To the extent practical, when conditions are unfrozen, install access matting or geotextiles in areas with calcareous soils where stripping is not required (temporary workspaces, travel lanes, access roads, steep slopes). • Should stripping be required, conduct stripping under dry, unfrozen conditions. In areas where there are thin surface calcareous soil which cannot be reasonably stripped using equipment, it may be preferable to refrain from stripping, and implement mitigation methods to prevent or alleviate compaction (Table 5.1-3, c). • In areas with calcareous surface soils where stripping is required and there are sufficient surface soils to practically strip, conduct multi-lift stripping, and stockpile each lift separately. Protect each stockpile from potential wind/water erosion and Implement Soil Erosion Contingency Plan [Appendix F] install erosion and/or sediment control measures where required. • Implement Best Methods for Common Leaseholder Activities for grading and topsoil salvage, if warranted [Appendix C]. • Implement the Soil Erosion Contingency Plan, if warranted [Appendix C]. • Implement the Soil Handling Contingency Plan, if warranted [Appendix G].	• Reduction in soil fertility resulting from admixing with calcareous soils
2. Water and/or wind erosion	Entire Project	Project Footprint	• Avoid topsoil stripping wherever feasible and limit topsoil stripping to structure locations and the substation. • Postpone work on excessively wet or thawed soils until conditions are compatible or refreeze; implement the Soil Handling Contingency Plan, if warranted [Appendix G]. • Refrain from stripping topsoil in areas with high wind/water erosion potential (such as, steep slopes) and install access matting or geotextiles in areas with high potential for erosion (clay textured soils) where stripping is required. • Implement Soil Erosion Contingency Plan [Appendix F] install erosion and/or sediment control measures where required.	• Reduction in soil fertility from the loss of topsoil/ subsoil resulting from water and/or wind erosion

Table 5.1-3. Potential Effects, Key Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Soils

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project-specific EPP Reference]	Potential Residual Effect(s)
2. Water and/or wind erosion (cont'd)	See above	See above	• Monitor the right-of-way, off-right-of-way access routes, and substation site on a routine basis for the life of the project; issues related to slope or bank erosion or wind and water erosion will be reported to ATCO Electric's Environmental Staff and ATCO Electric will implement applicable remedial measures on a timely basis.	• See above
3. Soil compaction and rutting	Entire Project	Project Footprint	• Monitor ground surface to verify that it is sufficiently dry or frozen (to ensure that work can continue without causing rutting). • Where topsoil stripping has been completed, compacted subsoils must be reclaimed post-construction as specified in the EPP (Appendix 1). • Postpone work on excessively wet or thawed soils until conditions are dry or refreeze. • To the extent practical, implement the use of equipment with low pressure tires or wide-pad tracks [Appendix I]. • Install access matting or geotextiles in areas with high potential for compaction (clay textured soils), where warranted. • Implement the Wet/Thawed Soil Contingency Plan, if warranted [Appendix J]. • Implement the Soil Handling Contingency Plan, if warranted [Appendix G]. • Subsoil decompaction will occur if required at the post-construction phase, as specified in the Project's Environmental Protection Plan (Appendix 1).	• Reduction in soil fertility due to mixing of topsoil and subsoil due to compaction and rutting
4. Mixing of topsoil/ strippings with subsoil	Entire Project	Project Footprint	• Avoid topsoil stripping wherever feasible and limit topsoil stripping to structure locations and the substation. • To the extent practical, work under frozen conditions in areas where topsoil stripping is not required (temporary workspaces, travel lanes, access roads, steep slopes). • To the extent practical, when conditions are unfrozen, install access matting or geotextiles in areas with where stripping is not required (temporary workspaces, travel lanes, access roads, steep slopes). • Where topsoil stripping has occurred, work under favourable dry and unfrozen conditions, to the extent practical.	• Reduction in soil fertility resulting from over stripping soils during salvage and replacement resulting in mixing

Table 5.1-3. Potential Effects, Key Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Soils

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project-specific EPP Reference]	Potential Residual Effect(s)
4. Mixing of topsoil/ strippings with subsoil (cont'd)	See above	See above	• Shallow topsoils encountered in the Project may be less than what can be reasonably be stripped with equipment. In areas with limited topsoil, should the activities be conducted in unfrozen conditions, it is recommended to discuss alternate mitigations with PCA (Appendix 1). • Where soils are not readily distinguishable by colour, or require specialized handling for soil stripping and salvage areas, the ATCO Electric Environmental Advisor will provide direction based on an evaluation of soil texture and structure. • Conduct routine topsoil and subsoil checks during stripping activities. • Stockpile the topsoil and subsoils separately. • Implement the Wet/Thawed Soil Contingency Plan, if warranted [Appendix J]. • Implement the Soil Handling Contingency Plan, if warranted [Appendix G]. • Implement Best Methods for Common Leaseholder Activities for grading and topsoil salvage, if warranted [Appendix C].	• See above

[a] Detailed key mitigation measures were principally developed in accordance with Axys and Walker, 1998 and ATCO Electric's Environmental Protection Plan Jasper Interconnection Powerline Project (Appendix 1).

5.1.6.1 Characterization of Potential Residual Effects

The method for the characterization of potential effects on vegetation was described in Section 4. Qualitative criteria ratings are based on the best available scientific knowledge and the professional experience of the assessment team.

Reduction in Soil Fertility Resulting from Admixing with Calcareous Soils

During construction activities calcareous soils may be encountered in localized areas. If these soils are mixed with non-calcareous soils, they can result in decreased soil fertility.

Prevention of admixing is key to reducing the potential and residual effects of admixing of calcareous soils. During Project construction, the use of multi-lift stripping is recommended only in those areas where topsoils stripping on calcareous soils is required, with each lift being stored in separate stockpiles. The extent of topsoil salvage will be determined by the Right-of-Way Manager and Environmental Coordinator. Under dry and unfrozen conditions, where there are thin layers of calcareous soils which cannot be reasonably stripped using equipment, it may be preferable to refrain from stripping and instead to implement mitigation methods to prevent or alleviate compaction (see recommended mitigation measures in Table 5.1-3 for soil compaction and rutting). Where stripping can be done, implementation of the Soil Handling Contingency Plan (Appendix G of the Project EPP) and proposed key mitigation measures outlined in Table 5.1-3 will limit the mixing of problem soils and reduce the magnitude of the potential residual effect to minor (see Table 5.1-4 point a).

Reduction in Soil Fertility Due to Loss of Topsoil/Subsoil Due to Water and/or Wind Erosion

Construction of the Project may result in some minor surface erosion of topsoil and/or strippings until a stable vegetative cover can be established, particularly on slopes and ecosites that are more susceptible to wind and water erosion. Soil erosion can reduce soil productivity through subsequent soil mixing, loss of mineral soil, seed bank, and organic matter. Areas where the erosion potential is high will be protected (access matting, geotextiles) during disturbance as a preventative measure.

ATCO Electric will complete a Post-construction Reclamation Assessment after one full growing season for three years to assess the effectiveness of key mitigation and reclamation measures on soils, vegetation, watercourses, waterbodies and wetlands disturbed during construction of the Project (Section 9.1 of the EPP). Post-construction monitoring (PCM) programs for pipeline projects (which similarly involve soil stripping along right‒of‒way travel lanes) have shown that issues related to erosion can be resolved within 2 to 3 years [TERA Environmental Consultants 2009a, b, 2011, 2012, 2013a,b] (i.e., medium-term in duration). The erosion control measures outlined in Table 5.1-3 to address soil erosion are industry-accepted best practices and, consequently, are expected to reduce loss of surface soils resulting from erosion. Areas where the rutting and compaction potential is high will be protected (access matting, geotextiles) during disturbance as a preventative measure.

Excavation erosion resulting from face instability can lead to the loss and soil mixing. However, through the implementation of key mitigation outlined in Table 5.1-3, the magnitude of excavation erosion is considered to be minor. It is expected that erosion of excavation walls can be resolved during construction prior to backfill (i.e., immediate to short-term in duration) (see Table 5.1-4, point b).

Reduction in Soil Fertility Due to Mixing of Topsoil and Subsoil Due to Compaction and Rutting

Compaction and rutting can occur when the soil is saturated (wet) and expanded and pliable (clay type soils). Mixing of topsoil/strippings with subsoil as a result of compaction alleviation and rutting in forested and agricultural lands along access, travel lanes, the transmission line right-of-way, and temporary workspace can be alleviated over time.

Overall, in forested lands, soil mixing due to salvage, replacement, rutting, and alleviation of soil compaction activities is reversible, and medium to extended-term in duration. Since the degree of topsoil/stripping salvage and storage will be reduced through the implementation of key mitigation measures outlined in Table 5.1-3, the residual effect on soil productivity is of minor magnitude (see Table 5.1-4, point c).

Reduction in Soil Fertility Resulting from Over Stripping Soils during Salvage and Replacement Resulting in Mixing

Selective topsoil stripping, salvage and replacement is expected to occur mostly at structure locations. Stripping along temporary access roads, temporary workspaces and where grading is required will only be conducted on a limited basis and only in areas which cannot be effectively protected using alternative methods (i.e., access matting, working under frozen conditions).

Soil mixing results in the alteration of mineral soil and organic matter proportions in the upper horizons (topsoil) with subsoil, thereby decreasing soil productivity. During construction of the Project, it is likely that a minor amount of soil mixing will occur at and along the transmission structure locations, along permanent access off the transmission line right-of-way and travel lanes, and where grading is required. Soil mixing can also occur when topsoil is not salvaged from a wide enough area around excavation sites where face excavation instability or sloughing can occur.

During Project construction, selective topsoil salvage, storage (and replacement) are recommended during dry, non-frozen conditions to support successful reclamation of disturbed areas. The extent of topsoil salvage will be determined by the Right-of-Way Manager, and Environmental Coordinator during site preparation. Key mitigation measures outlined in Table 5.1-3 will reduce the magnitude of soil mixing to a minor level. If soil mixing occurs, it can be alleviated over time through tilling, the addition of soil amendments (such as green feed or manure), and importation of topsoil or natural processes. Consequently, the potential residual effect is reversible and medium-term in duration.

Construction activities may result in a loss or soil mixing during salvage and replacement activities. Soil salvaged during the construction process will be stored on-site in berms, or used for reclamation of other disturbed areas at the site. Consequently, this residual effect will be extended-term in duration. With the implementation of the proposed key mitigation measures outlined in Table 5.1-3, this potential residual effect is considered to be of minor magnitude. Past project experience has shown that soil productivity would return to pre-construction conditions and, therefore, is reversible.

In areas where topsoil salvage is not conducted (workspaces, travel lanes, access roads, steep slopes), construction activities will likely result in some soil mixing. However, additional protection of topsoil may be provided where warranted (such as application of geotextile, gravel, and access matting). If work cannot be suspended during non-frozen wet ground conditions and/or frozen yet thawed soil conditions, then the Wet/Thawed Soils Contingency Plan (Appendix J of the Project EPP) will be implemented if wet weather or thawed soil conditions are expected.

Past project experience has shown that soil productivity returns to pre-construction conditions as a result of natural processes (such as leaf litter, organic debris, and native plant encroachment) over several years (i.e., the effect is reversible) depending upon the amount of organic material, growing conditions, and development of the leaf litter to support soil development and fertility. The reduction in soil fertility as a result of soil mixing during construction activities is not expected to extend longer than 10 years (i.e., medium-term). However, in some situations, the duration may exceed 10 years (i.e., long-term) to allow for natural processes (noted above), to return to pre-construction conditions where stripping did not occur. See Table 5.1-4, point c for the characterization of this potential effect.

The method set out in Section 4.0 was adopted for the characterization of potential effects for landforms and soils. This qualitative assessment relied on available research literature and the professional experience of the assessment team.

Potential residual effects on soils after key mitigation measures are applied on decreased soil fertility and loss of topsoil.

Table 5.1-4. Potential Residual Effects Characterization for Landforms and Soils

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Reduction in Soil Fertility Resulting from Admixing with Calcareous soils	**Context:** Mixing of surface calcareous soils with subsoils resulting from improper stripping techniques and stockpile storage. Mixing of calcareous surface soils with subsoils could decrease soil productivity in forested areas by decreasing nutrient availability and water update. This can alter the mineral composition, textural properties and structure of soil, therefore, affecting soil productivity and the success of vegetation establishment.	
	Geographic Extent: Structure Locations	Mixing of surface calcareous soils with subsoils is confined mainly to the area of disturbance (mostly structure locations).
	Duration: Medium to extended-term	Loss of soil productivity from mixing of surface calcareous soils with subsoils during construction activities, if identified early, can be reversed or reduced through treatment with applicable amendments. If this is not identified post-construction, it could extend up to 10 years (i.e., medium-term) following salvage. However, a loss of soil productivity from the mixing of saline/sodic subsoil can extend beyond the operational life of the Project (i.e., extended-term) if this is undetected.
	Frequency: Isolated	Mixing of surface calcareous soils with subsoils will mostly be confined to an isolated period of time (i.e., the construction phase).

Table 5.1-4. Potential Residual Effects Characterization for Landforms and Soils

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Reduction in Soil Fertility Resulting from Admixing with Calcareous soils (cont'd)	**Reversibility:** Reversible	Loss or mixing of topsoil/strippings with subsoil can be reversed over time with soil management techniques.
	Magnitude: Minor	Although some soil mixing is anticipated, implementation of the proposed key mitigation measures outlined in Table 5.1-1 is expected to effectively prevent and reduce the potential effects on soil productivity.
b. Reduction in soil fertility from the loss of topsoil/subsoil resulting from water and/or wind erosion	**Context:** When vegetative cover is removed, exposed soils are susceptible to surface erosion. Erosion risk is a function of vegetative cover, texture, slope, and disturbance (such as wind, water, and construction activities). Erosion can reduce soil productivity through subsequent soil mixing, loss of mineral soil, seed bank, and organic matter.	
	Geographic Extent: Structure Locations	Erosion is confined to the area of disturbance such as structure locations, but may also include related facilities, along access roads and travel lanes, and where grading is required.
	Duration: Immediate to medium-term	Surface erosion is generally expected to not extend past the construction phase (i.e., immediate to short-term), given the implementation of key mitigation measures during construction and, if necessary, the implementation of further erosion control measures post-construction.
	Frequency: Isolated	Erosion will mostly be confined to an isolated period of time (i.e., the construction phase).
	Reversibility: Reversible	Erosion can be reversed over time through the implementation of key mitigation measures until excavation is backfilled and surface vegetative cover is established.
	Magnitude: Minor	Excavation and surface erosion is anticipated. The implementation of the proposed key mitigation measures outlined in Table 5.1-2 and, if necessary, further sediment and erosion control measures applied post-construction are expected to effectively reduce the potential effects on soil productivity.
c. Reduction in soil fertility due to mixing of topsoil and subsoil due to compaction and rutting	**Context:** Compaction and rutting can occur when the soil is saturated (wet) and expanded and pliable (clay type soils). Mixing of topsoil/strippings with subsoil as a result of compaction alleviation and rutting in forested lands along access roads, travel lanes, the right-of-way, and temporary workspace can be alleviated over time.	
	Geographic Extent: Project Footprint	Compaction and rutting is confined to the area of disturbance at structure locations, related facilities, along access roads and travel lanes, and where grading is required.
	Duration: Medium to extended-term	Loss of soil productivity resulting from compaction and rutting during construction activities is not expected to extend longer than 10 years (medium-term) following salvage. However, a loss of soil productivity from soil mixing can extend beyond the operation phase (extended-term) where topsoil/strippings is stored in berms at related facilities.
	Frequency: Isolated	Compaction and rutting will mostly be confined to an isolated period of time (i.e., the construction phase).

Table 5.1-4. Potential Residual Effects Characterization for Landforms and Soils

Potential Residual Effect	Criteria Rating	Effects Characterization
c. Reduction in soil fertility due to mixing of topsoil and subsoil due to compaction and rutting (cont'd)	**Reversibility:** Reversible	Reduction in soil fertility or soil mixing can be reversed over time with soil management techniques.
	Magnitude: Minor	Reduction in fertility or soil mixing as a result of compaction and rutting is anticipated. However, the implementation of the proposed key mitigation measures outlined in Table 5.1-2 is expected to effectively reduce the potential effects on soil productivity.
d. Reduction in soil fertility resulting from over stripping soils during salvage and replacement resulting in mixing	**Context:** Topsoil salvage, replacement, alleviation, or soil compaction activities and rutting can result in soil mixing. Salvage of soils with gravelly subsoils, shallow topsoil, or poor colour differentiation can also result in soil mixing. Loss or mixing of topsoil/strippings with subsoil could decrease soil productivity in forested areas. This can alter the mineral composition, textural properties, and structure of soil, therefore, affecting soil productivity and the success of vegetation establishment.	
	Geographic Extent: Project Footprint	Loss or mixing of topsoil/strippings with subsoil is confined to the area of disturbance at structure locations, related facilities, along access roads and travel lanes, and where grading is required.
	Duration: Medium to extended-term	Loss of soil productivity resulting from topsoil/strippings and subsoil mixing during construction activities is not expected to extend longer than 10 years (medium-term) following salvage. However, a loss of soil productivity from soil mixing can extend beyond the operational phase of the Project (i.e., extended-term) where topsoil/strippings is stored in berms at related facilities.
	Frequency: Isolated	Soil mixing will mostly be confined to an isolated period of time (i.e., the construction phase).
	Reversibility: Reversible	Loss or soil mixing can be reversed over time with soil management techniques.
	Magnitude: Minor	Loss or mixing of topsoil with subsoil is anticipated. However, the implementation of the proposed key mitigation measures outlined in Table 5.1-2 is expected to effectively reduce the potential effects on soil productivity.

5.1.7 Summary and Recommendations

During construction, CH2M recommends that appropriate soil mitigation measures be applied and the site monitored for signs of negative terrain effects. CH2M suggests that the recommended soil mitigation measures in Table 5.1-3 are discussed with applicable government representatives prior to the commencement of ground disturbance activities, if warranted.

5.1.8 Cumulative Effects Assessment

The potential and likely residual effects of the Project on landforms and soils (loss of topsoil through erosion and loss of soil productivity) in combination with existing activities and reasonably foreseeable future developments constitute minor changes in landform and soil components. The proposed soils-related mitigation outlined in Table 5.1-3 will reduce the severity of cumulative effects on soil productivity and topsoil. Specifically, should any of the potential effects noted in Table 5.1-3 be encountered, the appropriate mitigation will be applied to the effect. If effects are encountered from previous unrelated projects (i.e., if admixed soil is encountered) the locations will be recorded during construction and addressed, where possible, during reclamation. It is expected that operators of reasonably foreseeable future developments will also implement similar measures developed in accordance with industry and provincial regulatory guidelines for soil conservation.

The reversibility of cumulative effects on soil productivity in the SA is considered medium-term, as cumulative effects on soil and soil productivity are expected to approximate pre-disturbance productivity in less than 10 years. The potential for cumulative environmental effects to landforms and soil are predicted to be negligible and restricted to the Project Footprint.

5.1.9 References

5.1.9.1 Literature Cited

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5.1.9.2 GIS Data and Mapping References

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5.2 Vegetation

5.2.1 Existing Conditions and Context

This subsection summarizes the existing information regarding the vegetation species and vegetation communities that are of concern within the Vegetation Study Area (SA). For this application, vegetation species include all vascular (native and non-native), non-vascular (i.e., bryophyte: moss, liverwort, hornwort), and lichen species present in the Vegetation SA.

The scope and methods necessary to adequately assess vegetation resources were determined with the guidance of the provincial regulatory requirements, in conjunction with published rare vegetation survey recommendations, and with the guidelines and precedence set by developments of similar scope in the vicinity of the Project (see Section 5.2.1.2). Potential Project-related effects and key mitigation pertaining to vegetation are discussed in Section 5.2.3. Full key mitigation measures relating to vegetation in JNP are provided in *Best Available Methods for Common Leaseholders* (Axys Environmental Consulting Ltd. and David Walker and Associates [Axys and Walker], 1998).

Pre-construction conditions for vegetation are defined as the current state of the environment (not pre-disturbance or natural conditions). The current state of the environment is determined from the desktop review, field surveys, and ELC mapping. The current state of the environment will be used as the baseline for assessing Project-specific effects and cumulative effects.

5.2.1.1 Spatial Boundaries

The effects of the Project are considered in relation to a Project Footprint (as defined in Section 4.3.1) and a Vegetation SA.

The Vegetation SA represents the area where the direct and indirect influence of other land uses and activities could interact with Project-specific effects and may cause cumulative effects on vegetation. Key considerations used to establish the spatial boundaries of the Vegetation SA for the Project include the separation distance typically used to distinguish one rare plant population from another; the dispersal distance of non-native, invasive (i.e., weed) species to or from the Project Footprint; and the physical footprint of the Project within a regional landscape context.

Individual Element Occurrences (EOs) are rare vegetation species occurrences and rare ecological communities where the separation distances are more than 1 km, measured from the edges of each subpopulation (NatureServe, 2002). Although there are many factors that may be taken into account in determining individual EOs, where separation distances between subpopulations exceed 1 km, the occurrences of rare vegetation species and rare ecological communities are considered to be separate EOs (NatureServe, 2004).

Although dispersal distances depend on a number of factors, many weed species produce large numbers of seeds that are wind dispersed (Forman et al., 2003). For example, many of the species listed in the Alberta Weed Control Regulation belong to the sunflower family (Asteraceae), which is adapted for wind dispersal. Forman et al. (2003) found that the spread of non-native, invasive species could extend up to 1 km from the disturbed area.

Based on these concepts, the Vegetation SA generally consists of a 2 km wide band from the centre of the proposed right-of-way (e.g., 1 km on both sides of the centre of the proposed right-of-way). The spatial boundaries of the Vegetation SA are shown on Figure 5.2-1.

5.2.1.2 Desktop Study Methods

Vegetation Community Classification

Vegetation community classification was completed in support of the DIA for the Project within the Vegetation SA to describe the diversity, relative abundance, and distribution of vegetation communities and structural stages for lands where vegetation may be affected by the Project. ELC mapping was completed within the Vegetation SA to ecosite and vegetation unit types, as described in *Ecological (Biophysical) Land Classification of Banff and Jasper National Parks* (Holland and Coen, 1983). Mapping at a 1:3,000 scale occurred prior to the 2015 vegetation field surveys. Disturbance was mapped within the Vegetation SA using existing disturbance layers available from the ABMI (2015). Quality assurance and quality control measures were employed to facilitate consistency of delineation and attribution throughout the Vegetation SA and to facilitate accuracy of the vegetation community classification. Detailed ELC mapping methods are described in Section 1.1 of Appendix 5.2-1.

Rare Vegetation and Rare Ecological Communities

A literature review was conducted to identify rare vegetation and rare ecological communities with potential to occur within the Vegetation SA. Satellite imagery was reviewed to identify priority areas with potential to support rare vegetation and rare ecological communities (e.g., seepage areas, riparian areas, mature forested areas, and under-represented ecosystems).

The Alberta Conservation Information Management System (ACIMS) maintains provincial rare plant and rare ecological community data for the entire province including any records from JNP; PCA doesn't maintain separate rare plant records. Federal listings are maintained by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the Government of Canada (*Species at Risk Act* [*SARA*] Public Registry); JNP does not rank species separately from these entities. Using data available from ACIMS, COSEWIC and *SARA*, tables of tracked vascular plant species and ecological communities with potential to occur within the Natural Subregion encountered by the proposed route were compiled (Appendices 4.2-2 and 4.2-3). Habitat and phenological information for potential rare vascular plant species and rare ecological communities included in Appendices 4.2-2 and 4.2-3 were derived from Moss (1983), the Flora of North America Editorial Committee (FNA) (1993+), Kershaw et al. (2001), and Allen (2014). *SARA*, COSEWIC, and Alberta *Wildlife Act* designations are included in Appendix 5.2-2. Alberta General Status ranks (determined every 5 years by Alberta Environment and

Records of known rare vegetation and rare ecological community occurrences within 5 km of the proposed route were acquired from ACIMS (Alberta Environment and Sustainable Resource Development [AESRD], 2015a, b). Records provided by ACIMS indicated that tracked bryophyte and lichen species are known to occur within 5 km of the proposed right-of-way. Based on this, bryophyte and lichen specimen collection was included in the scope of the vegetation surveys for the Project.

Weed Species

Prior to the commencement of the vegetation surveys, weeds of management concern identified in the Alberta *Weed Control Regulation* and the 2015 IPM Plan for JNP Front Country and Wilderness Areas (Shepherd, 2015) were reviewed. A representative from JNP was contacted to determine whether any known or anticipated Noxious or area-specific weeds are present within the Vegetation SA and whether there were any recommended key mitigation measures. The 2016 IPM was received from JNP in December 2016 (Shepherd, 2016) and changes to the weeds of concern for JNP will be considered going forward.

Forest Health

Mountain pine beetle (MPB) and other forest pests (e.g., spruce beetle, Douglas-fir beetle) can pose a serious threat to mature coniferous forests. A representative of JNP was consulted regarding forest health concerns within the Vegetation SA. In addition, signs of forest health issues (i.e., tree discolouration on orthophoto imagery) were attributed to ELC polygons during mapping, when applicable. The occurrence of MPB within the Vegetation SA was also checked using the Mountain Pine Beetle Management Zones 2014 map (AESRD, 2014b).

5.2.1.3 Desktop Study Results

Vegetation Community Classification

The Project is located in the Montane Natural Subregion of the Rocky Mountain Natural Region (NRC, 2006). The Montane Natural Subregion is influenced by warm air masses moving along the Athabasca River valley. Vegetation communities are mainly comprised of closed forest communities dominated by lodgepole pine, Douglas-fir, aspen, and white spruce. Typical understory species in these communities include Canada buffaloberry, white meadowsweet, snowberry, saskatoon, and hairy wild rye. Deciduous forests occur on fluvial fans, terraces, and floodplains. Open grasslands occur on dry and exposed sites and are dominated by various grasses including June grass, northern wheatgrass, western wheatgrass, Kentucky bluegrass, and slender wheatgrass (NRC, 2006).

The proposed route follows, to the extent possible, existing linear disturbance with minor deviations for environmental and construction reasons. The proposed route has been routed adjacent to existing disturbance for 44.1 km of its 44.7 km total length (99 percent). Existing linear disturbance includes the Highway 16, Snaring Road, Celestine Lake Road, CN Railway, Kinder Morgan TMPL and TMX pipeline rights-of-way, ATCO pipelines, and existing distribution line rights-of-way (see Section 2.6.3).

The Project Footprint encounters primarily native vegetation (e.g., forests, shrubland) and existing disturbance (e.g., roads, day use area and existing rights-of-way).

Along the Project Footprint, approximately 30.0 ha (48 percent of the Project Footprint) of native vegetation will be cleared. Approximately 0.5 ha of the Project Footprint is located outside of the area that detailed ELC mapping was completed for (see Appendix 5.2-1) and, therefore, is not included in any of the metrics provided in the Vegetation Section of this DIA. Outside of the Project Footprint, in areas adjacent to the proposed right-of-way approximately 20.7 ha will require some level of treatment for the reduction of adjacent hazard trees and detailed ELC mapping was not completed for these areas.

Rare Vegetation and Rare Ecological Communities

There are five vegetation species listed as Endangered, Threatened, or Special Concern under *SARA* or COSEWIC, and one species listed as Endangered on the Alberta *Wildlife Act* that are known to occur in the Montane Natural Subregion (AEP, 2016a):

- Haller's apple moss (*Bartramia halleriana*) (Threatened by SARA and COSEWIC)
- Limber pine (*Pinus flexilis*) (Endangered by COSEWIC; Endangered by the Alberta Wildlife Act)
- Porsild's bryum moss (*Bryum porsildii*) (Threatened by SARA and COSEWIC; Endangered by the Alberta Wildlife Act)
- Tiny cryptanthe (*Cryptantha minima*) (Endangered by SARA; Threatened by COSEWIC; Endangered by the Alberta Wildlife Act)
- Western blue flag (*Iris missouriensis*) (Special Concern by SARA and COSEWIC)
- Whitebark pine (*Pinus albicaulis*) (Endangered by SARA and COSEWIC; Endangered by the Alberta Wildlife Act)

Since these species occur in the Montane Natural Subregion, they have potential to occur within the Vegetation SA; however, based on their habitat requirements (FNA, 1993+) and the distance to known occurrences, they are considered unlikely to occur along the proposed route. These species were targeted during vegetation surveys, but were not observed. Definitions of federal designations are provided in the sources and notes in Appendix 5.2B.

Haller's apple moss (*Bartramia halleriana* Hedw.) is a medium-sized moss found in tufts 4 to 13 cm high, green to yellow or brownish-green in colour. The capsules are on very short seta (stalks) and immersed among the leaves (Environment Canada, 2010). Occurrences of this species generally occupy north-facing, mesic, low-elevation (600 to 1,600 m) non-calcareous cliffs, bedrock outcrops or talus, under dense forest cover. The microclimate is frequently moist and cool, influenced by seepage, or by cold air movement through talus (Environment Canada, 2010). It is provincially ranked S1 in Alberta and is ranked federally by COSEWIC and *SARA* as Threatened (AEP, 2016a; Government of Canada, 2016a). No known occurrences of Haller's apple moss have been identified within this Natural Subregion within 5 km of the proposed right-of-way (AESRD, 2015a, 2015b). The closest occurrence is 6 km west of the western end of the rights-of-way.

Limber pine (*Pinus flexilis* James) is a small tree with a stout trunk and whorls of thick limbs, its light grey bark becoming dark brown and cracked with age. The 3 to 7 cm long needles have smooth margins and occur in groups of five, crowded at the ends of the branches. Its oval-shaped cones are 8 to 20 cm long, open at maturity, and have light brown scales that are thick at the tip. Limber pine grows in exposed rocky slopes and hilltops to subalpine elevations (Moss, 1983). In Alberta it is provincially ranked S2 by ACIMS, and is ranked by the Alberta *Wildlife Act* as Endangered (AEP, 2016a). Limber pine is ranked as Endangered under COSEWIC and is not currently listed under *SARA* (Government of Canada, 2016a). No known occurrences of limber pine have been identified within 5 km of the proposed right-of-way (AESRD, 2015a, 2015b).

Porsild's bryum moss (*Bryum porsildii* Cox, C. J. & T. A. J. Hedderson) is a small moss that grows in short, compact cushions only 0.3 to 1 cm high. These cushions are bright green and have a spongy texture. Individual stems are reddish-brown and have multiple branches. The older portions of the stems are covered in dense red rhizoids and often the leaves have lost their chlorophyll and appear colourless except for the costa, which becomes red with age. The leaves are shiny, slightly concave, recurved, and range in length from 0.6 to 1.5 millimetres (mm) (Environment Canada, 2014). Colonies are often found in shaded calcareous rock crevices or rock faces that are constantly moist with seepage or splash during the growing season, and most populations are associated with waterfalls (Environment Canada, 2014). It is provincially ranked S2S3 in Alberta, ranked by the Alberta *Wildlife Act* as Endangered, and is ranked federally by COSEWIC and *SARA* as Threatened (AEP, 2016a; Government of Canada, 2016a). There is one historical population in JNP, discovered by Thomas Drummond in 1828. This population has not been observed since its discovery, despite recent searches in 2007 and 2008 (Environment Canada, 2014). The buffer for this occurrence is between 0.3 and 2 km from the proposed right-of-way (AESRD, 2015b). Based on the known range, occurrences and habitat requirements of Porsild's bryum, this species is not expected to occur along the proposed right-of-way in this Natural Subregion (Environment Canada, 2014).

Tiny cryptanthe (*Cryptantha minima* Rydb.) is an annual herbaceous species that grows on dry, eroding prairie areas. The branched and bristly, hairy stems are 10 to 20 cm high with alternate, 5 to 15 mm long spatula-shaped leaves. The white, tiny flowers are evident from May to June on uncoiling branches with bristly haired bracts throughout (Environment Canada, 2012). The fruits are clusters of four, small, whitish nutlets within each flower cup (calyx); one is smooth, and the other three are covered with tiny bumps (Kershaw et al., 2001; Moss, 1983). In Alberta, tiny cryptanthe is found on poorly developed sandy soils of fluvial or aeolian origin, and usually near level to gently sloping valley bottom terraces (ASRD, 2004). It is ranked S2 in Alberta, ranked by the Alberta *Wildlife Act* as Endangered, ranked federally by *SARA* as Endangered and by COSEWIC as Threatened (AEP, 2016a; Government of Canada, 2016a). No known occurrences of tiny cryptanthe have been identified within this Natural Subregion within 5 km of the proposed right-of-way (AESRD, 2015a, 2015b).

Western blue flag (*Iris missouriensis* Nutt.) is a long-lived perennial herb, 30 cm to 60 cm tall with pale blue-green sword-like leaves. Two to four showy pale blue to lavender (sometimes white) flowers are borne on flowering stalks (COSEWIC, 2010a). In Alberta, western blue flag is known to occur in open areas between moist depressions or meadows, stream margins and drier upland communities (COSEWIC, 2010a; Kershaw *et al.,* 2001; Moss, 1983). It is provincially ranked S2 in Alberta and is ranked federally by COSEWIC and *SARA* as Special Concern (AEP, 2016a; Government of Canada, 2016a). No known occurrences of western blue flag have been identified within this Natural Subregion within 5 km of the proposed right-of-way (AESRD, 2015a, 2015b).

Whitebark pine (*Pinus albicaulis* Engelm.) is a small tree that grows 5 to 20 m at maturity within high elevation forests of the mountains of western North America (COSEWIC, 2010b). The crown is often matted and the trunk is crooked with smooth, whitish bark that is little broken except for at the base. Twigs are yellowish and hairy, while the stiff needles are 4 to 8 cm long and occur in bundles of five. Seed cones are 3 to 7 cm in length and are purplish with thickened scales (Moss, 1983). Whitebark pine grows in thin, rocky, cold soils at or near timberline in montane forests (FNA, 1993+). It is provincially ranked S3 in Alberta, ranked as Endangered by the Alberta *Wildlife Act*, and is ranked federally by COSEWIC and *SARA* as Endangered (AEP, 2016a; Government of Canada, 2016a). Twelve occurrences of this species were recorded between 1.6 km and 3.1 km from the proposed right-of-way within this Natural Subregion (AESRD, 2015a). Based on the known range, occurrences and habitat requirements of whitebark pine, this species is not expected to occur along the proposed right-of-way in this Natural Subregion (Moss, 1983; COSEWIC, 2010b).

There are currently 180 ACIMS-listed rare vascular plant species, 192 ACIMS-listed rare non-vascular plant and lichen species, and 56 ACIMS-listed ecological communities with the potential to occur within the Montane Natural Subregion (AEP, 2016a; Allen, 2014). Tables of rare vascular plant species and rare ecological communities with the potential to occur in the Montane Natural Subregion are included as Appendices 4.2-2 and 4.2-3, respectively.

ACIMS provided records of rare vegetation occurrences known within 5 km of the proposed route, which included 23 rare vascular plant species, 29 moss species, one liverwort species, 12 lichen species, and three rare ecological communities (AESRD, 2015a, 2015b). Rare vegetation populations and rare ecological communities are documented using EOs.

The previously recorded EOs are summarized in Table A5.2-1-4 of Appendix 5.2-1 and depicted on Figure 5.2-1.

Weed Species

Non-native and invasive species considered include those species listed under the Alberta *Weed Control Act* and *Weed Control Regulation*, those species identified as being of management concern by JNP (Shepherd, 2015, 2016; Shepherd, 2016, pers. comm.; Shepherd, 2017, pers. comm.), as well as those species listed as being non-native by ACIMS (AEP, 2016b). Under the Alberta *Weed Control Act*, Prohibited Noxious weeds are to be destroyed when found, while Noxious weeds are to be controlled to prevent further spread of the population.

In addition to the Alberta *Weed Control Act*, the 2016 IPM plan identifies a list of plant species that are of most concern (high priority) and pose notable threats to the ecological integrity of native vegetation communities within JNP (Shepherd, 2016; see Section 1.3 of Appendix 5.2-1).

JNP recommends an environmentally sensitive and effective non-native plant control IPM strategy consistent with the *Best Available Methods for Common Leaseholder Activities* (Axys and Walker, 1998).

Forest Health

MPB has been observed within JNP at low levels, first observed along the Smoky River in 1999, and later observed along Highway 16 in the Miette Watershed in 2002 (Parks Canada, 2009a). Fire suppression within JNP combined with warming trends over the past few decades have acted in combination to increase susceptibility of JNP forests to MPB invasion (Parks Canada, 2009a). Currently, mature lodgepole pine stands dominate the Miette and Athabasca River Valleys, the lowest elevation valleys in JNP that connect British Columbia's MPB source population to Alberta's mostly uncolonized boreal jack pine forests that extend to eastern Canada (Parks Canada, 2007). The number of MPB affected trees is increasing within JNP, with over 6,000 ha of JNP's pine forest now colonized (Parks Canada, 2007, 2014a). JNP's management tool of choice to stop or slow the eastward spread of MPB is prescribed burning. JNP plans to conduct prescribed burns (the Fiddle Prescribed Fire Complex) in five areas on the eastern boundary of JNP which is partially within the Project alignment (Parks Canada, 2016). A prescribed burn is planned for areas overlapping the Project Footprint and the areas adjacent to the Project Footprint targeted for hazard tree removal in 2017 (Smith, 2017, pers. comm.). ATCO Electric is consulting with Parks Canada and will ensure that appropriate protection measures are implemented.

Both Douglas-fir beetle and spruce beetle have historically been known to occur within JNP in the Middle Athabasca Fire Management Unit (Wilson, 2000). The first observation of Douglas-fir beetle within JNP was in 1980 (Paulson, 1995). Douglas-fir normally attacks weakened or dying trees. Stand age, lack of tree vigour, and disturbances are key factors that may increase populations of Douglas-fir beetles and spread to new trees (Paulson, 1995). Spruce beetle prefers both Engelmann and white spruce, and the majority of outbreaks originate from disturbance (e.g., blowdown, road clearing, or logging) (Wilson, 2000).

Other important forest pests known within JNP include the spruce budworm and the lodgepole pine needleminer (Wilson, 2000). Forest health issues were identified within approximately 24.9 ha of the Vegetation SA during ELC mapping, primarily within the C3 vegetation type of the HD4 ecosite (lodgepole pine/ground juniper/common bearberry), and the C6 vegetation type within the FR1 ecosite (lodgepole pine/Canada buffaloberry/showy aster).

While the AEP Mountain Pine Beetle Zone map does not include the area within JNP, the area of Alberta along the eastern boundary of JNP is within a Leading Edge Zone (AESRD, 2014b, 2014c) for MPB as part of the Alberta *Mountain Pine Beetle Management Strategy* (ASRD, 2007).

The prime objective of the Leading Edge Zone is to reduce and maintain MPB populations and spread to an endemic level (ASRD, 2007). If MPB-infested pine is to be harvested from the Project Footprint, appropriate mitigation will be developed in accordance with the Alberta Mountain Pine Beetle Log Management Directive (ASRD, 2011) for requirements and restrictions on hauling, storage, and disposal of timber and residue (e.g., bark, tops, or butts).

Selective Tree Removal

ATCO Electric's right-of-way widths vary with the voltage and structure type being utilized for each project. A typical 72 kV transmission line being constructed outside of JNP would require an 18 m right-of-way with an associated hazard tree area outside of the 18 m. Within JNP, ATCO Electric will utilize a non-standard right-of-way width of 10 m for construction and maintenance activities to ensure the safe and reliable operation of the electrical facilities, while respecting and protecting the Park and its world heritage setting.

ATCO Electric determined that approximately 34.6 ha or 75 percent of the proposed right-of-way and 7.2 ha or 91 percent of the temporary workspaces are open areas with sparsely distributed trees present. ATCO Electric estimates that approximately 14,972 trees greater than 2.5 m in height on the 10 m wide proposed right-of-way and up to an additional 1,958 trees in the temporary workspace will be removed. While ground verification is required to determine if clearing can be avoided in the case of temporary workspaces, no tree clearing is planned in any of the temporary laydown sites.

Adjacent to the proposed right-of-way, approximately 20.7 ha of additional area was identified to potentially contain hazard trees that will require some level of treatment to reduce the associated hazard to the transmission line. ATCO Electric, estimates that up to 10,010 trees will require some level of treatment, but this number will likely be reduced somewhat as ground verification is required prior to tree removal to determine whether select trees can be retained. A prescribed burn is scheduled by Parks Canada in 2017, a portion of which will overlap the Project Footprint and adjacent target areas for hazard tree removal. Table 5.2-1 summarizes the vegetation removal planned for the Project.

Table 5.2-1. Estimated Vegetation Removal Associated with the Project

Project Area	Total Area (ha)	Approximate Number of Trees to be Removed[a]
Proposed 10 m Right-of-Way	34.6	14,972
Temporary Workspaces	7.2	1,958
Hazard Tree Area adjacent to the proposed right-of-way	20.7	10,010

[a] Maximum stem count with ground verification required prior to removal of trees

5.2.1.4 Field Studies

Vegetation field work was conducted with the following objectives:

- Confirm desktop ELC mapping
- Identify rare vegetation and rare ecological communities (i.e., as defined by SARA, COSEWIC, the Alberta Wildlife Act, and ACIMS)
- Collect potentially tracked bryophyte and lichen specimens for subsequent identification by experts
- Record the abundance and distribution of non-native, invasive species
- Record information on the presence and location of forest health issues
- Provide mitigation recommendations in the event that rare vegetation, rare ecological communities, invasive species, or forest health issues were observed

Vegetation surveys covered approximately 27.6 km (61 percent) of the proposed right-of-way, focusing primarily on high priority habitats (based on previous rare plant observations and the habitats of potential rare species) and representative ecosystems for the area. Areas where vegetation surveys were conducted are shown on Figure A5.2-1-5 in Appendix 5.2-1.

General vegetation field results are presented in the following section. Detailed vegetation field methodology and results are presented in Appendix 5.2-1.

Vegetation Community Classification

Vegetation community classification field surveys were conducted on foot to achieve sufficient information to complete the ELC of the Vegetation SA. Following the 2015 field surveys, ELC mapping was finalized. Field plot data was used to compare preliminary ELC delineation and attribution to field observations. Where preliminary ELC deviated from field observations, appropriate edits were made to the ELC mapping. Where applicable, insight from field observations led to overall edits of the preliminary ELC.

Vegetation communities encountered by the proposed right-of-way include closed and open coniferous forests, closed deciduous forests, shrub communities, low herb-shrub communities, herb-dwarf shrub communities, and existing disturbances.

Closed coniferous forests (vegetation types, in descending order of total area, are C3, C27, C6, C4, C2, C5, C26) were encountered by the proposed right-of-way during ELC mapping. They consist of predominantly lodgepole pine and white spruce, with some Douglas-fir. Dominant shrubs include ground juniper, Canada buffaloberry, and prickly rose, with common bearberry, showy aster, common horsetail, wiry fern moss, and stair-step moss dominating the understory (Holland and Coen, 1983). Open coniferous forests (vegetation types, in descending order of total area, are O3 and O17) encountered by the proposed right-of-way are generally dominated by white spruce, with shrubby cinquefoil, Canada buffaloberry, and ground juniper in the shrub layer and common bearberry, hairy wild rye, and twinflower are common herbaceous species (Holland and Coen, 1983).

Closed deciduous forests (vegetation types, in descending order of total area, are C16 and C28) encountered by the proposed right-of-way are dominated by aspen within drier sites, with prickly rose, Canada buffaloberry, and ground juniper within the shrub layer and hairy wild rye and cream-coloured vetchling in the understory. Wetter sites are characterized by canopies of balsam poplar, a sparse shrub layer consisting of prickly rose and low-bush cranberry, and meadow horsetail, common horsetail and tall lungwort dominating the understory (Holland and Coen, 1983).

Shrub communities (vegetation types, in descending order of total area, are S7 and S1) encountered by the proposed right-of-way occur in moist (subhygric to hydric) areas. They are characterized by high shrub consisting of bog birch or dwarf birch, shrubby cinquefoil, and willow species. Understory herbaceous species include water sedge, tufted hair grass, and common horsetail (Holland and Coen, 1983).

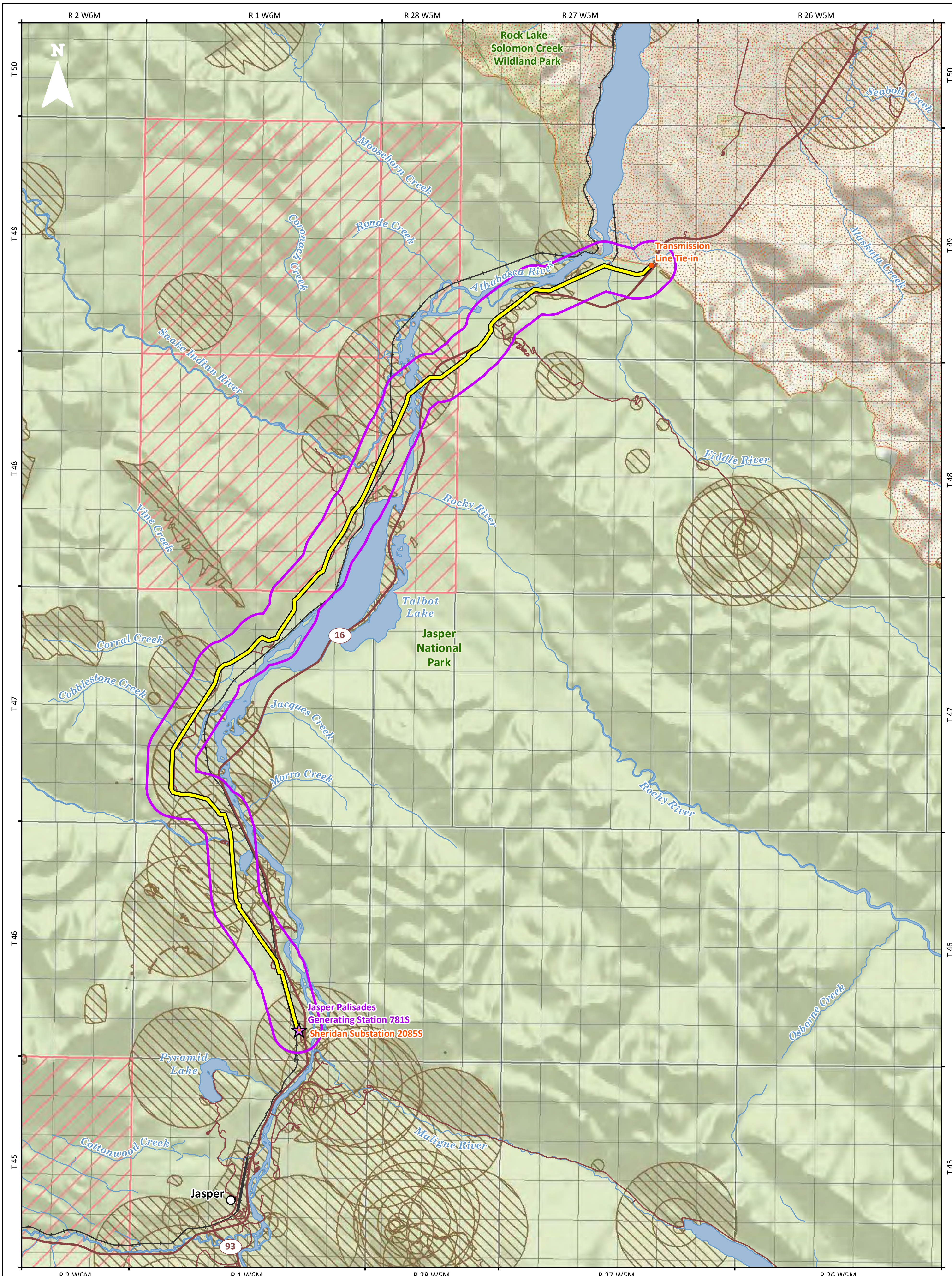
Low shrub-herb communities (L1) encountered by the proposed right-of-way consist of a dominance of shrubby cinquefoil and ground juniper in the shrub layer, with common bearberry, northern bedstraw, and pasture sagewort in the understory (Holland and Coen, 1983).

Herb-dwarf shrub communities (H6) encountered by the proposed right-of-way consist of a dominance of June grass, with pasture sagewort, wild blue flax, with littleleaf pussytoes also characteristic of this herbaceous community (Holland and Coen, 1983).

Existing disturbances (e.g., rights-of-way and roadsides) are dominated by introduced grass and forb species.

A list of all species observed at the time of the vegetation survey is provided in Appendix 5.2-6. Species nomenclature is according to the list of all elements in Alberta (AEP, 2016b, 2016c, 2016d), with more current taxonomic information drawn from NatureServe (2016), when necessary.

Full results of the ELC mapping including the ecosites and vegetation types encountered by the proposed right-of-way are detailed in Section 1.1.6 of Appendix 5.2-1.



Proposed Route	Waterbody		
892 Highway	Park/Protected Area		
	Vegetation Study Area		
Road	ACIMS Vegetation Element Occurrences (Non-sensitive)		
Railway	ACIMS Vegetation Element Occurrences (Sensitive)		
Watercourse	Mountain Pine Beetle Zone - Leading		

SCALE: 1:150,000

0 1 2 3 4 5 km

(All Locations Approximate)

FIGURE 5.2-1

VEGETATION OVERVIEW

JASPER INTERCONNECTION PROJECT

UTM Zone 11N
Hillshade: TERA 2008; Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Parks/Protected Areas: NRCan 2016, ATPR 2012; Jasper: NRCan 2003; Proposed Route outside JNP: ATCO Electric Ltd. 2015; Generating Station, Proposed Route in JNP: ATCO Electric Ltd. 2016; ACIMS: AESRD 2015; Mountain Pine Beetle Zones: AESRD 2014.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

\\ch2mhill\common\Shares\CNR\GIS_Proj2\VECA\660380\MAP_FILES\VEG\t660380_VEG_Reg_Loc_Rev01_20170530.mxd

Aspen Stands

The C16 vegetation type is the only vegetation type mapped within the Vegetation SA that is dominated by aspen. Occurring on mesic, Montane to Lower Subalpine sites, this vegetation type is characterized by an aspen canopy, a moderately dense shrub layer consisting of prickly rose, Canada buffaloberry and ground juniper, and a dense and species-rich herb layer dominated by hairy wild rye (Holland and Coen, 1983).

Approximately 180 ha of C16 vegetation was mapped within the TA3 and HD1 ecosites within the Vegetation SA. The proposed right-of-way will disturb approximately 0.4 ha of treed C16 vegetation type within the HD1 ecosite. The proposed temporary workspace will disturb approximately 0.1 ha of treed C16 vegetation type within the HD1 ecosite.

Douglas-fir Stands

Two vegetation types dominated by Douglas-fir were mapped within the Vegetation SA: C1 and O5.

The C1 vegetation type is a closed forest that occurs mostly on subxeric Montane sites in the Athabasca River valley. Douglas-fir is the dominant canopy tree, with lodgepole pine and white spruce often present at low cover within the canopy. The shrub layer consists of ground juniper, Canada buffaloberry, prickly rose and white meadowsweet. Hairy wild rye dominates the herbaceous layer (Holland and Coen, 1983).

Approximately 80.7 ha of the C1 vegetation type was mapped within the NY1 ecosite within the Vegetation SA. No C1 vegetation type will be disturbed by the Project Footprint.

The O5 vegetation type is an open forest that occurs on Montane xeric to subxeric moderate to steep slopes. It is dominated by Douglas-fir, with white spruce sometimes also present at low densities. The shrub layer is of low to moderate density, dominated by ground juniper and young Douglas-fir regeneration, with lesser amounts of prickly rose and white meadowsweet. Common bearberry, prairie groundsel, bluebunch wheatgrass and June grass dominate the moderate herbaceous layer (Holland and Coen, 1983).

Approximately 35.8 ha of O5 vegetation type was mapped within the NY3 ecosite within the Vegetation SA. The proposed right-of-way will disturb approximately 0.1 ha of treed O5 vegetation type within the NY3 ecosite.

Montane Grassland

Two grassland vegetation types were mapped within the Vegetation SA: L6 and H6.

The L6 vegetation type is a shrubby grassland found on subxeric Montane slopes in the Talbot Lake and east gate area of JNP. The herb/dwarf-shrub layer is dominated by ground juniper, with lesser amounts of northern wheat grass and rush-like sedge (Holland and Coen, 1983). Approximately 22.9 ha of L6 vegetation type was mapped within the DV1, DV2 and ZZ ecosites. No L6 vegetation type will be disturbed by the Project Footprint.

The H6 vegetation type is a grassland that occurs within subxeric to xeric Montane sites that are level to moderately sloping. June grass is the dominant plant, though its cover can vary widely between years depending upon summer precipitation. Other species characteristic of the H6 vegetation type include pasture sage, wild blue flax and littleleaf pussytoes (Holland and Coen, 1983). Approximately 453.8 ha of H6 vegetation type was mapped within the following ecosites: AT1, AT3, HD1, HD2, HD3, HD4, P, PT1, TA2, and TA3. Approximately 1.6 ha of H6 vegetation community will be disturbed by the proposed right-of-way within the following ecosites: AT1, AT3, HD1, HD2, HD3, HD4 and TA2. Approximately 0.5 ha of H6 vegetation type will be disturbed by the proposed temporary workspace within the HD1 and TA2 ecosites. Approximately 4.7 ha of H6 vegetation type will be disturbed by the proposed laydown areas (the Devona, Pocahontas, and Snaring laydown areas), within the HD4 and P ecosites.

Rare Vegetation and Rare Ecological Communities

Rare Vegetation That Warrants Mitigation

During the 2015 and 2016 vegetation surveys, 31 EOs, of 18 ACIMS-listed rare vegetation species, that warrant mitigation were observed along the proposed right-of-way. All of these species are Tracked by ACIMS, or new to Alberta (i.e., no prior recorded occurrences), and all of the occurrences are within the Project Footprint. The rare populations observed are summarized in Table 5.2-2 and are shown on Figure 5.2-2. Detailed information on the occurrences of rare vegetation observed along the proposed route, including legal locations, abundance and distribution, and species description, is provided in Table A5.2-1-7 in Appendix 5.2-1. Photoplates of the rare vegetation species observed are presented in Appendix 5.2-4.

Table 5.2-2. Rare Vegetation Observed During the 2015 and 2016 Vegetation Surveys That Warrant Mitigation

Common Name	Scientific Name	Species Type	Provincial Rank[a]	Number of Occurrences Observed in 2015 and 2016
brown stipplescale lichen	*Placidium lacinulatum*	Lichen	new to Alberta[b]	1
Crawe's sedge	*Carex crawei*	Vascular Plant	S3/Tracked	1
dwarf notchwort	*Lophozia badensis*	Liverwort	SU/Tracked	1
fallacious screw moss	*Didymodon fallax*	Moss	S2S3/Tracked	1
fingered jelly lichen	*Collema cristatum* var. *cristatum*	Lichen	S2/Tracked	1
Greenland primrose	*Primula egaliksensis*	Vascular Plant	S2/Tracked	1
hairy shadow lichen	*Phaeophyscia hirsuta*	Lichen	S2/Tracked	1
Hooker's cinquefoil	*Potentilla hookeriana*	Vascular Plant	SU/Tracked	8
largeleaf fissidens moss	*Fissidens grandifrons*	Moss	S2S3/Tracked	2
narrow mushroom-headed liverwort	*Preissia quadrata*	Liverwort	S2S3/Tracked	2
Placynthium lichen	*Placynthium pulvinatum*	Lichen	new to Alberta[b]	1
Porsild's braya	*Braya humilis* ssp. *porsildii*	Vascular Plant	S1/Tracked	3
small greasewort	*Aneura pinguis*	Liverwort	S2S4/Tracked	1
smooth cliff brake	*Pellaea glabella* ssp. *occidentalis*	Vascular Plant	S2/Tracked	1
Solorinella lichen	*Solorinella asteriscus*	Lichen	S1/Tracked	1
wild comfrey	*Cynoglossum virginianum* var. *boreale*	Vascular Plant	S1/Tracked	1
willow feather moss	*Amblystegium varium*	Moss	S2S3/Tracked	1
yellow sedge	*Carex flava*	Vascular Plant	S3/Tracked	3

[a] Definitions of provincial ranks and designations are summarized in Appendix 5.2-2.

[b] No prior recorded occurrences in Alberta.

Rare Vegetation That Does Not Warrant Mitigation

During the 2015 and 2016 vegetation surveys for the Project, 59 EOs, of 40 ACIMS-listed rare vegetation species, were observed that do not warrant mitigation, because they are off the Project Footprint, on the ACIMS Watch List, or determined by specialists to not warrant mitigation. Many of these rare plant occurrences are off the Project Footprint due to route realignments subsequent to vegetation surveys. Three of these species are on the ACIMS Watch List, which indicates low concern for conservation, as data are collected and stored by ACIMS for retrieval as necessary, but not entered into the database as element occurrences (AEP, 2016e). In 2015, ACIMS removed the Watch List species from the list by Natural Subregion (AEP, 2016a) and their shapefiles (AESRD, 2015a, 2015b). For many of the tracked bryophyte and lichen species, specialist lichenologists and bryologists have suggested that mitigation is not warranted, since the species are thought to be, or recorded to be, more common than ranks reflect. Some species appear in both Tables 5.2-1 and 5.2-3. This is because occurrences in Table 5.2-2 are within the Project Footprint, whereas those in Table 5.2-3 are outside the Project Footprint. Occurrences that are outside the Project Footprint are reported in case the Project Footprint changes and to provide additional context for rare species. These rare plant occurrences are summarized in Table 5.2-3. Detailed information on the occurrences of rare vegetation that do not warrant mitigation, including legal locations, abundance and distribution, and species description, is provided in Table A5.2-1-7 in Appendix 5.2-1.

Table 5.2-3. Rare Vegetation Observed During the 2015 and 2016 Vegetation Surveys That Does Not Warrant Mitigation

Common Name	Scientific Name[a]	Species Type	Provincial Rank[b]	Number of Occurrences Observed in 2015 and 2016
Acarospora lichen	*Acarospora moenium*	Lichen	new to Alberta[c]	1
altai blister lichen	*Toninia tristis* ssp. *asiae-centralis*	Lichen	S1?/Tracked	1
bare-bottomed sunburst lichen	*Xanthomendoza fulva*	Lichen	S3/Tracked	1
blackberry scale	*Psora* cfr *globifera*	Lichen	S1S2/Tracked	1
camouflage lichen	*Melanohalea* cfr *subelegantula*	Lichen	S3/Tracked	1
chestnut pelt lichen	*Peltigera castanea*	Lichen	SU/Tracked	1
fringed chocolate chip lichen	*Solorina spongiosa*	Lichen	S2S3/Tracked	1
Collema lichen	*Collema substellata*	Lichen	new to Alberta[c]	2
Crawe's sedge	*Carex crawei*	Vascular Plant	S3/Tracked	1
crescent frost lichen	*Physconia perisidiosa*	Lichen	S3/Tracked	2
cryptic rosette lichen	*Physciella chloantha*	Lichen	SU/Tracked	1
dark shadow lichen	*Phaeophyscia sciastra*	Lichen	S3/Tracked	1
detritus rim lichen	*Lecanora zosterae*	Lichen	new to Alberta[c]	1
dwarf bulrush	*Trichophorum pumilum*	Vascular Plant	S3/Watched	7
earthscale lichen	*Catapyrenium cinereum*	Lichen	S2S3/Tracked	1
fan ramalina	*Ramalina sinensis*	Lichen	S3/Tracked	2

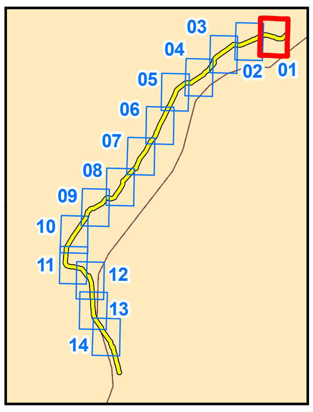
Table 5.2-3. Rare Vegetation Observed During the 2015 and 2016 Vegetation Surveys That Does Not Warrant Mitigation

Common Name	Scientific Name[a]	Species Type	Provincial Rank[b]	Number of Occurrences Observed in 2015 and 2016
Greenland primrose	*Primula egaliksensis*	Vascular Plant	S2/Tracked	1
hairy shadow lichen	*Phaeophyscia hirsuta*	Lichen	S2/Tracked	1
Hooker's cinquefoil	*Potentilla hookeriana*	Vascular Plant	SU/Tracked	3
Hypogymnia lichen	*Hypogymnia dichroma*	Lichen	new to Alberta[c]	3
Johansen's didymodon moss	*Didymodon johansenii*	Moss	S2S3/Tracked	1
Lecidea lichen	*Lecidea beringeriana*	Lichen	new to Alberta[c]	1
Leptogium lichen	*Leptogium pulvinatum*	Lichen	new to Alberta[c]	1
muffin pelt	*Peltigera conspersa*	Lichen	new to Alberta[c]	1
Orthotrichum moss	*Orthotrichum pellucidum*	Moss	S3/Watched	1
Parry's sedge	*Carex parryana*	Vascular Plant	S3/Watched	1
Pellia liverwort species	*Pellia* sp. (sterile)	Liverwort	SU/Tracked	1
Placidium lichen	*Placidium squamulosum*	Lichen	SU/Tracked	1
powder-tipped shadow lichen	*Phaeophyscia adiastola*	Lichen	S2?/Tracked	1
Porsild's braya	*Braya humilis* ssp. *porsildii*	Vascular Plant	S1/Tracked	2
Ramalina lichen	*Ramalina* sp. 1 sensu Goward 1999	Lichen	new to Alberta[c]	2
ring *Pellia*	*Pellia neesiana*	Liverwort	SU/Tracked	2
shaded cladonia lichen	*Cladonia umbricola*	Lichen	S2S4/Tracked	1
smooth shadow lichen	*Phaeophyscia ciliata*	Lichen	S2S4/Tracked	1
Solorinella lichen	*Solorinella asteriscus*	Lichen	S1/Tracked	1
split-peg lichen	*Cladonia symphycarpia*	Lichen	S2S4/Tracked	2
turgid scorpion moss	*Pseudocalliergon turgescens*	Moss	S2S3/Tracked	1
wild comfrey	*Cynoglossum virginianum* var. *boreale*	Vascular Plant	S1/Tracked	2
worm buttons	*Buellia elegans*	Lichen	S2/Tracked	1
yellow sedge	*Carex flava*	Vascular Plant	S3/Tracked	2

[a] The addition of 'cfr' indicates that the identification is the best possible determination based on the condition of the collected specimen (which was too young or of poor condition).

[b] Definitions of provincial ranks and designations are summarized in Appendix 5.2-2.

[c] No prior recorded occurrences in Alberta.



- Proposed Route
- Temporary Workspace and Easement
- Laydown Yards
- Highway (892)
- Road
- Railway
- Watercourse
- Waterbody
- Jasper National Park Boundary

2015 Vegetation Survey Results

- Rare Bryophyte/Lichen Occurrence
- Rare Vascular Plant Occurrence
- Rare Ecological Community Occurrence

2016 Vegetation Survey Results

- Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 01 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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June 2017	660380
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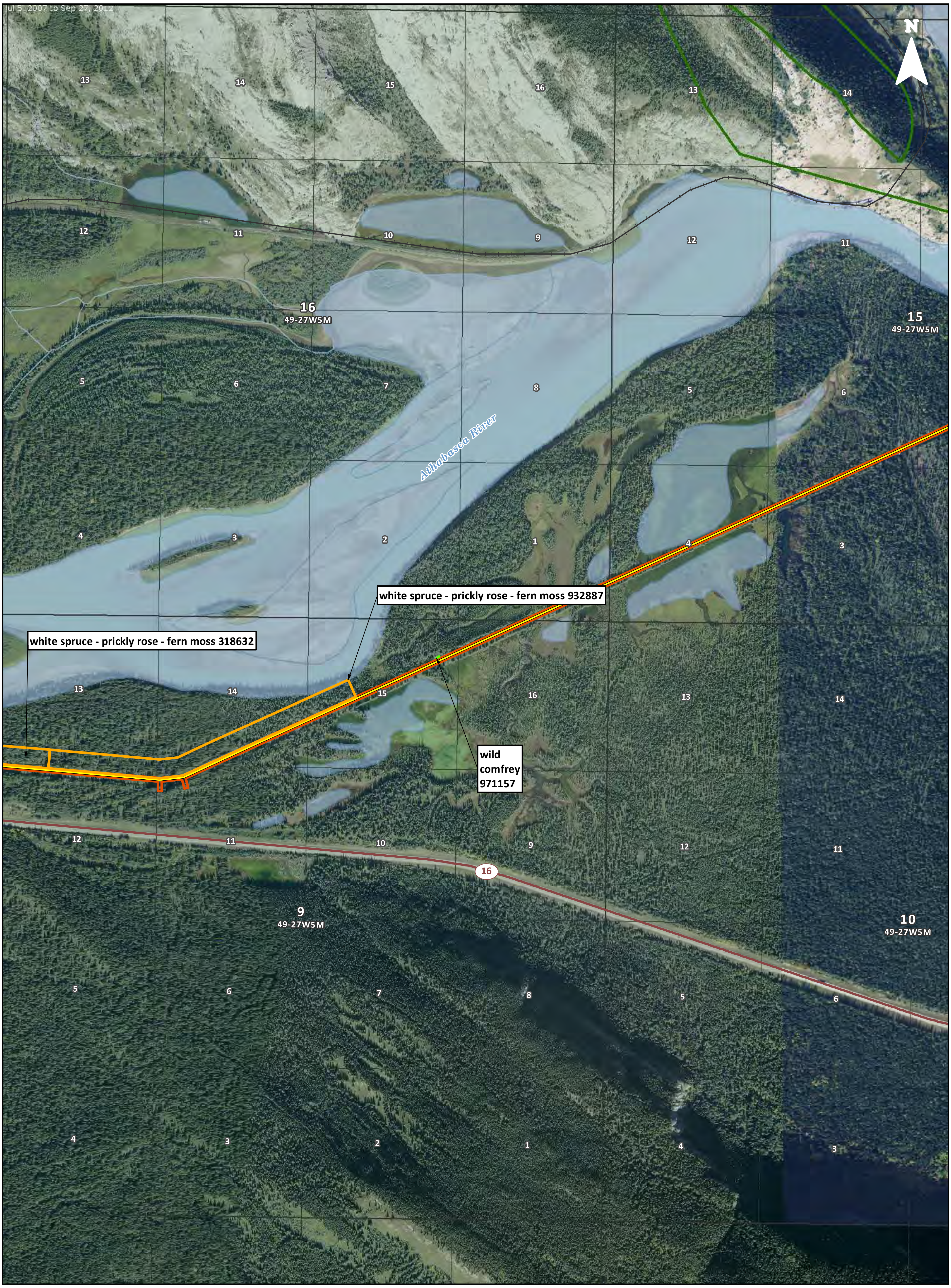

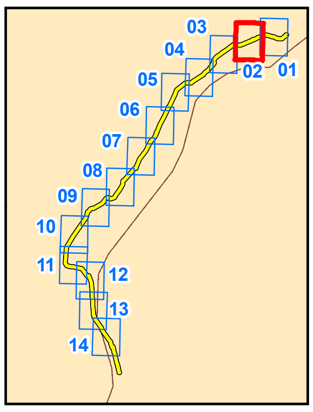

Proposed Route
Temporary Workspace and Easement
Laydown Yards
Highway
Road
Railway
Watercourse
Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 02 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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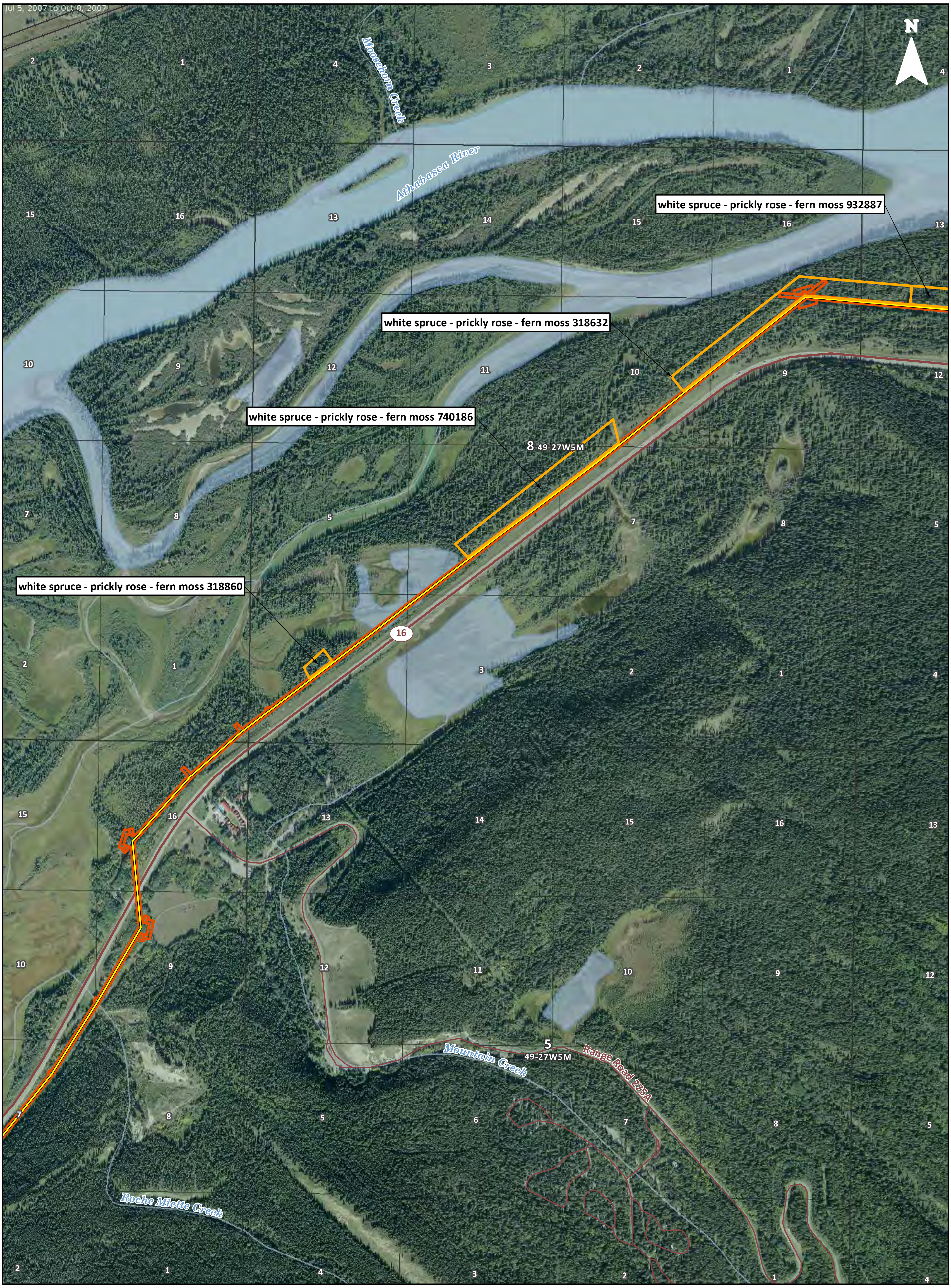

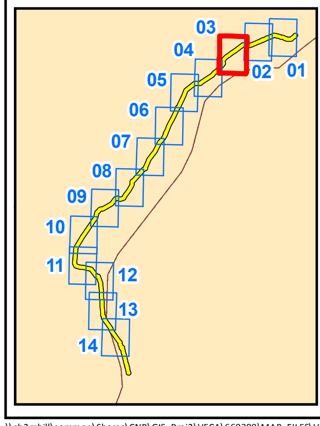

Proposed Route
Temporary Workspace and Easement
Laydown Yards
892 Highway
Road
Railway
Watercourse
Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 03 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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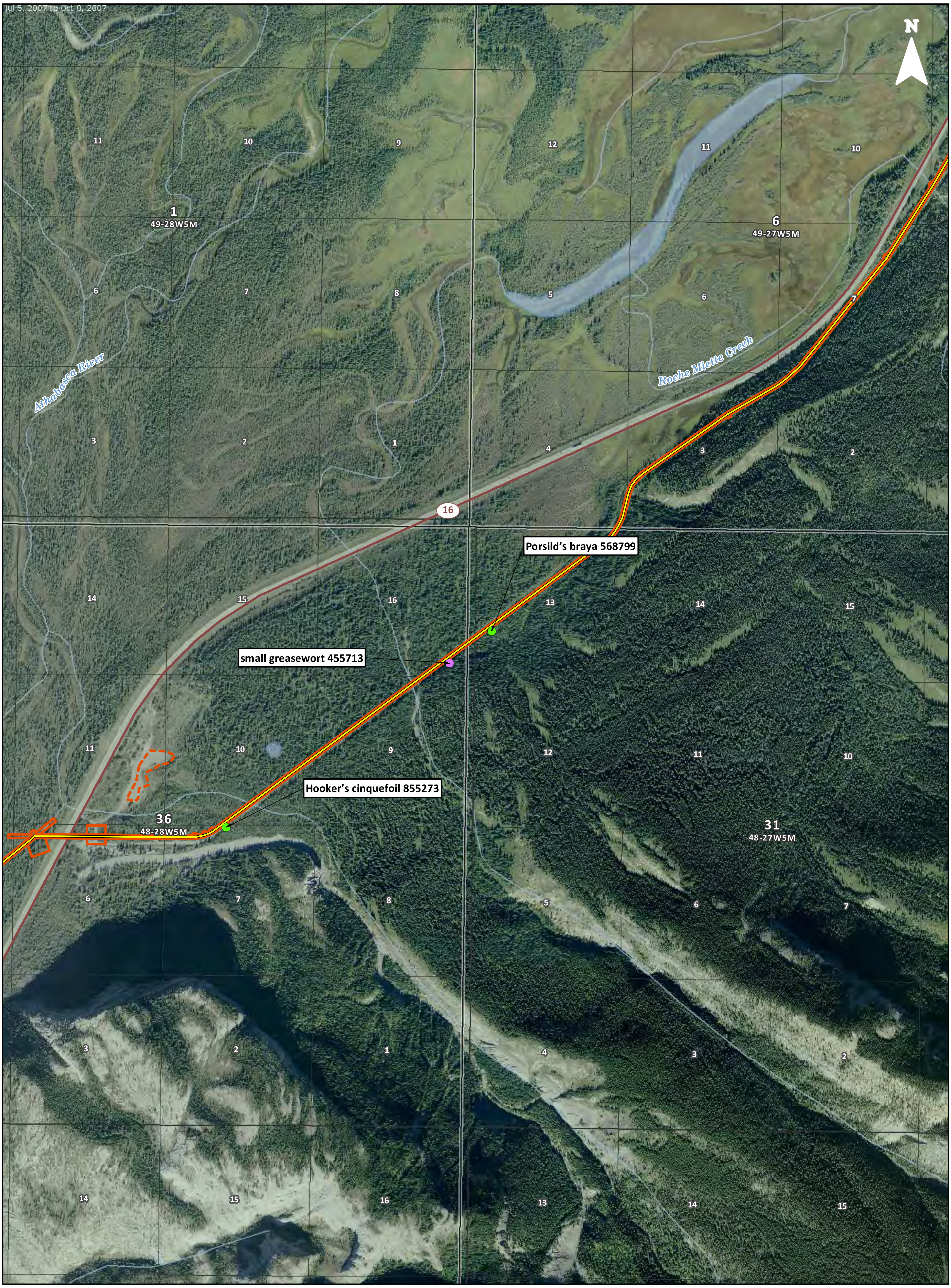

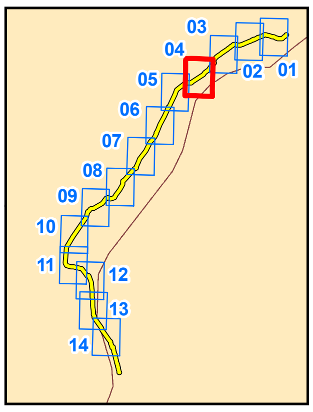

Proposed Route

Temporary Workspace and Easement

Laydown Yards

892 Highway

Road

Railway

Watercourse

Waterbody

Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence

Rare Vascular Plant Occurrence

Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 04 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
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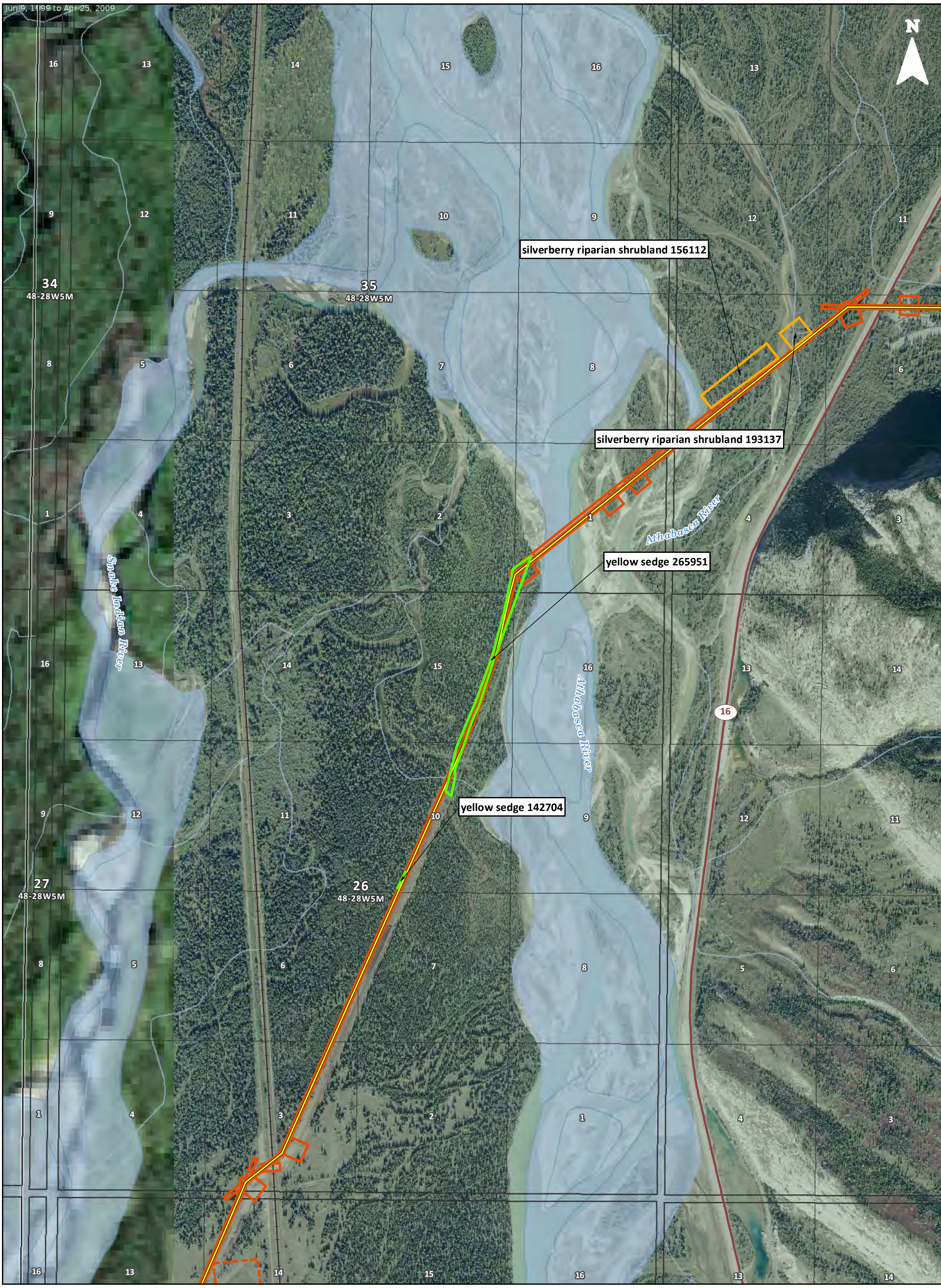

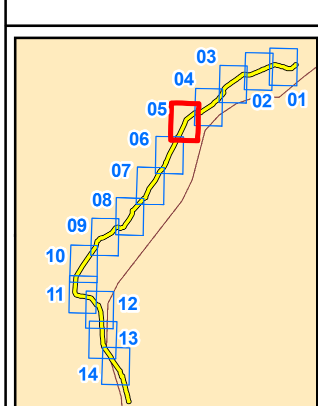

Proposed Route
Temporary Workspace and Easement
Laydown Yards
Highway
Road
Railway
Watercourse
Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 05 OF 14

JASPER INTERCONNECTION PROJECT

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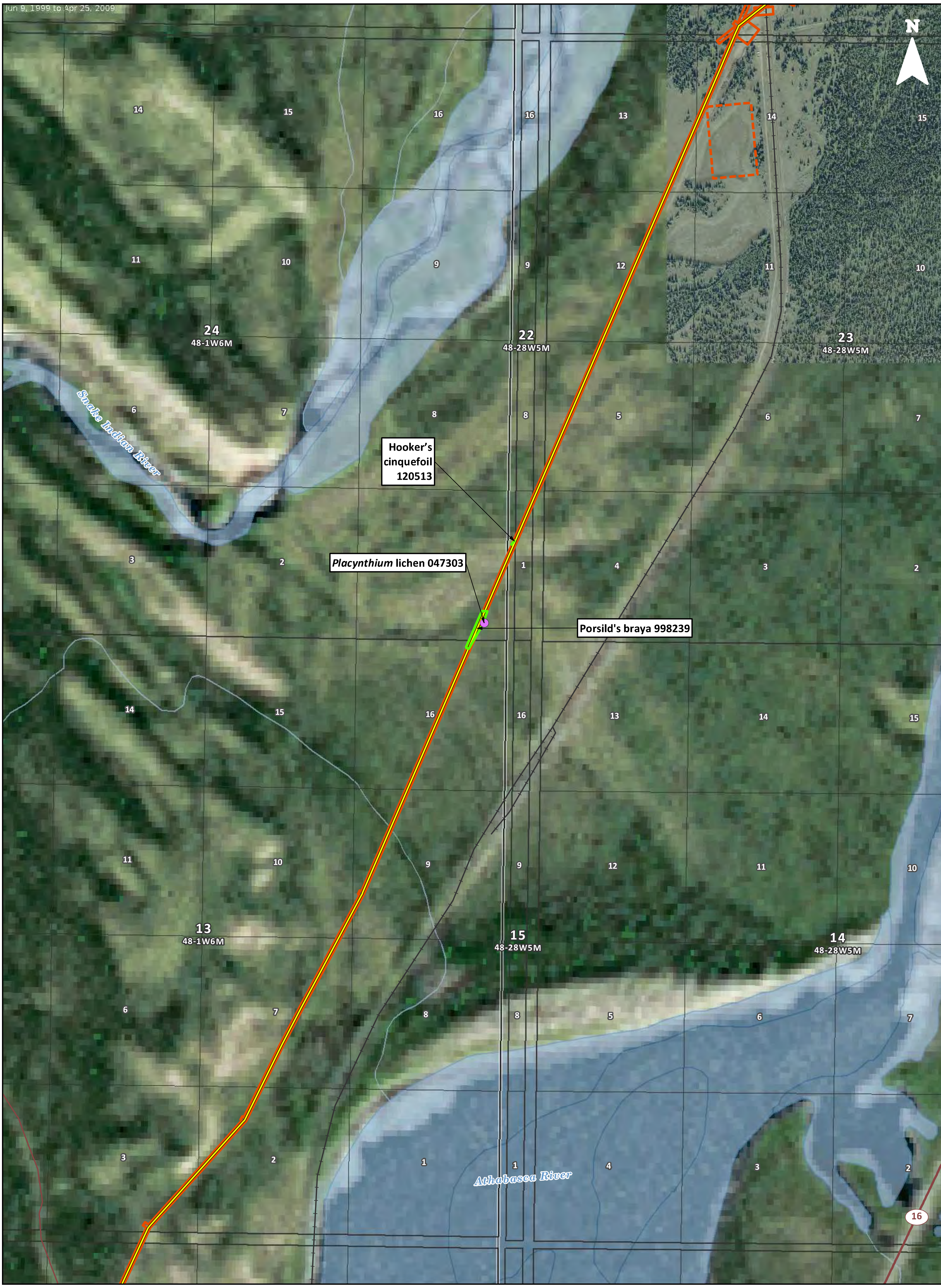

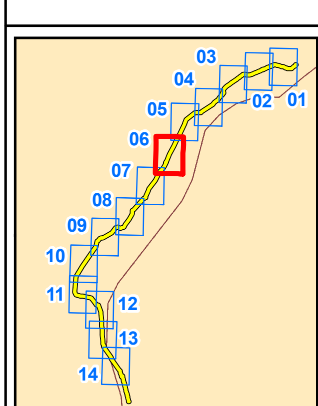

Proposed Route
Temporary Workspace and Easement
Laydown Yards
892 Highway
Road
Railway
Watercourse
Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 06 OF 14

JASPER INTERCONNECTION PROJECT

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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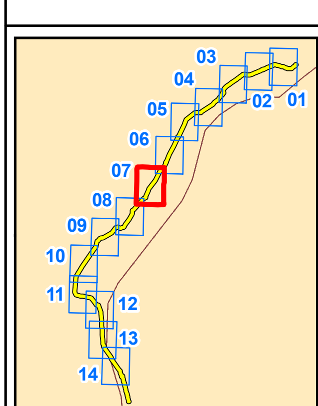

Proposed Route

Temporary Workspace and Easement

Laydown Yards

892 Highway

Road

Railway

Watercourse

Waterbody

Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence

Rare Vascular Plant Occurrence

Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 07 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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June 2017	660380
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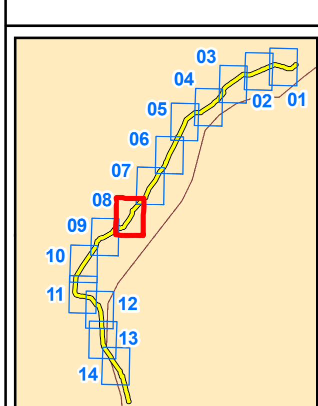

Proposed Route

Temporary Workspace and Easement

Laydown Yards

Highway

Road

Railway

Watercourse

Waterbody

Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence

Rare Vascular Plant Occurrence

Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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.

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 08 OF 14

JASPER INTERCONNECTION PROJECT

June 2017	660380
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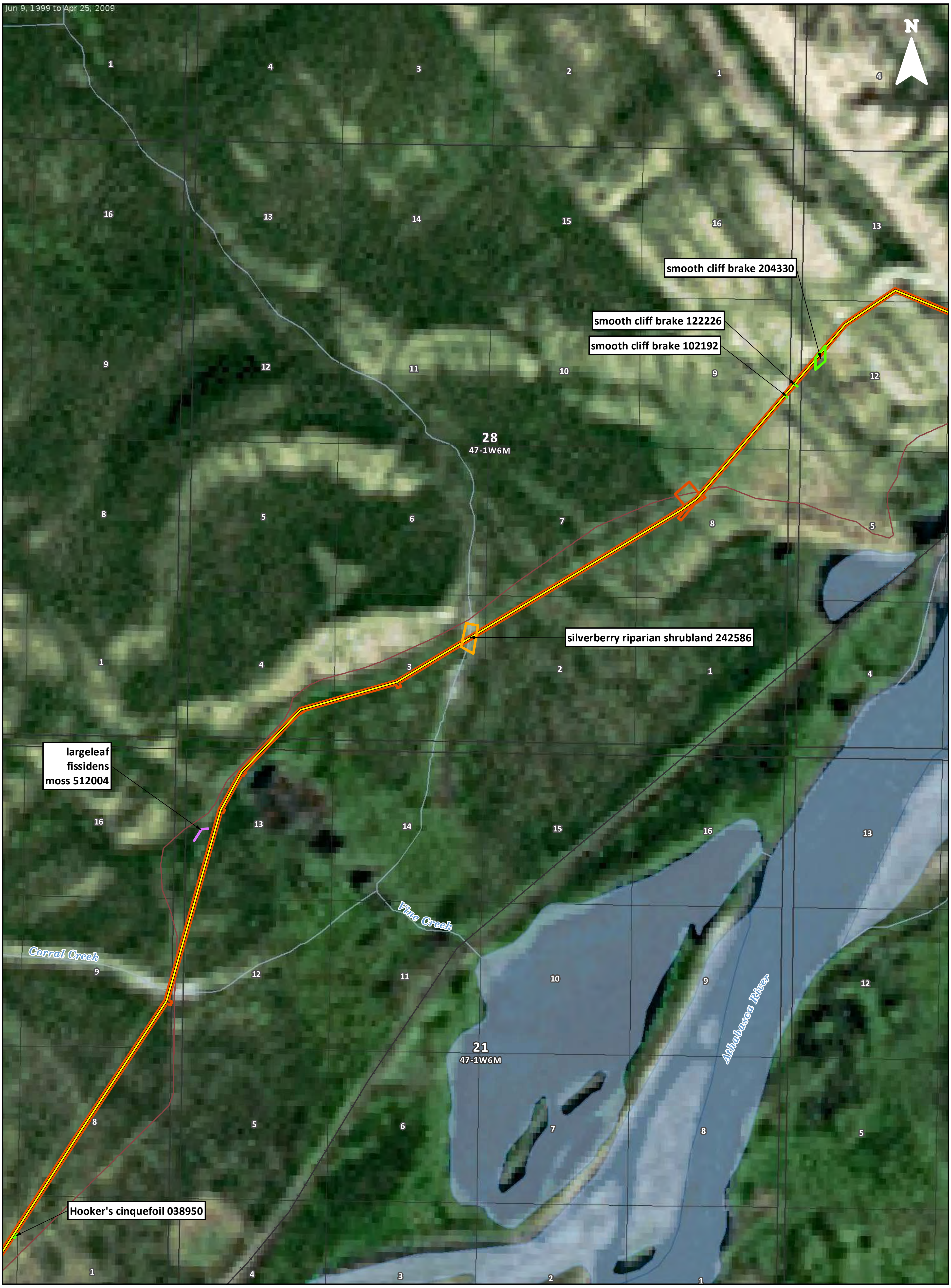

Proposed Route
Temporary Workspace and Easement
Laydown Yards
Highway
Road
Railway
Watercourse
Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 09 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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June 2017	660380
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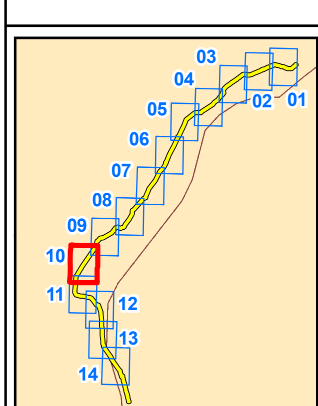

Proposed Route
Temporary Workspace and Easement
Laydown Yards
Highway
Road
Railway
Watercourse

Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 10 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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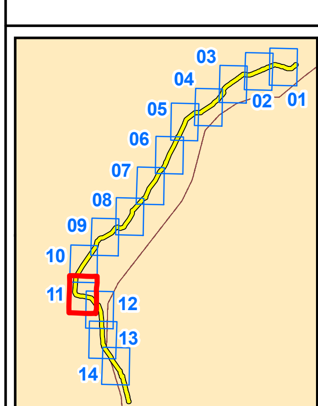

Proposed Route
Temporary Workspace and Easement
Laydown Yards
892 Highway
Road
Railway
Watercourse

Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results
Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results
Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 11 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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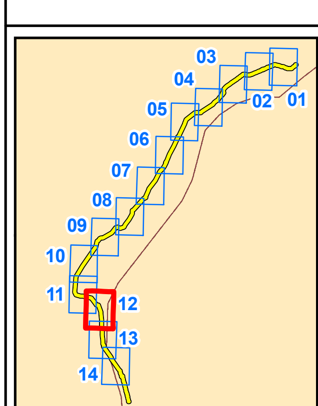

Proposed Route
Temporary Workspace and Easement
Laydown Yards
892 Highway
Road
Railway
Watercourse

Waterbody
Jasper National Park Boundary

2015 Vegetation Survey Results

Rare Bryophyte/Lichen Occurrence
Rare Vascular Plant Occurrence
Rare Ecological Community Occurrence

2016 Vegetation Survey Results

Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 12 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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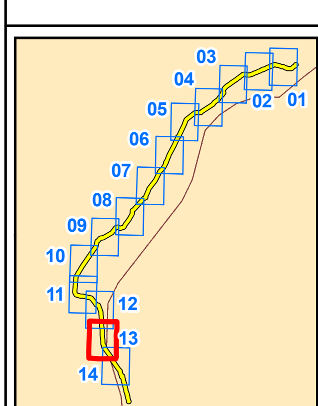

Proposed Route	Waterbody
Temporary Workspace and Easement	Jasper National Park Boundary
Laydown Yards	**2015 Vegetation Survey Results**
892 Highway	Rare Bryophyte/Lichen Occurrence
Road	Rare Vascular Plant Occurrence
Railway	Rare Ecological Community Occurrence
	2016 Vegetation Survey Results
Watercourse	Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 13 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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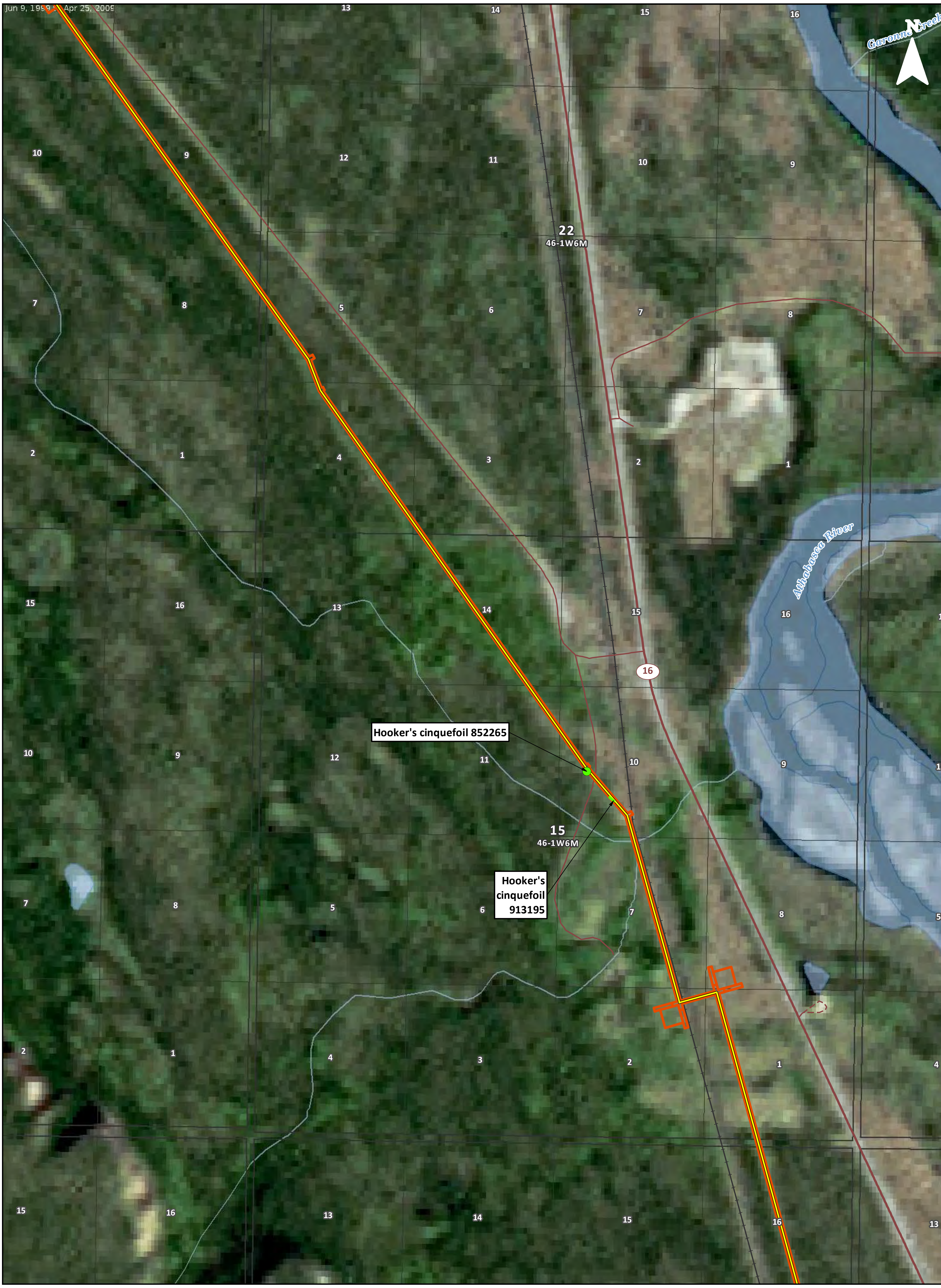

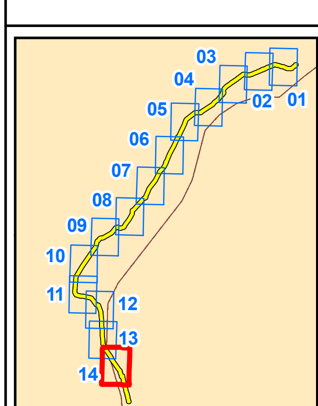

Proposed Route	Waterbody
Temporary Workspace and Easement	Jasper National Park Boundary
Laydown Yards	**2015 Vegetation Survey Results**
892 Highway	Rare Bryophyte/Lichen Occurrence
Road	Rare Vascular Plant Occurrence
Railway	Rare Ecological Community Occurrence
Watercourse	**2016 Vegetation Survey Results**
	Rare Vascular Plant Occurrence

ATCO Electric

SCALE: 1:10,000

0 100 200 300 m

(All Locations Approximate)

FIGURE 5.2-2

RESULTS OF THE 2015 AND 2016 VEGETATION SURVEYS

SHEET 14 OF 14

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Alberta Township System: AltaLIS 2009; Roads: IHS 2016; Railways: NRCan 2012; Watercourse, Waterbody: NRCan 2007-2011; Imagery: ATCO Electric Ltd. 2015; Proposed Route: ATCO Electric Ltd. 2016; Survey Results: CH2M 2015.

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Rare Ecological Communities

Four occurrences of the following two ACIMS-listed rare ecological communities were observed along the proposed right-of-way during the 2015 field surveys:

- Silverberry riparian shrubland (*Elaeagnus commutata* riparian shrubland, SU, tracked) – three occurrences
- White spruce – prickly rose – fern moss (*Picea glauca*/*Rosa acicularis*/*Abietinella abietina*, S1, tracked) – one occurrence

These observed rare ecological communities are shown on Figure 5.2-2. Detailed information on these rare ecological communities, including legal location, abundance and distribution, community description and recommended mitigation are provided in Table A5.2-1-6 of Appendix 5.2-1. Photoplates of the observed rare ecological communities are presented in Appendix 5.2-4.

One occurrence of the June grass – pasture – sagewort – wild blue flax rare ecological community (*Koeleria macrantha*/*Artemisia frigida*/*Linum lewisii*, S2S3, tracked) was observed off of the proposed construction footprint. Due to its location, mitigation is not deemed warranted for this occurrence. It is detailed in Table A5.2-1-7 of Appendix 5.2-1.

Two of these communities are represented by vegetation types within Holland and Coen's *Ecological (Biophysical) Land Classification of Banff and Jasper National Parks* (1983). June grass – pasture sagewort – wild blue flax is represented by the H6 vegetation type ELC mapping indicates that approximately 0.8 ha of June grass – pasture sagewort – wild blue flax will be disturbed by the proposed right-of-way, and approximately 4.7 ha will be disturbed by the proposed laydown areas.

The white spruce – prickly rose – fern moss rare ecological community is represented by the C27 vegetation type (Holland and Coen, 1983). Approximately 2.3 ha of white spruce – prickly rose – fern moss will be disturbed by the proposed right-of-way.

Weed Species

One Prohibited Noxious weed species (spotted knapweed) and six Noxious weed species (creeping [Canada] thistle, Dalmatian toadflax, ox-eye daisy, perennial sow-thistle, tall buttercup, and yellow [common] toadflax) were observed along the proposed right-of-way during the 2015 and 2016 vegetation surveys (see Section 1.3.2 of Appendix 5.2-1). In total, 38 non-listed, non-native species were also observed along the proposed right-of-way during the 2015 and 2016 vegetation surveys.

A list of all species observed at the time of survey, including weeds, is provided in Appendix 5.2-6. Weed location and abundance data are presented by land use and legal locations in Table A5.2-1-8 in Appendix 5.2-1. Density classes presented in Appendix 5.2-5 follow the density distribution guide provided in the AEP Rangeland Health Assessment Guide (Adams et al., 2009, see Appendix 5.2-5).

Forest Health

Signs of beetle damage were observed in NE 5-47-1 W6M along the proposed right-of-way during the 2015 vegetation surveys. In addition, evidence of controlled burns and removal of colonized trees (i.e., cutting and burning) were observed in SW 14-49-27 W6M along the proposed right-of-way near the eastern boundary of JNP. A photo of suspected beetle damage is included as Plate 28 within Appendix 5.2D.

5.2.2 Regulatory Context

Regulatory context for vegetation is derived from federal and provincial legislation and park management plans. Relevant federal legislation includes the *SARA* and the *CNPA*. Relevant provincial legislation includes the Alberta *Wildlife Act* and the Alberta *Weed Control Act*. Federal and provincial legislation is summarized in the following sections, in addition to relevant park management plans and a summary of how they relate to vegetation. A review of these documents did not identify any objectives related to vegetation that may be incompatible with the Project.

The *Best Available Methods for Common Leaseholder Activities* (Axys and Walker, 1998) and JNP Management Plan were used to develop the Project-specific key mitigation measures. While the Project is not regulated by the Enhanced Approval Process *Integrated Standards and Guidelines* (Alberta Energy Regulator, 2013), the vegetation management guidelines were considered in the development of Project-specific key mitigation measures.

Federal Legislation

Species at Risk Act

The federal *SARA* provides legal protection for Canadian indigenous species, subspecies, and distinct populations. The purpose of the *SARA* is to prevent wildlife and plant species at risk from becoming extirpated or extinct, to secure the recovery of at risk species, and to encourage management of other species to prevent them from becoming at risk. Protected species are those that are listed in Schedule 1 of *SARA* and are designated as either Extirpated, Endangered, Threatened, or Special Concern. Once a species is added to Schedule 1, it benefits from all the legal protection afforded under *SARA*, and mandatory recovery planning (for species listed as Endangered or Threatened) or management planning (for species listed as Special Concern). Species included on Schedule 1 are established by the federal cabinet and are based on recommendations by COSEWIC and consultation with government, Indigenous groups, and the public. *SARA* applies to federal lands; however, the *Act* may apply to other lands when provincial protection is deemed inadequate by the Federal Minister of the Environment. In addition, specific protection required for species at risk is described (Government of Canada, 2016b).

Canada National Parks Act

The *CNPA* is enforced by the PCA, and provides legal protection for the national parks of Canada so that "the parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations". Under Section 8(2), the *CNPA* notes that maintaining or restoring ecological integrity is the first priority when considering all aspects of the management of the Park. Under Section 16(1), the *CNPA* supports "the protection of flora" and "the protection of fauna, the taking of specimens of fauna for scientific or propagation purposes, and the destruction or removal of dangerous or superabundant fauna".

Plant Protection Act

The *Plant Protection Act* protects plant life and the agricultural and forestry sectors of the Canadian economy by preventing the importation, exportation and spread of pests (e.g., non-native invasive weeds) and by controlling or eradicating pests in Canada. This Act prohibits the import, movement or growth of pests, things infested with pests or biological obstacles to pest control; enables the declaration of infested areas; and enables regulations to detect, quarantine and destroy pests.

Provincial Legislation

Wildlife Act

While the Alberta *Wildlife Act* does not apply within federal lands such as JNP, it includes species of concern that are not currently ranked under COSEWIC or *SARA*. As such, species ranked by the *Wildlife Act* are considered within this report to inform a comprehensive assessment.

Section 6 of the Alberta *Wildlife Act* requires the Minister to establish and maintain the Endangered Species Conservation Committee (ESCC), whose functions are to advise about endangered species and to make recommendations to the Minister with respect to the preparation and the adoption of Recovery Plans for Endangered species; organisms that should be established as Endangered species; and Endangered species and biodiversity conservation. Under the *Wildlife Act*, the *Wildlife Regulation* Alberta Regulation (AR) 143/97 provides a list of Endangered species in Alberta (Schedule 6 of the Regulation) that includes seven vascular species and one bryophyte species (Province of Alberta, 1997). The ESCC has assessed two additional Alberta vegetation species as Species of Special Concern, but these are not yet protected by the *Wildlife Act* (AESRD, 2014a).

Weed Control Act

Although the Alberta *Weed Control Act* does not apply within federal lands such as JNP, weeds included within the *Weed Control Regulation* AR 19/2010 are considered within this report to inform a comprehensive assessment of the Project.

The Alberta *Weed Control Act* regulates Prohibited Noxious weeds, Noxious weeds, and weed seeds through various control measures, including inspection and enforcement. According to the *Weed Control Act,* Prohibited Noxious weeds are those that must be destroyed, and Noxious weeds are those that must be controlled by the owner or occupant of those lands on which the weeds are present. Under the *Weed Control Act*, the *Weed Control Regulation* AR 19/2010 designates 46 plant species as Prohibited Noxious weeds and 29 plant species as Noxious weeds in Alberta (Province of Alberta, 2010). The *Weed Control Regulation* also recognizes that a plant species may be designated as a Noxious weed or a Prohibited Noxious weed within a municipality by bylaw. In this case, designation as a Prohibited Noxious weed under the municipal bylaw prevails over a designation as a Noxious weed under the *Regulation* (Province of Alberta, 2010).

Nuisance weeds are no longer listed in Alberta or regulated by the *Weed Control Act*. There are many additional, non-listed species that were introduced to Alberta (i.e., non-native), including seeded agronomic species and horticulturally used species, that can be invasive in certain land uses. The designation of species as non-native in Alberta is determined by ACIMS (AEP, 2016b).

Provincial Policies and Guidelines

Environmental Protection Guidelines for Transmission Lines

The *Environmental Protection Guidelines* Rules and Regulations (R&R)/11-03 document (Alberta Environment, 2011) applies to the planning, construction, operation, maintenance, decommissioning, and reclamation of transmission lines in Alberta, including all disturbances associated with the transmission line. The objectives related to vegetation include encouraging assessment and documentation of pre-development vegetation conditions as the standard for post-development conditions; conducting site assessments following reclamation to provide a complete evaluation of vegetation conditions and comparison to pre-development conditions; promoting awareness of the importance of protecting native vegetation through reducing disturbance; and promoting the rapid re-establishment of vegetation that is compatible with the adjacent land. The Guidelines also prescribe reducing the risk of introducing pests, weeds, or diseases (e.g., scentless chamomile or clubroot) to the project area by cleaning construction equipment brought in from outside the area (Alberta Environment, 2011).

Sensitive Species Inventory Guidelines

The *Sensitive Species Inventory Guidelines* (AESRD, 2013) refer to "sensitive species" as those that are legally listed as Endangered or Threatened under the provincial *Wildlife Act* or federal *SARA*, designated as Species of Special Concern through the provincial detailed status assessment or *SARA*, or ranked as At Risk, May Be at Risk, or Sensitive in Alberta by the General Status assessment process. This protocol is also suitable for detecting other rare and potentially at risk plant species in Alberta that have not yet been assessed by the ESCC or COSEWIC (AESRD, 2013). The guidelines establish standards for species at risk plant surveys in Alberta and discuss requirements to the qualifications of survey personnel, sampling efforts, survey timing, and survey protocols. The document also prescribes that the Canadian Wildlife Service Prairie and Northern Region *Occupancy Survey Guidelines for Prairie Plant Species at Risk* (Henderson, 2009) and Alberta Native Plant Council (ANPC) *Guidelines for Rare Vascular Plant Surveys in Alberta* (ANPC, 2012) should be followed for conducting plant surveys (AESRD, 2013).

Weed Management on Industrial Sites

The *Weed Management on Industrial Sites* R&R/12-01 document (AESRD, 2012) provides information for operators of industrial developments on preventing weeds and problem plants from being introduced during planning, construction, operations, and reclamation phases. The factsheet specifies that problem plants are not defined by the *Weed Control Act*, but are interpreted by Alberta regulatory agencies as plants that tend to disrupt or invade natural ecosystems (AESRD, 2012). The guidelines for operators outlined in the document prescribe developing an integrated weed management plan during the planning stages and incorporating it into site operational plans and reclamation activities; conducting a weed survey of the site prior to construction is also required (AESRD, 2012).

Management Plans

The Project is located entirely within JNP, which has a park-specific management plan (Parks Canada, 2010) as well as an IPM Plan for front country and wilderness areas (Shepherd, 2016).

Jasper National Park Management Plan

The management plan provides strategic direction for resource protection, visitor experience, and public appreciation and understanding (Parks Canada, 2010). As it relates to vegetation, the management plan has the following relevant objectives:

- Ensure JNP has the full complement of native species and communities that are characteristic of the Rocky Mountain Natural Region
- Prepare and implement a recovery strategy for Haller's apple moss
- Collaborate with regional partners (e.g., federal and provincial agencies, landowners) to implement measures that will keep species from being added to Canada's species at risk list
- Restore priority terrestrial habitats, with a focus on montane grasslands, Douglas-fir and aspen stands, and riparian vegetation
- Take steps to eliminate or control non-native species and diseases, with a priority on the most invasive and the most likely to have lasting negative effects on terrestrial or aquatic ecosystems
- Allow ecological processes to play their traditional role in shaping park ecosystems; where public safety is a concern, use techniques that emulate ecological processes as closely as possible. This may include the following:
  - Use fire to maintain and restore natural vegetation, using the range of natural variability as a guide
  - Monitor forest insects and diseases; develop appropriate responses to fluctuations of native forest insects and diseases; consider the interests of adjacent land managers

  - Improve our understanding of the effect of climate change on park ecosystems and identify appropriate management strategies
- Identify threats to the survival of sensitive species and improve our knowledge of their population dynamics and habitat requirements
- Restore disturbed landscapes to their natural state
- Restore the montane ecosystem with a focus on sharing the area with wildlife, improving vegetation health, and demonstrating environmental stewardship

The various zoning and land use considerations within JNP are outlined in Section 2.5.4. The Project Footprint is not within any land use zones with associated vegetation objectives. The management plan also includes targets or thresholds that Parks Canada will use to use to measure success. Vegetation-related targets include completion of the Haller's apple moss recovery strategy, increase of the percent area burned by ecoregion, and maintenance or shrinkage of the aerial human footprint at a park scale by 2014. Management targets for non-native plants, forest health, and aspen condition are currently under development.

Jasper National Park Integrated Pest Management Plan

The JNP IPM Plan (Shepherd, 2016) addresses the threat of non-native plant invasions within JNP, describes Parks Canada's legislated responsibilities, and outlines a strategy for control of invasive non-native plants within the context of maintaining ecological integrity. It is designed to meet the objectives of JNP's Vegetation Restoration Program by preventing new weed invasions while restoring native plant communities to areas that have become disturbed or unbalanced. The Vegetation Restoration Program's operation goals for 2015 include rehabilitation of disturbed land; ongoing, systematic monitoring and treatment of priority non-native plant infestations; continued public communication and awareness; continued collaboration with the Leaseholders Working Group; and inventory and treatment of non-native plants in prioritized front country and wilderness areas.

The IPM Plan presents strategies and methods of control of invasive non-native plants within JNP, which are consistent with the *Best Available Methods for Common Leaseholder Activities* (Axys and Walker, 1998).

Jasper National Park Fire Management Plan

The JNP Fire Management Plan (FMP) outlines JNP's fire management organization, policies, and planned general responses for prescribed fires and wildfires. The two main strategic components of the plan outline 1) wildfire management and control for the purposes of protecting in-park visitors, residents, ecological resources, property, infrastructure and heritage resources; and 2) the use of fire as a tool for ecosystem management.

The JNP FMP outlines a MPB management strategy, which has objectives of ecosystem process restoration, stand type change, FireSmart (management of forest fuels within forest lands adjacent to the Municipality of Jasper and other major developments), strategic fire control lines and capping units, and habitat and vegetation restoration. The overall objective of MPB management is to maintain the natural disturbance regime within historic ranges of variation, which means ensuring forested land is subject to a fire-dominated disturbance regime within JNP.

MPB management within JNP follows a phased strategy that is responsive to the level of MPB colonization, moving from direct suppression to prevention through habitat reduction (see Table 5.2-4). Ongoing prevention strategies relate to reducing the susceptibility of particular lodgepole pine stands or reducing their attractiveness to the beetles. Long-term landscape level management includes prescribed burns that create age and species mosaics unfavourable for large outbreaks of bark beetles.

Table 5.2-4. JNP Mountain Pine Beetle Management Strategy

Phase	Threshold	Management Strategy
Phase 1: Direct Suppression	Less than 1000 colonized trees throughout JNP.	Direct treatment through fall and burn practices is used to remove small spots or patches of colonized trees in lightly colonized areas, scattered colonizations on the periphery of larger colonizations and in areas where resource constraints limit other treatment options. The following criteria apply: • Colonized trees (that contain live beetle broods) should be felled • Colonized portions of the trees are bucked, piled, and burned; crews must ensure that all colonized bark area is well burned • Stumps are burned or treated when possible Resources and effort will focus on prevention strategy, primarily through habitat reduction using prescribed fire.
Phase 2: Modified Suppression	Greater than 1000 colonized trees throughout JNP but beetles limited to main valley, lower elevations.	Ground crews will locate and assess affected areas within JNP with emphasis on determining eastern-most extent of beetles within JNP. Treatment will commence with removals beginning with trees furthest east and crews will work gradually westward. Resources and effort will focus on prevention strategy, primarily through habitat reduction using prescribed fire.
Phase 3: Prevention Strategy only	Extensive beetle colonization, stands significantly affected throughout main valley and broad range of elevation.	Effort will shift to prevention and long-term habitat reduction strategies only.

Source: Parks Canada, 2007.

The FMP also identifies several vegetation types and species of concern for which prescribed burning is a primary restoration tool: aspen stands, Douglas-fir forest, grassland areas and whitebark pine stands. All of these communities and species have become less dominant on the landscape within JNP, at least in part due to reduced disturbance caused by fire control efforts of the past century (Parks Canada, 2007).

5.2.3 Vegetation Effects Assessment

This subsection presents the assessment of the potential effects of the Project on Vegetation. The potential effects are identified in consideration of the existing conditions information presented in Section 25, and the potential residual effects are characterized and assessed according to the methods presented in Section 4.

5.2.3.1 Identification of Potential Effects, Key Mitigation Measures, and Residual Effects

The potential effects associated with the construction and operation of the Project on Vegetation were identified by the assessment team and are listed in Table 5.2-5. Routing (i.e., avoidance) and the selective hazard tree management (Section 2.7.1.1) are the primary mechanisms to reduce potential effects on vegetation. The key mitigation measures developed for the Project include limiting vegetation disturbance through winter construction and use of access matting and snow packing along the right-of-way.

The key mitigation measures proposed in Table 5.2-5 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the *Best Available Methods for Common Leaseholders* (Axys and Walker, 1998).

The potential residual effects listed in Table 5.2-5 were identified according to the methodology described in Section 4 and are the effects remaining after mitigation is implemented.

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Loss or alteration of native vegetation	Entire Project	Project Footprint to Vegetation SA	• Confine activities to the right-of-way and designated access roads or trails and workspaces [Sections 6.1, 6.3]. • If additional workspace or right-of-way is required during construction, even if it is only required for temporary use, appropriate permission must be obtained from Parks Canada [Section 6.1]. • Restrict construction traffic to existing roads, the allotted travel lane, designated off-right-of-way access roads and workspace [Sections 6.3, 6.5]. • If the travel lane and workspaces have not been stripped, the Environmental Advisor will monitor the condition of the travel lane and workspaces during materials hauling to assess whether topsoil is being subject to degradation that will eventually adversely affect soil capability. If topsoil is being degraded, stripping will be conducted and/or geotextiles, access matting, gravel or other mitigation will be applied [Section 6.3, Appendix J]. • The parking or operation of vehicles in non-approved off-right-of-way sites will be strictly prohibited [Appendix C: Axys and Walker, 1998 – Section 5.1.2.2]. • Because of their restricted occurrence in the Park, the felling of mature Douglas-fir trees (diameter at breast height [DBH]>30 cm) will be avoided wherever possible, and will be undertaken only with the prior approval of Parks Canada [Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • Avoid disturbance within montane grassland areas, where possible. • Avoid disturbance within aspen-dominated ecosystems, where possible. • No native botanical specimens will be picked or collected by staff or contractors unless authorized by permit [Appendix C: Axys and Walker, 1998 – Section 5.1.2.2]. • All areas to be cleared will be clearly flagged prior to commencement of activities to avoid trespass infractions and needless clearing [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • A permit for the removal of vegetation (dead or alive) will be obtained from Parks Canada as part of the approval process for brushing and clearing [Appendix A, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • For transmission and distribution line rights-of-way, brushing widths will be dependent on the above-ground height of the conductors and the height and species of trees adjacent to the right-of-way [Appendix C: Axys and Walker, 1998 – Section 5.2.2.2].	• Loss or alteration of native vegetation

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Loss or alteration of native vegetation (cont'd)	See above	See above	• All brushing will be undertaken by hand, with a brush mower or with cut-off type equipment to maintain sod and soil integrity. The blading of vegetation with a dozer will be prohibited as a maintenance brushing technique, except where subsequent grading or excavation activities are required [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • Where brushing will result in the removal of important buffer trees, discussions will be held with Parks Canada to identify alternative scenarios for satisfying the clearing requirements [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • Where access by conventional logging trucks is available during the course of maintenance activities, all trees with a DBH of 15 cm or greater will be salvaged for either firewood, wood chips or merchantable timber. Most trees will be designated for firewood. Whole logs will be taken to Parks Canada processing facility located in Marmot Pit, 6.5 km south of Jasper, or other approved location. Where the creation of new or improved access to a site would be required to facilitate salvage operations, salvage requirements will be waived and all timber will be disposed of on-site [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2. More measures regarding timber are included within this Section]. • Grubbing and grading of temporary workspace will be avoided wherever possible. Clearing of these sites will use saw equipment which minimizes stump height, and will use mowers for the removal of small diameter brush [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • Avoid grubbing and grading in wet areas, including bogs, fens, swamps, marshes and riparian areas [Section 6.1]. • Maintain stumps (avoid grubbing) and low-growing vegetation in areas with steep slopes (>40%) having a high risk of erosion [Section 6.1]. • All new areas to be cleared will be restricted to essential expansion areas and essential temporary workspace required for maintenance activities [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • Decking sites will be located on approved extra workspace, generally in existing cleared areas. Additional clearing for the creation of deck sites will be avoided wherever possible [Section 6.1, Appendix C: Axys and Walker, 1998 – Section 5.2.2.2].	• See above

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Loss or alteration of native vegetation (cont`d)	See above	See above	• For sensitive ecosites (described in Section 5.0 and 6.0), off road maintenance activities must be scheduled for the frozen ground period (approximately November 15 – April 15) [Sections 5.0, 6.0]. If maintenance activities are required outside this period, only low ground-pressure equipment must be used [Sections 5.0, 6.0]. • Initiate Wet/Thawed Soils Contingency Plan (Appendix J), if warranted. • Where ground disturbance is anticipated topsoil will be salvaged and replaced. Topsoil depth will depend on soil type, but the upper 15 cm of a forest soil will be considered sufficient. Additional and separate salvage and replacement of the upper 2.5 cm of the topsoil may be directed by Parks Canada if a source of seeds of native plants is required [Appendix C: Axys and Walker, 1998 – Section 5.2.8.2]. • Where grade spoil or topsoil has been stockpiled on un-stripped areas (i.e., sod), conventional clean-up buckets on hoes will be used to remove this material from the stockpile sites, taking care not to scalp the sod layer during the process [Section 6.4, Appendix C: Axys and Walker, 1998 – Section 5.2.3.2]. • All sites disturbed for maintenance activities and not supporting permanent structures, roads, or gravel caps will be rehabilitated to an approved cover of vegetation sufficient to control long-term erosion [Appendix C: Axys and Walker, 1998 – Section 5.2.5.2]. • All reclaimed sites in Talbot and Devona Ecosites will be monitored for on-going soil loss and revegetation progress until a stabilizing vegetative cover has been established on the right-of-way [Appendix C: Axys and Walker, 1998 – Section 5.2.5.3]. On the Footprint, there are 2.05 ha of Talbot Ecosite; 2.6 ha of Devona 2 Ecosite. • Restore native vegetation along disturbed areas of the proposed right-of-way by seeding disturbed non-wetland areas with native seed or implementing seeding alternatives outlined in Section 5.2.8.2 [Section 9.0, Appendix C: Axys and Walker, 1998]. • Seeding will take place within 7 days of clean-up if there is a risk of soil erosion or weed growth [Appendix C: Axys and Walker, 1998 – Section 5.2.8.2. Alternatives to seeding are outlined in Section 5.2.8.2]. • Wherever possible, seeding will be done as soon as weather and soil conditions permit in early spring (break-up to early July) or fall (early October to mid-November). Seeding outside of these ideal periods may decrease the chance of successful plant establishment and, if necessary, the site will be reseeded during the next fall or spring [Appendix C: Axys and Walker, 1998 – Section 5.2.8.2].	• See above

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Loss or alteration of native vegetation (cont`d)	See above	See above	• Restrict vehicle access over newly seeded areas [Section 7.0]. • If it is deemed required in areas of ground disturbance, intact sod mats will be salvaged and replaced as mitigation of sensitive eco-sites (e.g., riparian, Aeolian dunes, rare plant occurrences), for control of runoff for watershed protection or to assist revegetation [Appendix C: Axys and Walker, 1998 – Section 5.2.8.2]. • Complete final reclamation (seeding/planting) during non-frozen conditions as soon as weather and soil conditions permit [Section 9.0]. • Monitor the effectiveness of revegetation efforts during the Post-Construction Reclamation Assessment. Undertake additional remedial work, where warranted [Sections 7.0, 9.1]. ***Works In-and-About a Stream:*** • Brushing on the right-of-way will not be permitted within 10 m of the high watermark of any stream unless: – a vehicle crossing structure is required at the stream to access work sites on either side of the stream; and – maintenance sites fall within this buffer zone [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. • Brushing widths will be limited within the 10 m buffer zone to a 5 m wide corridor for access purposes (e.g., bridge installation), unless otherwise approved by Parks Canada. Where trenching activities are required for maintenance purposes within this zone, brushing will be restricted to the width of the permanent right-of-way [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. • No off right-of-way clearing or brushing for extra workspace development will be undertaken within the 10 m buffer zone, unless otherwise authorized by Parks Canada. Any off right-of-way extra workspace required for operations will be located beyond this zone [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. • Where right-of-way brushing is permitted within the 10 m buffer zone, walk-down small trees and shrubs or complete brushing by hand. All slash will be removed from the zone for disposal [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. Where right-of-way brushing is permitted within the 10 m buffer zone, walk-down small trees and shrubs or complete brushing by hand. All slash will be removed from the zone for disposal [Axys and Walker, 1998 – Section 5.2.7.2].	• See above

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Loss or alteration of native vegetation (cont`d)	See above	See above	• Where pre-construction bank conditions are contributing to a stream's productive capacity for fish (e.g., vertical or overhanging bank structure, overhanging vegetation, large organic debris [LOD]), appropriate bank restoration measures will be undertaken to restore original habitat components to the degree possible, thus avoiding reductions in stream productive capacity. The use of such restoration techniques as vegetated crib walls, brush layering or live staking [see Figures 5.2.7-6 to 5.2.7-8, Appendix 3] will be reviewed with Parks Canada personnel in the development of the restoration plan [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2].	• See above
2. Loss or alteration of rare vegetation or rare ecological communities	Entire Project	Project Footprint to Vegetation SA	• Implement mitigation measure recommended for occurrences of rare vegetation and rare ecological communities observed on or adjacent to the proposed right-of-way, as outlined in Table A5.2 1-6 of Appendix 5.2-1. • Implement the Plant Species of Concern Discovery Contingency Plan [Appendix L] in the event that rare vegetation species or ecological communities are identified during future vegetation studies or during construction activities. Such occurrences should be assessed by a qualified vegetation ecologist and mitigation measures will be determined taking into account site-specific conditions and ecological community or vegetation species sensitivity criteria. Mitigation measures could include the following: – If feasible, schedule construction to occur after the seed set period to enhance the survival of the population. – Avoid the plant species or community and flag and fence off the occurrence (e.g., narrow footprint, leave a gap in strippings pile, extend road or watercourse bores) [Section 6.1, Appendix L]. – Realign the travel lane or workspaces to avoid the site [Appendix L]. – Inform all users of access restrictions along native vegetation segments and in the vicinity of flagged or fenced sites [Sections 7.1, 7.2, Appendix L].	• Loss or alteration of rare vegetation or rare ecological communities

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
2. Loss or alteration of rare vegetation or rare ecological communities (cont`d)	See above	See above	– Narrow the right-of-way, to the extent feasible, in the vicinity of the rare plant population or rare ecological community. Temporarily cover the site with geotextile pads, flex net or access mats to prevent ground vegetation disturbance and reduce compaction of the area of vegetation concern [Appendix L]. If matting is expected to be needed for more than one season and will not be in constant use during this time (e.g., matting installed during winter will remain until the following winter), matting should be removed prior to the growing season and replaced immediately before construction activities resume. – Propagating listed plants or ecological communities (e.g., by harvesting seed, salvaging and transplanting sod or collecting cuttings of the listed species or community) [Appendix L]. – Transplant portions of sod containing the plants of concern or the feature that houses the plants (e.g., log, rock). Move to a suitable receiving site off the footprint [Appendix L, Appendix C: Axys and Walker, 1998 – Section 5.2.8.2]. – In areas where surface salvage is necessary (e.g., structure locations) in an area with a rare plant occurrence, conduct separate soil salvage: store topsoil separately from grade spoil or borrow material, identify with labelled stakes or flags, and replace to the location from where it was stripped [Appendix L, Appendix C: Axys and Walker, 1998 – Section 5.2.3.2]. – Reduce strippings salvage, grading or grubbing to the extent practical to protect plant root systems [Appendix L]. – Reduce clearing shrubs/trees in the area to the extent possible to allow the original species composition, shade, structure, and moisture retention to persist. – Re-contour to match pre-disturbance site conditions, so that drainage is not altered [Appendix L, Appendix C: Axys and Walker, 1998 – Section 5.2.9.2]. – Restrict the general application of herbicide within 30 m of area, during the operational phase. Spot spraying, wicking, mowing, or hand-picking are acceptable measures for weed control in these areas [Appendix L]. – Have a qualified environmental professional revisit the area(s) of concern prior to construction to confirm the extent of the identified rare vegetation population or rare ecological community occurrences to assist in the determination of appropriate site-specific mitigation measures [Appendix L].	• See above

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
2. Loss or alteration of rare vegetation or rare ecological communities (cont`d)	See above	See above	• Conduct post-construction monitoring to assess mitigation success (e.g., for 3 years commencing in the first full growing season following clean-up) [Sections 7.1, 9.1, Appendix L]. • If any federally-listed rare vegetation species are incidentally observed during construction (e.g., whitebark pine), immediately cease construction activities in the area and consult a QEP and/or Parks Canada for further direction.	• See above
3. Weed introduction or spread	Entire Project	Project Footprint to Vegetation SA	• A pre-construction weed survey will be conducted to identify occurrences of Noxious or Prohibited Noxious weeds that are known to occur in the vicinity of where the activities will be undertaken [Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • Pre-treatment by chemical, hand or mechanical means prior to construction may be required in heavily infested weed areas to prevent the transmission of weed seed by equipment and vehicles. The equipment used in these areas must be cleaned prior to moving off the infested site [Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • Clean all equipment (pressure wash) prior to entering the Park and between sites. Clean equipment involved in work at Noxious weed-invested sites prior to leaving the location [Section 6.2; Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • Keep a log of all equipment that has been cleaned. Provide this log to the project coordinator for record keeping. • Immediately record any sites where equipment was specifically cleaned due to concerns associated with Noxious weeds and provide a record to the ATCO project coordinator. • The ATCO Electric project coordinator will notify Parks Canada of any sites discovered and not previously known that were infested with Noxious weeds. • Topsoil will not be imported from outside the Park [Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • Monitor Noxious weed growth on topsoil piles during the course of construction activities and conduct corrective measures (i.e., herbicide application, mowing, or hand-pulling), if warranted.	• Weed introduction or spread

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
3. Weed introduction or spread (cont`d)	See above	See above	• All sites to be developed for permanent aboveground facilities (e.g., structure locations) will be stripped of their topsoil. This material will be stockpiled in a secure location away from future disturbance or contamination, and seeded to an approved grass cover for long-term stabilization. This material will be redistributed over the stripped site upon abandonment of the site [Section 6.7, Appendix C: Axys and Walker, 1998 – Section 5.2.3.2]. • If a delay has occurred between clean-up and revegetation, mechanical or chemical weed control may be necessary before seeding can occur [Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • All native seed will be double sampled and submitted to a certified seed testing laboratory for germination and purity analysis [Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • The seed certificates of all seed used for revegetation will be inspected for the presence of seeds of undesirable species. The certified Canada No. 1 seed grade will not be relied upon as a guarantee of clean seed. Many undesirable weeds are not listed [Appendix C: Axys and Walker, 1998 – Section 5.2.10.2]. • Use and application of herbicides must be in accordance with the requirements of Section 5.2.2 [Appendix C: Axys and Walker, 1998]. • The use of herbicides will only be considered to: – control pest activity for which there is no other control method available; – reduce or eliminate populations of introduced target organisms that are threatening the ecological integrity of adjacent provincial or private lands; – reduce or eliminate populations of introduced target organisms that are threatening the ecological integrity, function, or use of Park's lands; and/or – reduce or eliminate populations of introduced target organisms that are interfering with an ecological restoration program [Appendix C: Axys and Walker, 1998 – Section 5.2.2.2]. • Only herbicides registered under the federal *Pest Control Products Act* (*PCPA*) and used as intended will be considered for use in the Park [Appendix C: Axys and Walker, 1998 – Section 5.2.2.2].	• See above

Table 5.2-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Vegetation

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
3. Weed introduction or spread (cont`d)	See above	See above	• Application for use of herbicides must be made to Parks Canada by February for the following field season. • Conduct post-construction monitoring to assess weed mitigation success (e.g., for 3 years commencing in the first full growing season following clean-up). • Rehabilitated areas will be monitored at least once a year by Parks Canada for the presence of weed infestations. Parks may notify the leaseholder of the requirement for treatment [Appendix C: Axys and Walker, 1998 – Section 5.2.10.3]. • The standards and good practice guidelines of the Industrial Vegetation Management Association of Alberta (IVMAA), will be adopted [Appendix C: Axys and Walker, 1998 – Section 5.2.10.3].	• See above
4. Introduction or spread of forest pests	Entire Project (Treed areas)	SA	• If hauling infested materials outside of JNP, develop an appropriate strategy for handling and disposing of infested woody material in consultation with the appropriate regulatory authority, timber disposition holders and following methods outlined in the ASRD Directive 2010-01 MPB Log Management (ASRD, 2011) • If evidence of beetle infestation or other forest health issues are observed on the proposed right-of-way, consult JNP officials for specific mitigation recommendations (e.g., fall and burn practices). • Larger diameter branches and boles of spruce must be scattered to eliminate accumulation of spruce materials to minimize the risk of attraction and propagation of spruce beetles. • Douglas-fir boles and branches over 15 cm must be removed from the site or burned to prevent propagation of Douglas-fir beetles.	• Introduction or spread of forest pests
5. Combined potential effects on native vegetation	Entire Project	Vegetation SA	• Refer to Key Mitigation Measures for Potential Effects 1 to 4 above.	• Combined residual effects on native vegetation

[a] Mitigation measures were developed in accordance with Axys and Walker, 1998 and provided in the Project EPP (Appendix 1).

5.2.3.2 Characterization of Potential Residual Effects

The method for the characterization of potential effects on vegetation was described in Section 4. Qualitative criteria ratings are based on the best available scientific knowledge and the professional experience of the assessment team.

Loss or Alteration of Native Vegetation

Preservation of native vegetation is important for protecting gene pools for future use, protecting wildlife species and their habitats, preserving climax ecosystems and native biodiversity, and conserving representative habitats characteristic of the region. The sensitivity of vegetation community types is complex and may vary depending on the age of the community and local ecological factors (including species composition, topography, soil texture, and hydrology). Disturbance of ecological factors may influence the ability for a community to regenerate to pre-construction conditions. The selection of effective construction techniques, schedule, and site-specific key mitigation measures aim to reduce the magnitude of the disturbance of these ecological factors and the effects on the vegetation community.

ELC mapping indicates that vegetation types and species of concern within JNP identified by the FMP will not be substantially affected by the Project. Approximately 0.5 ha of treed aspen-dominated vegetation types will be disturbed by the proposed right-of-way and temporary workspace, representing less than 1 percent of the area of aspen-dominated vegetation present within the Vegetation SA. Approximately 0.1 ha of treed Douglas-fir dominated vegetation types will be disturbed by the proposed right-of-way, representing less than 1 percent of the area of Douglas-fir dominated vegetation types present within the Vegetation SA. Approximately 6.8 ha of Montane grassland will be disturbed by the proposed right-of-way, temporary workspace and laydown areas, representing approximately one and a half percent of the Project Footprint mapped within the Vegetation SA. Mitigation measures will be implemented to reduce disturbance to these areas.

The majority of the proposed right-of-way will be allowed to revegetate following construction to a maximum height that does not affect reliability or safety standards. ATCO Electric will complete a pre-construction assessment along the proposed route ahead of construction activities in order to catalogue the existing environmental conditions. The findings in this pre-construction assessment will be used, along with mitigation outlined in the Best Available Methods for Common Leaseholder Activities Guidelines (Axys and Walker, 1998) and the Project EPP to assist with reclamation and remediation. Reclamation and monitoring will continue for 5 years following Project construction until reclamation is determined to be on a trajectory to meet the MO/DERS established in the Terms of Reference (Parks Canada, 2015), or baseline environmental conditions. The MO/DERs will be verified prior to construction to establish a baseline of pre-disturbance status and conditions.

The proposed route has been aligned to follow existing disturbances to the extent feasible (44.1 km or 99 percent of the proposed right-of-way length). Temporary workspaces will be situated on or adjacent to existing disturbances to the extent possible. Selective topsoil stripping, salvage and replacement is expected to occur mostly at structure locations. Stripping along temporary access roads, temporary workspaces and where grading is required will only be conducted on a limited basis and only in areas which cannot be effectively protected using alternative methods (i.e., access matting, working under frozen conditions).

Temporary disturbance, including clearing, is anticipated during construction at the proposed laydown areas (5.05 ha) and temporary workspaces (3.8 ha) and access. Existing roadways, access roads for existing right-of-way, and previously disturbed areas will be used where feasible to access the Project; however, temporary access may be required to the proposed right-of-way in areas where there are no existing roads adjacent to the proposed right-of-way or where terrain conditions, wetlands, or other barriers prevent travel along the proposed right-of-way. Within the vegetation management areas directly adjacent to the right-of-way hazard trees will be field confirmed and marked for management based on the guidelines set out in the Best Available Method for Common Leaseholder Activities (Axys and Walker, 1998). Where hazard trees are salvaged, they will be mechanically removed by feller bunchers or harvesters. Equipment will reach from right-of-way edge to remove as many hazard trees as possible without leaving right-of-way to limit effects on adjacent, non-hazard vegetation. Outside the Project Footprint, 20.7 ha will require some level of treatment for the reduction of adjacent hazard trees.

Extended-term disturbances are anticipated at the proposed structure locations and Sheridan Substation. No native vegetation will be cleared outside of the Palisades facility to construct the Sheridan Substation. Detailed structure locations and footprint are not yet available, so the amount of native vegetation that will be cleared at the proposed structure locations for the operational life of the Project cannot yet be determined.

Clearing associated with construction activities and maintenance of vegetation within the proposed right-of-way will result in direct effects on vegetation. Changes to vegetation species diversity (i.e., species composition, distribution, and extent) and alteration of the community structure (by the change or removal of canopy layers) will occur.

Clearing a corridor and maintaining an opening in an early seral stage changes the abiotic conditions along the corridor and in adjacent plant communities. Air temperature and relative humidity differences have been measured 20 m to 25 m into the forest on both sides of an electrical transmission line corridor (Pohlman et al., 2007). The abiotic effects are intensified when the open corridor has an abrupt, straight-line edge. Cleared areas have increased wind strength and increased light and moisture penetration. The wider the opening, the greater the windthrow effects and the greater the distance of climate differences into the adjacent plant community (St. James, 2009). Changes in abiotic conditions result in changes to understory plant species in the adjacent forest.

Disturbed areas along the proposed right-of-way supporting native vegetation will be seeded with an appropriate native seed mix, or reclaimed using seeding alternatives outlined in Section 5.2.8.2 of the *Best Available Methods for Common Leaseholder Activities* (Axys and Walker, 1998). The majority of the proposed right-of way will be allowed to revegetate following construction to a maximum height that does not affect reliability or safety standards. Although areas disturbed during construction will be allowed to naturally regenerate where erosion is not a concern, species composition will be altered, especially where stripping and grubbing are conducted. Minimal disturbance construction practices (i.e., no salvage or grubbing outside of graded areas) will limit the alteration of native vegetation.

No locally or regionally adopted threshold or standard exists against which the incremental change in vegetation composition can be judged. The assessment of the magnitude of the potential effect on native vegetation is based on a qualitative understanding informed by the relevant regional and regulatory guidelines; an understanding of the ecological and land use context; previous environmental assessments for projects of similar scale and complexity; previous post-construction monitoring (PCM) results; and the professional experience of the vegetation assessment team. The magnitude of the effect on native vegetation will be limited by the implementation of the proposed key mitigation measures outlined in Table 5.2-5 and the reclamation measures outlined in Section 7.

The loss or alteration of native vegetation is primarily limited to the Project Footprint and is medium- to extended-term in duration, reversible, and of moderate magnitude (Table 5.2-6, Point [a]).

Loss or Alteration of Rare Vegetation or Rare Ecological Communities

An early season vegetation survey was conducted from June 4 to June 14, 2015 and a late season vegetation survey was conducted from August 7 to August 15, 2015 along selected segments of the proposed right-of-way. A supplemental early season 2016 survey was conducted from June 8-9, 2016 along selected rerouted segments of the proposed right-of-way. During the 2015 and 2016 vegetation surveys, no vegetation species listed by *SARA*, COSEWIC, or the *Alberta Wildlife Act* were observed. In total, 18 ACIMS-listed rare vegetation species (31 EOs) were observed along the right-of-way (see Section 4.2.1.5 and Appendix 5.2A). Four occurrences of two ACIMS-listed rare ecological communities were observed along the proposed right-of-way during the 2015 field surveys (see Section 4.2.1.5 and Appendix 5.2A).

Clearing and construction activities for the Project will result in native vegetation loss and alteration and, therefore, potential loss or alteration to local rare vegetation or rare ecological communities. Key mitigation measures for rare vegetation are based on site-specific conditions and species/community sensitivity criteria. Sensitivity criteria include, but are not limited to, the following:

- Location of the population or community within or relative to the Project Footprint
- Construction activity timing
- Relative rarity of the species or community (e.g., regionally or nationally)
- Growth habits and propagation strategies of the species or community components
- Community or population size and abundance in the local area
- Habitat preferences of the species or community and proximity of available habitat
- Expected or known sensitivity or resilience to disturbance of the species or community components
- Past mitigation success of the same or similar species or community
- Requirements or recommendations based on consultation with regulators

Site-specific mitigation measures for rare vegetation species and rare ecological communities observed on and adjacent to the proposed right-of-way are detailed in Table A5.2-1-6 of Appendix 5.2-1.

Key mitigation measures for rare vegetation generally falls into the following categories:

- Avoidance (e.g., realignment, narrow down)
- Reducing disturbance (e.g., adjusting workspaces, ramping/matting over)
- Alternative construction/reclamation techniques (e.g., salvaging seed or sod, transplanting, or separate soil salvage) (see Table 5.2-5)

These proposed key mitigation measures have been used previously on other major construction projects to successfully mitigate for rare vegetation and rare ecological communities (Alliance Pipeline Limited Partnership [Alliance], 2002; TERA Environmental Consultants 2005, 2011, 2012a, 2014a, 2014b).

Based on the assessment of the rare vegetation and rare ecological communities expected to be encountered during construction, the key mitigation measures described previously are considered likely to be appropriate and applicable to the Project. Where complete avoidance is not feasible, a disturbance or alteration of a portion of a population or community may occur.

With the application of key mitigation measures, the potential residual effects of construction activities associated with the Project on rare vegetation and ecological communities are of short- to extended-term duration, reversible, and of moderate magnitude (Table 5.2-6, Point [b]).

Weed Introduction or Spread

Non-native and invasive species often inhabit areas where the seedbank has been disturbed by anthropogenic activity. Invasive plants reduce or displace native species by outcompeting for resources and germinating easily in disturbed habitats. In natural areas, invasive plants are cited as a major constraint of vegetation succession and one of the five direct drivers of biodiversity loss (Van der Putten et al., 2000; Millennium Ecosystem Assessment, 2005). Once established and when left unmanaged, invasive plants alter plant species composition and community structure, and they reduce wildlife habitat value by decreasing food sources. Over time, a continued dominance by invasive plants will alter ecosystem processes such as nutrient cycling and soil moisture regimes. Invasive plant dominance has also been linked to accelerated soil erosion and, when adjacent to streams, can initiate an increase in sedimentation and a change in water quality (Talmage and Kiviat, 2004).

Identification of weed species was conducted along the proposed right-of-way where the 2015 vegetation surveys were conducted. All weed species observed during the 2015 vegetation surveys were recorded, and their density and distribution were noted (see Table A5.2-1-8 in Appendix 5.2-1). The information collected during the vegetation surveys allows for an understanding of baseline weed conditions and the magnitude of weed infestations along the proposed route.

One Prohibited Noxious weed species (spotted knapweed) and six Noxious weed species (creeping [Canada] thistle, Dalmatian toadflax, ox-eye daisy, perennial sow-thistle, tall buttercup, and yellow [common] toadflax) were observed along the proposed right-of-way during the 2015 vegetation surveys (see Section 5.2.1.5 and Appendix 5.2-1). The abundance of invasive species was observed to be moderate and was generally associated with anthropogenic disturbances. The proposed key mitigation measures outlined in Table 5.2-5 are effective, industry-standard measures to reduce the potential for the introduction or spread of weeds. These measures will be implemented during both construction and operations and maintenance activities along the proposed Project route and permanent access, and at the proposed substation and structure locations.

Experience during past pipeline construction programs has revealed that the implementation of appropriate key mitigation measures during construction resulted in limited ongoing weed issues (i.e., species presence, density, and distribution were kept at the pre-construction levels) (Alliance, 2002; Interprovincial Pipe Line Inc., 1995; TERA Environmental Consultants [Alta.] Ltd., 2000; TERA Environmental Consultants, 2002, 2012b, 2012c). The potential introduction or spread of Prohibited Noxious weeds, Noxious weeds, and other invasive and non-native species may occur at any time during the operational life of the Project. The period needed to reverse the effect may vary depending upon the land use of the affected area and the species.

As a consequence, the potential residual effects of construction activities associated with the Project on weed introduction or spread are short- to long-term in duration, reversible, and of moderate magnitude (Table 5.2-6, Point [c]).

Introduction or Spread of Forest Pests

Forest pests, such as MPB, are a natural component of forested ecosystems; however, an abundance of good habitat or unusual climate conditions can increase pest survival and this can affect local and regional forests. When pest populations are high, large geographic areas can be affected, resulting in a large area where the forest canopy is dominated by dead trees. The hauling of infested materials during construction activities associated with transmission line and facility development may inadvertently move pests by moving trees that contain larvae of active adults to areas with low incidences of forest pest activity. The potential effects of forest pest spread are considered to have a negative impact balance since they can cause a loss of forest structure and biodiversity.

Evidence of MPB damage was observed on the proposed right-of-way during the 2015 vegetation surveys, and ELC mapping identified forest health issues within approximately 24.9 ha of the Vegetation SA. Models have indicated that the most likely MPB routes thorough JNP to the commercial forests of Alberta are the Yellowhead Pass and the Athabasca River valley (Dalman, 2003).

MPB management within JNP is primarily achieved through prescribed burning. Other key mitigation measures, such as scheduling clearing activities outside of the flight period (May to September), and adhering to other hauling and storage restrictions outlined by provincial authorities (ASRD, 2011), are effective industry-standard measures to reduce the potential for the introduction or spread of forest pests. Key mitigation measures outlined in Table 5.2-5 will be considered during both construction and operations of the Project based on consultation with provincial authorities, timber disposition holders, and in consideration of methods outlined in the ASRD Directive 2010-01 *Mountain Pine Beetle Log Management* (ASRD, 2011). The Project is not likely to cause the introduction or spread of forest pests with the implementation of the proposed key mitigation measures (Table 5.2-5). The potential residual effect of introduction or spread of forests pests is long to extended-term in duration, reversible to pre-construction or equivalent conditions, and of minor magnitude (Table 5.2-6, Point [d]).

Combined Residual Effect(s) on Vegetation

The evaluation of the combined effects on native vegetation considers the individual potential residual effects evaluation in Section 5.2.3 (residual effects [a] through [d] of Table 5.2-6) that are likely to occur and could act in combination on native vegetation.

The following potential residual effects are likely to act in combination to result in overall effects on native vegetation:

- Loss or alteration of native vegetation
- Loss or alteration of rare vegetation and rare ecological communities
- Weed introduction or spread

All of these identified individual potential residual effects have the potential to act in combination on native vegetation encountered by the Project. It is likely that native vegetation will be directly and indirectly altered within the Vegetation SA (all Project components), rare vegetation and rare ecological communities will be altered on the right-of-way as well as temporary infrastructure and workspace, and weeds will be introduced and spread (all Project components). The probability of these potential residual effects acting in combination at any specific location along a pipeline route or at a compressor station site is high.

Key mitigation measures listed in Table 5.2-6 will be implemented to manage and reduce the potential residual effects. The magnitude of the combined effects on native vegetation following the implementation of these key mitigation measures is conservatively considered to be moderate (Table 5.2-6, Point [e]).

The characterization of the potential residual effects of the construction and operation of the Project on Vegetation is summarized in Table 5.2-6.

Table 5.2-6. Residual Effects Characterization for Vegetation

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Loss or alteration of native vegetation	**Context:** Native vegetation contributes to ecosystem health because of its relationship with other ecosystem components. Preservation of native vegetation is important for protecting gene pools for future use, biodiversity, and wildlife species and their habitats. The proposed right-of-way crosses primarily disturbed areas (approximately 53% disturbance). The resiliency of native vegetation varies based on community type and disturbance history. The majority of the community types known to occur along and near the Project Footprint are resilient to disturbance; however, recovery time varies by community type.	
	Geographic Extent: Project Footprint to Vegetation SA	Potential direct alteration of native vegetation will be limited to the proposed right-of-way, structure locations, permanent and temporary access, temporary workspace and vegetation management areas adjacent to the right-of-way (i.e., removal of potentially hazardous trees) Potential changes in light levels, hydrology, and other edge effects may extend beyond the Project Footprint.
	Duration: Medium- to extended-term	Alteration of native vegetation is expected to occur in the medium-term for the temporary workspaces, and in the extended-term for the proposed right-of-way, structure locations, and Sheridan Substation where vegetation will be allowed to fully regenerate following the operational life of the Project.

Table 5.2-6. Residual Effects Characterization for Vegetation

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Loss or alteration of native vegetation (cont'd)	**Frequency:** Isolated to continuous	Potential alteration of native vegetation at temporary workspaces, and temporary access will be of isolated frequency, since it is confined to the construction phase. The frequency of alteration of native vegetation will be periodic for the proposed right-of-way, since vegetation will be maintained underneath the conductors and within the proposed right-of-way. At the proposed structure locations and Sheridan Substation, where vegetation growth will be controlled throughout the life of the Project, the frequency of alteration of native vegetation will be continuous.
	Reversibility: Reversible	Vegetation is expected to re-establish during the operational life of the Project on the temporary infrastructure and workspaces. Vegetation growth is expected to be controlled throughout the operational life of the proposed route, structure locations, and Sheridan Substation, and is reversible to pre-construction or equivalent conditions with implementation of reclamation measures beyond the operational life of the Project.
	Magnitude: Moderate	Construction of the Project will result in the clearing of native vegetation at the proposed structure locations, and a portion of the right-of-way. On the right-of-way, grading will only be conducted in areas which cannot be effectively protected using alternative methods (i.e., access matting, working under frozen conditions). Graded disturbances will be revegetated following construction activities. Vegetation height will be controlled on the proposed right-of-way, structure locations and Sheridan Substation throughout the life of the Project. The disturbance of native vegetation has been reduced by aligning the proposed Project route adjacent to existing disturbances to the extent possible (as well as siting temporary infrastructure, and workspace on or adjacent to existing disturbances where possible) and by using minimal disturbance construction methods and is expected to be of moderate magnitude The clearing of native vegetation will result in a measurable loss of function and value therefore, the magnitude of the residual effect is moderate. The functions and values of native vegetation include: ecological health (e.g., soil and water retention, climate control), genetic diversity (i.e., preservation of biodiversity as well as local genetics), wildlife use (e.g., food, shelter, varied habitats, for mammals, birds and insects), and human use (e.g., Indigenous use, recreational, and viewscapes).
b. Loss or alteration of rare vegetation or rare ecological communities	**Context:** Resilience to disturbance depends on the species' or communities' rarity, the location on the Project Footprint, and the extent of the occurrences. The species' growth form, habitat, and primary mode of reproduction will also contribute to its ability to recover from disturbance.	
	Geographic Extent: Project Footprint to Vegetation SA	The direct loss or alteration of a rare vegetation population or rare ecological community may occur in the Project Footprint, whereas indirect effects on rare vegetation populations or rare ecological communities as a result of changes in hydrology or light levels may affect populations that extend beyond the proposed right-of-way into the Vegetation SA.
	Duration: Short- to extended-term	The duration of the loss or alteration of rare vegetation populations or rare ecological communities is dependent upon the species or communities affected, but is expected to be limited to the construction phase or to extend into the operations phase for up to 10 years, except for the forested community, which will be extended-term.
	Frequency: Isolated to continuous	Loss or alteration of rare vegetation populations or rare ecological communities is likely to be confined to the construction phase; however, depending on the relation of occurrences to the Project Footprint, periodic or continuous disturbance may be unavoidable.

Table 5.2-6. Residual Effects Characterization for Vegetation

Potential Residual Effect	Criteria Rating	Effects Characterization
b. Loss or alteration of rare vegetation or rare ecological communities (cont'd)	**Reversibility:** Reversible	With the implementation of the proposed key mitigation measures, the rare vegetation populations and rare ecological communities are expected to recover. The PCM program will implement adaptive management to increase the chance of successful recovery.
	Magnitude: Moderate	With the implementation of the proposed key mitigation measures, it is expected that the Project will not place any individual EO at risk of being eliminated.
c. Weed introduction or spread	**Context:** Non-native and invasive plant species that occur at high densities on the landscape can exert competitive pressure and result in the alteration of native vegetation composition. Weed species are typically early seral species that readily establish in disturbed areas.	
	Geographic Extent: Project Footprint to Vegetation SA	Although activities likely to result in the introduction or spread of invasive and non-native species are restricted to the proposed right-of-way, weeds may spread beyond the Project Footprint to the Vegetation SA.
	Duration: Short- to long-term	With the implementation of appropriate PCM and vegetation management activities, the potential residual effect of weed introduction or spread is expected to occur in the short- to long-term (including the potential for maintenance activities to introduce weeds), depending upon the weed species, associated land use, and the density and distribution of the weed occurrence.
	Frequency: Periodic	Weed introduction or spread can occur intermittently but repeatedly over the assessment period.
	Reversibility: Reversible	With the use of proposed key mitigation measures, weed introduction or spread is expected to be reversible.
	Magnitude: Moderate	The magnitude of the residual effect of the introduction or spread of weeds is considered moderate, given that the vegetation surveys identified numerous occurrences of Noxious species, however, they will be controlled through mitigative measures.
d. Introduction or spread of forest pests	**Context**: The introduction or spread of forest pests may cause a reduction in the health and vigour of affected trees, and may cause mortality of individual trees or to stands of trees. Tree mortality will result in a change in vegetation community structure.	
	Geographic Extent: Vegetation SA	The potential introduction or spread of forest pests resulting from transmission line construction as well as maintenance activities may extend beyond the Project Footprint to the Vegetation SA.
	Duration: Long- to extended-term	The effects of the introduction or spread of forest pests is expected to persist for more than 10 years and may extend beyond decommissioning and abandonment.
	Frequency: Isolated to Continuous	The potential residual effect of the introduction or spread of forest pests is most likely to occur during clearing activities where salvaged timber is transported away from the proposed rights-of-way, permanent access, Sheridan Substation site, temporary workspace and temporary access. If tree mortality occurs as a result of forest pest introduction, the effects will be continuous over the assessment period.
	Reversibility: Reversible	It is expected that the potential residual effects of the introduction or spread of forest pests will be reversible.

Table 5.2-6. Residual Effects Characterization for Vegetation

Potential Residual Effect	Criteria Rating	Effects Characterization
d. Introduction or spread of forest pests (cont'd)	**Magnitude**: Minor	Standard proposed key mitigation measures are expected to reduce the risk of the introduction or spread of forest pests as a result of the construction and operations of the Project.
e. Combined residual effects on native vegetation	**Context**: All of the individual adverse effects identified above have the potential to act in combination on native vegetation within the Project Footprint.	
	Geographic Extent: Vegetation SA	The combined effects on native vegetation may extend beyond the Project Footprint into the Vegetation SA.
	Duration: Short- to extended-term	The residual combined effects on vegetation may extend beyond decommissioning and abandonment where maintenance and operations activities may prevent the re-establishment of a native forested community.
	Frequency: Continuous	The combined effects on native vegetation are continuous where the vegetation has been altered and is managed to maintain an early seral stage of vegetation.
	Reversibility: Reversible	Given enough time, the native vegetation community is expected to recover. Vegetation will be cleared on the proposed structure locations and Sheridan Substation throughout the lifetime of the Project.
	Magnitude: Moderate	With the implementation of key mitigation measures, it is expected that the combined residual effects on Vegetation will be moderate since the Project will have a limited effect on native vegetation, will not place EOs at risk of elimination, will meet current provincial regulatory standards for controlling the introduction or spread of weed species, and will have a limited effect on forest pest introduction or spread.

5.2.3.3 Summary

The potential environmental effects of the Project on vegetation are similar to other transmission line developments in the province. Appropriate key mitigation measures will be applied during construction to reduce disturbance of native vegetation, disturbance to rare vegetation and rare ecological communities, the introduction or spread of weeds, and the introduction or spread of forest pests. With application of the recommended key mitigation measures in Table 5.2-5, the potential environmental effects on vegetation associated with construction and operation of the Project can be reduced.

5.2.4 Cumulative Effects Assessment

5.2.4.1 Loss or Alteration of Native Vegetation

The Project is located within the Montane Natural Subregion, which occupies approximately 7 percent of JNP and is the area that has been most affected by development activities and past management practices within JNP (Parks Canada, 2010). Much JNP's development has occurred within the Vegetation SA, which includes the Highway 16, the CN Railway, and commercial accommodations and facilities that are outside the community of Jasper (Parks Canada, 2010). As such, portions of the Vegetation SA have been previously altered by development activities; however, most of the vegetation communities within the Vegetation SA remain intact.

The amount of disturbance to native vegetation and clearing in the Vegetation SA as a result of the Project is reduced by paralleling existing disturbances for 99 percent of the proposed route length. ATCO Electric is expected to further reduce the amount of disturbance to native vegetation by siting temporary workspace (i.e., laydown yards) and the Sheridan Substation on previously disturbed land

and industrial land uses, to the extent practical. Vegetation communities located along the Project Footprint will have the potential to be altered such that their overall abundance may be reduced, although early seral (i.e., forb and shrub) native vegetation communities will be established following revegetation. Vegetation types and species of concern within JNP as identified by the FMP will not be substantially affected by the Project.

The Project will act cumulatively with existing and reasonably foreseeable developments within the Vegetation SA. Reasonably foreseeable developments, which involve clearing activities within the Athabasca River Valley, are described in Table 4.9-1 in Section 4.9 and include the infrastructure maintenance and transportation and facility infrastructure upgrades by Parks Canada, the reactivation of a pipeline segment by the Kinder Morgan Trans Mountain Project. It is anticipated that these future developments will be sited, constructed, and operated according to protective measures and mitigation similar to those recommended for the Project. Consequently, most cumulative effects of the Project and reasonably foreseeable developments are primarily attributed to an alteration, rather than complete removal, of native vegetation. No additional key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.2-5 of this DIA are deemed to be warranted.

With the implementation of recommended key mitigation measures, it is anticipated that the Project's contribution to cumulative incremental change of native vegetation community composition within the Vegetation SA is moderate in magnitude. The Project's contribution to this cumulative effect is expected to be reversible in the medium to extended-term, depending on the associated land use, the type of development, and the time required for various native species to regenerate following the disturbance.

5.2.4.2 Loss or Alteration of Rare Vegetation or Rare Ecological Communities

Most of the rare plant species and rare plant communities with potential to occur in the Project area are found on lands supporting native vegetation. The desktop review conducted prior to the vegetation surveys identified numerous previously identified rare vegetation species and rare ecological communities within the Vegetation SA. Rare vegetation surveys were conducted during the growing seasons in 2015 and 2016, during which 18 ACIMS-listed rare vegetation species (31 EOs) warranting mitigation and 2 ACIMS-listed rare ecological communities (4 EOs) were observed along the proposed right-of-way. Protection measures and environmental management techniques for these rare populations and ecological communities are provided in Appendix 5.2-1.

Lands within the Vegetation SA include approximately 8502.0 ha (94.9 percent) of undisturbed habitats, while the remaining areas have previously been cleared. The potential for rare vegetation and ecological communities is often highest on lands with contiguous native vegetation and, therefore, construction activities for the Project and future development activities such as transportation and infrastructure upgrades, and maintenance and pipeline reactivation may act cumulatively to alter remaining or previously unaffected rare vegetation and ecological communities in the Vegetation SA. It is expected that future projects anticipated in the area will employ key mitigation measures similar to those recommended for this Project, reducing the cumulative effects on rare vegetation species and rare ecological communities in the Vegetation SA. With the implementation of recommended key mitigation measures, it is anticipated that the Project's contribution to cumulative effects on rare vegetation species and rare ecological communities within the Vegetation SA will be moderate in magnitude and reversible in the short- to extended-term.

5.2.4.3 Weed Introduction or Spread

Weeds typically establish in areas that have been previously disturbed. Existing activities resulting in ground disturbance and potential introduction or spread of weeds include creation of roads and utility corridors as well as past pipeline and facility development. In general, no additional weed mitigation is warranted given the proven effectiveness of the proposed weed-related mitigation outlined in Table 5.2-5 of this DIA. Other operators within the Vegetation SA are expected to implement similar industry-standard mitigation to control weeds. The overall cumulative effect on weeds in the Vegetation SA as a result of existing activities, the Project, and reasonably foreseeable developments is considered to be of moderate magnitude. With the implementation of the above key mitigation measures, it is anticipated that the Project's contribution to cumulative effects on weed introduction or spread will be reversible in the short to long-term.

5.2.4.4 Introduction or Spread of Forest Pests

Forest pests pose a serious threat to mature coniferous forests in western Canada. While the MPB is a natural part of the southern Rocky Mountain ecosystem, recent beetle activity has been greater in recent years because of milder winters and an abundance of mature pine forests as a result of fire suppression (Parks Canada, 2009b). Over 6,000 ha of pine forest within JNP have been colonized by MPB (Parks Canada, 2014). Controlled burns of prime age lodgepole pine/beetle habitat have been carried out within JNP on the south side of the Athabasca River valley to provide landscape level breaks in the MBP habitat to limit the spread (Parks Canada, 2014).

Strategies to address bark beetle infestations have been generally developed for landscape level management (e.g., controlled burns), and cannot be applied to linear disturbances. Consequently, ATCO Electric will consult with Parks Canada staff to receive forest pest updates and mitigation strategies prior to Project clearing. All applicable provincial and regional guidelines/restrictions and scheduling requirements related to tree clearing and pre-hauling preparation (e.g., bark removal) will be followed in order to reduce the potential for spread of forest pests (e.g., MPB). Hauling of timber potentially infected by a forest pest (e.g., MPB) will be scheduled for the period either before or after the beetle flight period unless otherwise approved by provincial forestry authorities. Fallen infested trees will not be stacked near healthy standing or felled trees. All non-merchantable timber infested with MPB (or other forest pest) will be disposed of by burning or mulching to eliminate the risk of spread of forest pests.

Mitigation outlined in Table 5.2-5 includes effective industry-standard measures developed to reduce the potential for spread of forest pests, as well as consultation with JNP to comply with their forest pest management strategies. These measures will be implemented during all phases of the Project that require clearing of mature coniferous forest. Following construction, forest health will be monitored along the route, with particular attention paid to areas of high risk of MPB outbreaks (e.g., mature pine). Outbreaks will be recorded and reported to JNP.

Other developments within the Vegetation SA are expected to implement similar industry-standard mitigation to control forest pests such as MPB. The overall cumulative effect on forest pests in the Vegetation SA as a result of existing activities, the Project, and reasonably foreseeable developments is considered to be of minor magnitude. With the implementation of the key mitigation measures outlined above, it is anticipated that the Project's contribution to cumulative effects on the introduction or spread of forest pests will be reversible in the long- to extended-term and of minor magnitude.

5.2.4.5 Combined Effects on Native Vegetation

There may be a combined cumulative effect on vegetation because of the Project and reasonably foreseeable developments in the Vegetation SA. Although the magnitude of individual effects on native vegetation are minor to moderate, combined effects on native vegetation are expected to be detectable and approach, but remain within environmental, social, and/or regulatory standards.

Given the consistency of industry-standard practices in areas of native vegetation, the implementation of site-specific key mitigation measures for native vegetation, rare vegetation, weeds, and forest pests during existing activities, construction of the Project and reasonably foreseeable developments, no key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.2-5 are deemed to be warranted.

The overall combined cumulative effect on native vegetation in the Vegetation SA is considered to be of moderate magnitude. Depending on the development type and the vegetation affected, the Project's contribution to combined cumulative effects on native vegetation is considered to be reversible in the short- to long-term. Although the probability of the previously listed cumulative effects acting in combination is high, the magnitude of the Project's contribution to the combined effects on native vegetation is considered minor (Table 5.2-6, Point [e]).

There are no situations where there is a high probability of occurrence of a permanent or long-term cumulative effect of high magnitude on vegetation that cannot be technically or economically mitigated.

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5.3 Aquatic Wildlife and Ecosystems

5.3.1 Existing Conditions and Ecological Context

5.3.1.1 Spatial Boundaries

The Project components were considered in relation to the Project Footprint (as defined in Section 4.3.1) and spatial boundaries were determined by the potential zones of interaction between aquatic wildlife and ecosystems and the Project.

The Aquatic SA was 1 km wide band extending approximately 500 m from both sides of transmission line centre line, on land. At watercourses, the assessment included an area extending 100 m upstream at each crossing location to a minimum of 300 m downstream. At ephemeral drainages, the assessment consisted of the area extending 100 m upstream at each crossing location to a minimum of 100 m downstream.

The Aquatic RA was area beyond the SA and was defined as a 30 km wide band extending approximately 15 km from both sides of the transmission line centre line. This area includes high quality habitat within the Athabasca River basin. The Aquatic RA encompasses the area where the direct and indirect influence of Project activities could interact with aquatic wildlife and ecosystems.

5.3.1.2 Overview of Existing Conditions

The purpose of the aquatic wildlife and ecosystems review was to document baseline conditions along the proposed route and at the proposed substation, including river basins and surface water quality. The study area is located within the Athabasca River basin in Alberta. Specific information for Athabasca River basin is discussed in detail below in regards to fish distribution, conservation listings, and species-specific descriptions as well as watercourses crossed. Recommendations and regulatory requirements are provided for transmission line and vehicle and equipment crossings of watercourses.

A watercourse is defined as any reach, flowing on a perennial or intermittent basis, that has defined bed and banks for a minimum of 100 m. A drainage is defined as a waterbody that lacks defined bed and banks for greater than 100 m. These terms are used throughout the Aquatics and Water Resources section, with the exception of discussions related to the *Code of Practice for Watercourse Crossings*, which uses the term “waterbody” in place of “watercourse”. The *Code of Practice for Watercourse Crossings* defines a waterbody as having a “defined bed and banks, whether or not water is continuously present, but does not include fish-bearing lakes” (AESRD, 2013a).

The Athabasca River is a major river system in JNP that originates approximately 100 km south of Jasper at the Columbia Icefields. Within the study area, 24 tributaries of into the Athabasca River were assessed for fish and fish habitat as well as one crossing of the Athabasca River.

In April 2011, Parks Canada published a Canadian Heritage River Monitoring Report on the Athabasca River for the years from 1999 to 2010 (Parks Canada, 2011). The report indicates water quality has been monitored by ECCC at two locations within the Athabasca River, one upstream of the town site of Jasper (as a control) and one approximately 20 km downstream of the town site. Parameters monitored include pH, dissolved oxygen, turbidity, conductivity, and temperature as well as metals, ions, bacteria, and nutrients. The report indicates that water quality of the river within the park is affected by localized contamination from sewage effluent and likely by point discharges from contaminated sites, road salt, and spills, but that the river as a whole appeared to be meeting integrity guidelines for water quality. The report concludes that there has been a significant improvement in water quality in the 10-year period covered by the report.

Water quality is very important for aquatic species. For brook trout, the optimal range for dissolved oxygen is greater than 7 milligram(s) per liter (mg/L) at temperatures of 15°C and the optimal pH range is 6.5 to 8.0 though they are tolerant of a pH range of 4.0 to 9.5 (Newbury and Gaboury, 1993). Northern pike can tolerate a minimum dissolved oxygen of 0.1-0.4 mg/L for a few days. The optimal dissolved oxygen value for rainbow trout is 7 mg/L, with a temperature greater than 15°C. Dissolved oxygen levels less than 3 mg/L are lethal. Rainbow trout can tolerate a temperature range of 0°C to 25°C. The optimal pH range for rainbow trout is 6.5 to 8.0 though they can tolerate a pH of 5.5 to 9.0 (Newbury and Gaboury, 1993).

5.3.1.3 Species with Conservation Status

Athabasca Rainbow Trout

Athabasca rainbow trout (*Oncorhynchus mykiss*) are designated as endangered under COSEWIC (2014). Over the last 15 years, the Athabasca rainbow trout has declined over 90 percent (COSEWIC, 2014) because of habitat degradation and competition with non-native trout species such as brook trout.

Athabasca rainbow trout are listed as at risk under the Alberta Environment and Parks (AEP) “General Status of Alberta Wild Species” (AEP, 2015a). According to the Alberta Athabasca Rainbow Trout Recovery Plan 2014 – 2019 (AESRD, 2014) threat significance for hybridization and competition by non-native rainbow trout in Jasper is rated as high.

Rainbow trout are a cold water species. Rainbow trout spawn in the spring after ice melts and when water temperatures reach at least 6°C. Fry emerge from the gravel in late July and early August (Mayhood, 1992). Spawning habitat consists of fine gravels in small streams (Joynt and Sullivan, 2003).

Bull Trout

Bull trout (*Salvelinus confluentus*) are listed as Sensitive under the General Status of Alberta Wild Species (AEP, 2015a) and Threatened under the Alberta *Wildlife Act*. In 2014, bull trout populations were assessed as healthy (low risk) in all Alberta National Parks and Alberta Provincial Parks (AEP, 2015b, 2015c). According to the Bull Trout Conservation Management Plan 2012 – 2017 (AESRD, 2012a), bull trout are listed by provincial biologists as a potential risk in the Athabasca River.

Bull trout are a cold water species. Bull trout spawn in the fall and can be observed moving into spawning streams in late August and early September (Mayhood, 1992). Spawning occurs in early October when water temperatures are below 10°C (Joynt and Sullivan, 2003). Eggs will hatch in March or April and young will stay in creeks for 1 to 3 years. Juvenile bull trout are usually nocturnal and are usually not observed during the day. Bull trout prefer gravelly streams with low sediment loading (Joynt and Sullivan, 2003).

Pygmy Whitefish

Pygmy whitefish (*Prosopium culterii*) are listed as May Be At Risk under the General Status of Alberta Wild Species (AEP, 2015a). Pygmy whitefish are small, slim whitefish that have been reported from Yellowhead and Moose lakes in the upper Fraser River watershed and the Athabasca River, Snaring River and lower Snake Indian River within the upper Athabasca River watershed (Government of Alberta, 2011). The Athabasca River population was assessed in 2011 and found to be significant concern based on its limited known distribution, small population size and potential anthropogenic threats (e.g.*,* accidental spills) (Government of Alberta, 2011).

Pygmy whitefish are typically found in deep cold lakes and fast, cold montane streams. They appear to coexist with, but are much less abundant than, mountain the upper Athabasca watershed (Mayhood, 1992; Mackay, 2000). The life history of pygmy whitefish in these montane areas is not well known, but spawning generally occurs in fall between October and December over coarse gravel in shallow water of lakes or streams. Eggs hatch and fry emerge in early spring after winter incubation. Adults reach maturity in 1 to 3 years (Joynt and Sullivan, 2003).

5.3.1.4 Aquatic Wildlife and Ecosystems Field Study Methods

Methodology

This subsection provides information on the watercourse assessments, fish habitat characteristics, water quality measurements, habitat quality ratings, and the Fisheries and Wildlife Management Information System (FWMIS) desktop search. Aquatic surveys were completed as per the requirements of the permit from Parks Canada (JNP-2015-18637).

Watercourse Assessments

The watercourse assessments have been prepared using the Proponent's Guide to Information Requirements for Review under the Fish Habitat Protection Provisions of the *Fisheries Act* Version 1.2 (DFO, 2009).

Fish Habitat Characteristics

The distribution, quality, and suitability of fish habitat were assessed. Site cards were used to record descriptions of fish habitat and stream morphology (i.e., channel measurements, channel morphology, instream cover, and dominant riparian habitat). Characteristics also included substrate conditions, surface water accumulation or drainage, topography, vegetation, potential fish habitat or fish presence, connectivity to nearby watercourses, and dominant riparian habitat where observable at the time of the field assessment.

Water Quality Measurements

Water quality measurements were conducted at sites to determine suitability of water conditions with respect to fish survival. For these measurements, pH, temperature (°C), and conductivity (µS/cm) were measured using an Oakton Multiparameter PCS Tester 35. Dissolved oxygen was measured using an Oakton DO meter.

Fisheries and Wildlife Management Information System

The Government of Alberta maintains a fisheries and wildlife database known as the FWMIS. Although JNP excluded from the FWMIS database, historical data was obtained for the Athabasca River near Hinton, Alberta. This information was used to inform the understanding of species presence within the Aquatic SA.

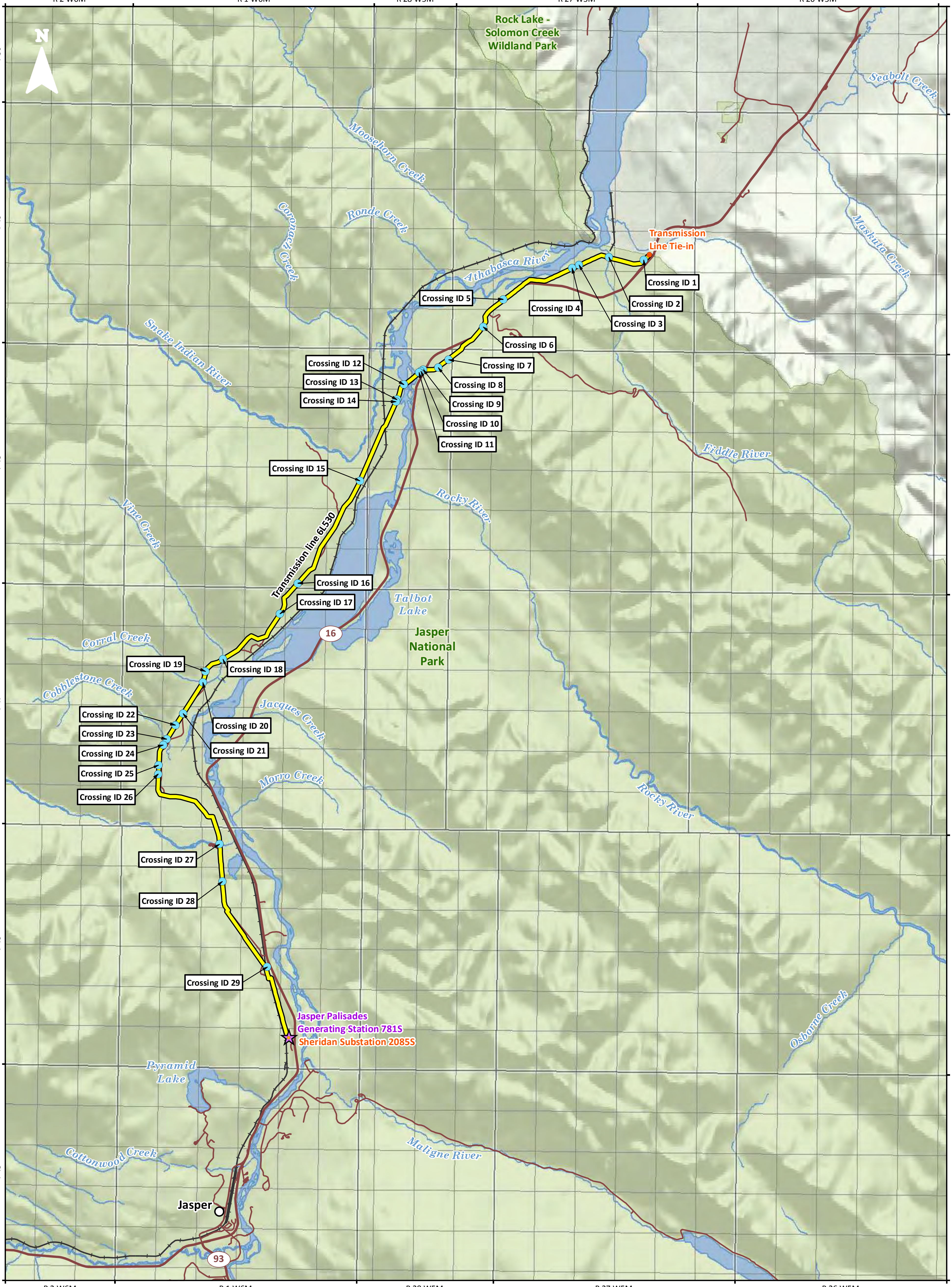
Fish Sampling

Fish sampling was conducted according to A Review of Fish Sampling Methods Commonly Used In Canadian Freshwater Habitats (Portt et al., 2006), the Alberta Fisheries Management Division Electrofishing Policy Respecting Injuries to Fish (AESRD, 2012b), Standard for Sampling of Small Streams in Alberta (AESRD, 2013b), Standard for the Ethical Use of Fishes in Alberta (AESRD, 2013c), Standard for Sampling Small-Bodied Fish in Alberta (AESRD, 2013d). Fish sampling was conducted in sample areas of approximately 100 m in length. Fish stop nets were used to isolate the sample area for fish migration where feasible. Gee minnow traps were set where feasible and allowed to soak for a period of 15 to 24 hours.

5.3.1.5 Aquatic Wildlife and Ecosystems Field Study Results

Identification of Watercourses

Using the methodologies outlined in Section 5.3.1.4, CH2M identified watercourses along the Project Footprint as described in Table 5.3-3 and shown on Figure 5.3-1. Watercourses that were identified in data from NRCan (2007-2011) were visited. Waterbody identification was confirmed and the waterbody was classified, as appropriate.



Watercourse Crossing
Proposed Route
Highway
Road
Railway
Watercourse
Waterbody
Park/Protected Area

ATCO Electric

SCALE: 1:150,000

0 1 2 3 4 5 km

(All Locations Approximate)

FIGURE 5.3-1

WATER BODIES IDENTIFIED ALONG THE PROJECT FOOTPRINT

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Hillshade: TERA 2008; Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Parks/Protected Areas: NRCan 2016, ATPR 2012; Jasper: NRCan 2003; Generating Station, Substation, Proposed Route: ATCO Electric Ltd. 2016; Watercourse Crossing: CH2M 2015.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

\\ch2mhill\common\Shares\CNR\GIS_Proj2\VECA\660380\MAP_FILES\AQUATICS\t660380_AQ_WCC_Rev00_20170530.mxd

Table 5.3-1. Waterbodies Identified along the Project Footprint

Crossing ID	Location LSD	Location UTM (NAD83)	Waterbody Type[a]
1	7-14-49-27 W5M	11U 0444257E 5897681N	Spring
2 (Fiddle River)	8-15-49-27 W5M	11U 0442848E 5897795N	Large permanent
3	4-15-49-27 W5M	11U 0441644E 5897472N	Wetland (not assessed)
4	1-16-49-27 W5M	11U 0441368E 5897346N	Wetland (not assessed)
5 (Mountain Creek)	5-8-49-27 W5M	11U 0438583E 5896079N	Small permanent
6 (Roche Miette Creek)	10-6-49-27 W5M	11U 0437765E 5894972N	Spring
7	9-36-48-28 W5M	11U 0436377E 5893648N	Dry (boulder swale)
8	10-36-48-28 W5M	11U 0435950E 5893327N	Does Not Cross right-of-way
9	5-36-48-28 W5M	11U 0435343E 5893247N	Does not exist
10	5-36-48-28 W5M	11U 0435252E 5893184N	Dry (cobble swale)
11 (Athabasca R Side Channel)	5-36-48-28 W5M	11U 0435176E 5893124N	Snye
12 (Athabasca River)	1-35-48-28 W5	11U 0434572E 5892643N	Large permanent
13	10-26-48-28 W5	11U 0434293E 5892033N	Large permanent
14	10-26-48-28 W5M	11U 0434256E 5891945	Small permanent
15	9-13-48-01 W6M	11U 0432797E 5888751N	Small permanent
16	3-2-48-01 W6M	11U 0430283E 5884613N	Spring
17	8-34-47-01 W6M	11U 0429558E 5883380N	Spring
18 (Vine Creek)	3-28-47-01 W6M	11U 0427250E 5881547N	Large permanent
19	13-28-47-01 W6	11U 0426544E 5881052N	Small permanent
20(Corral Creek)	9-20-47-01 W6M	11U 0426438E 5880604N	Dry (cobble swale)
21	15-17-47-01 W6M	11U 0425640E 5879354N	Small permanent
22	11-17-47-01 W6M	11U 0425339E 5878874N	Does not exist
23	4-17-47-01 W6M	11U 0424982E 5878315N	Does not exist
24 (Cobblestone Creek)	4-17-47-01 W6M	11U 0424836E 5878082N	Dry (cobble swale)
25 (Minor Creek)	9-7-47-01 W6M	11U 0424655E 5877266N	Dry
26	8-7-47-01 W6M	11U 0424639E 5876903N	Dry (cobble swale)
27(Snaring River)	11-33-46-01 W6M	11U 0427110E 5874074N	Large permanent
28	10-15-46-01 W6M	11U 429051E 5869114N	Small permanent[b]
29	10-15-46-1 W6M	11U 0429051E 5869114N	Ephemeral

[a] Data was collected in July 2015.

[b] Waterbody type based on desktop classification and photos received from Parks Canada November 25, 2016.

Water Quality Results

Water quality results are presented in Table 5.3-2. Dissolved oxygen and turbidity readings were within the optimal ranges for species expected or sampled within the Project Footprint. Dissolved oxygen ranged from 7.08-19.46 mg/L in sampled watercourses. Dissolved oxygen greater than 7 mg/L is optimal for rainbow trout, brook trout and norther pike (Newbury and Gaboury, 1993). Turbidity ranged from 0.62 -10.77 NTU which is very low and demonstrates that the water was very clear and optimal for fish. Newbury and Gaboury indicate that turbidity of less than 30 is optimal for brook trout and that they can tolerate a range of 0-130 NTU. Other comparable preferences and tolerances for turbidity were not available for fish species known to be within the Aquatic RA. However, based on the very low readings, it would be expected turbidity levels presented in Table 5.3-2 would not exceed the tolerance of any fish species known to occur in the Aquatic RA.

Table 5.3-2. Water Quality
Various Watercourses/Waterbodies

Site Location	pH[b]	Dissolved Oxygen[b] (mg/L)	Conductivity[b] (µs/m)	Temperature[b] (°C)	Turbidity** (NTU)
1[a]	Spring	Spring	Spring	Spring	Spring
2 (Fiddle River)[c]	N/S	N/S	N/S	N/S	N/S
3 [c]	N/S	N/S	N/S	N/S	N/S
4 [c]	N/S	N/S	N/S	N/S	N/S
5 (Mountain Creek) [a]	8.4	7.08	644	13	2.66
6 (Roche Miette Creek) [a]	Spring	Spring	Spring	Spring	Spring
7	Dry	Dry	Dry	Dry	Dry
8	Not in right-of-way	Not in right-of-way	Not in right-of-way	Not in right-of-way	Not in right-of-way
9 [d]	-	-	-	-	-
10	Dry	Dry	Dry	Dry	Dry
11 (Athabasca Side Channel)[c]	N/S	N/S	N/S	N/S	N/S
12 (Athabasca River)[c]	N/S	N/S	N/S	N/S	N/S
13	8.3	8.22	654	9.3	1.57
14	8.3	10.68	655	5.5	1.87
15	8.9	10.01	1618	11.1	8.56
16[c]	Spring	Spring	Spring	Spring	Spring
17[c]	Spring	Spring	Spring	Spring	Spring
18 (Vine Creek)	8.7	12.55	215	12.5	0.62
19	8.8	16.72	432	6.4	1.52
20 (Corral Creek)	Dry	Dry	Dry	Dry	Dry
21	8.8	19.46	272	5.2	10.77
22	Dry	Dry	Dry	Dry	Dry
23[d]	-	-	-	-	-
24 (Cobblestone Creek)	Dry	Dry	Dry	Dry	Dry
25 (Miner Creek)	Dry	Dry	Dry	Dry	Dry
26	Dry	Dry	Dry	Dry	Dry
27 (Snaring River)[c]	N/S	N/S	N/S	N/S	N/S
28[e]	N/S	N/S	N/S	N/S	N/S
29	Dry	Dry	Dry	Dry	Dry

Table 5.3-2. Water Quality
Various Watercourses/Waterbodies

Site Location	pH[b]	Dissolved Oxygen[b] (mg/L)	Conductivity[b] (µs/m)	Temperature[b] (°C)	Turbidity** (NTU)

[a] Springs were not sampled for water quality.

[b] Data collected between August 19 and 24, 2015.

[c] Not sampled for water quality due to classification as a wetland or known fish presence.

[d] Does not exist.

[e] Not visited during 2015 survey.

Note:

N/S = Not sampled.

Existing Historical Fisheries Data Information

Table 5.3-3 provides information on fish species identified in the Athabasca River near Hinton, Alberta and fisheries data obtained from existing data reports.

Table 5.3-3. Existing Historical Fisheries Data Information

Site Location	Fish Code	Species Name	Year of Data	Source
Athabasca River (near Highway 40)	SPSC	Spoonhead sculpin (*Cottus ricei*)	1998	FWMIS
Athabasca River (near Highway 40)	RNTR	Athabasca rainbow trout (*Oncorhynchus mykiss*)	1998	FWMIS
Athabasca River (near Highway 40)	BLTR	Bull trout (*Salvelinus confluentus*)	1998	FWMIS
Athabasca River (near Highway 40)	NRPK	Northern pike (*Esox Lucius*)	1998	FWMIS
Athabasca River (east of Brule Lake)	LNDC	Longnose dace (*Rhinichthys cataractae*)	1998	FWMIS
Athabasca River (east of Brule Lake)	PGWH	Pygmy whitefish (*Prosopium coulteri*)	1998	FWMIS
Athabasca River (east of Brule Lake)	WHSC	White sucker (*Catastomus commersoni*)	1998	FWMIS
Athabasca River (mouth of Snaring River)	MNWH	Mountain whitefish (*Prosopium williamsoni*)	1994	FWMIS
Athabasca River (mouth of Snaring River)	LNSC	Longnose Sucker (*Catostomus catostomus*)	1994	FWMIS
Athabasca River (mouth of Snaring River)	PYWH	Pygmy whitefish (*Prosopium coulterii*)	2008	Government of Alberta, 2011
Unnamed Wetland (Site Location 3)	LKCH	Lake chub (*Couesius plumbeus*)	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Athabasca River (Site Location 12)	MNWH	Mountain whitefish (*Prosopium williamsoni*)	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Unnamed Watercourse (Site Location 13)	BURB	Burbot (*Lota lota*)	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Unnamed Watercourse (Site Location 14)	BURB	Burbot (*Lota lota*)	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Unnamed Watercourse (Site Location 15)	BKTR	Brook trout (*Salvelinus fontinalis*)	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Unnamed Watercourse (Site Location 19)	BKTR	Brook trout	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Unnamed Watercourse (Site Location 21)	BKTR, BLTR, RNTR, MNWH	Brook trout, bull trout, rainbow trout, mountain whitefish	2005	Terasen Pipeline (Trans Mountain) Inc., 2005

Table 5.3-3. Existing Historical Fisheries Data Information

Site Location	Fish Code	Species Name	Year of Data	Source
Snaring River (side channel) (Site Location 27)	RNTR, MNWH, BLTR	Rainbow trout, mountain whitefish, bull trout	2005	Terasen Pipeline (Trans Mountain) Inc., 2005
Snaring River (near mouth Athabasca confluence) (Site Location 27)	PYWH	Pygmy whitefish (*Prosopium coulterii*)	2008	Government of Alberta, 2011

Sources: AEP, 2015d; Terasen Pipeline (Trans Mountain) Inc., 2005; Government of Alberta, 2011

Overall Habitat Quality and Potential for Fish Presence, Species Captured or Observed

An overview of the fish habitat quality and potential for fish presence is summarized in Table 5.3-4 and a summary of the habitat features are described below.

Table 5.3-4. Fish Habitat Quality and Potential for Fish Presence, Species Captured or Observed
Watercourses in the Project Footprint

Site Location	Fish Habitat Quality	Potential for Fish Presence[a]	Fish Species Captured or Observed
1	Low	Low	None
2 (Fiddle River)[b]	Good	High	Existing fisheries data
3[b]	N/S	N/S	Existing fisheries data
4[b]	N/S	N/S	N/S
5 (Mountain Creek)	Low	Moderate	Northern pike juvenile
6 (Roche Miette Creek)	Nil	Nil	None
7[b]	N/S	N/S	N/S
8[b]	N/S	N/S	N/S
9[c]	DNE	DNE	DNE
10[b]	N/S	N/S	N/S
11 (Athabasca Side Channel)[b]	Good	Good	Northern pike juvenile
12 (Athabasca River)	Good	Good	Existing fisheries data
13[b]	Low	Low	Existing fisheries data
14[b]	Low	Low	Existing fisheries data
15	Good	Good	Brook trout
16[b]	Nil	Nil	None observed
17[b]	Nil	Nil	None observed
18 (Vine Creek)	Low	Low	None observed
19	Good	Good	Brook trout
20 (Corral Creek)	N/S	N/S	N/S
21	Good	Good	Northern pike juvenile
22[c]	Nil	Nil	N/S
23[c]	DNE	DNE	DNE
24 (Cobblestone Creek)[b]	N/S	N/S	N/S
25 (Minor Creek)[b]	N/S	N/S	N/S
26[b]	N/S	N/S	N/S
27 (Snaring River)[b]	Good	Good	Existing fisheries data
28[d]	N/S	N/S	N/S
29[b]	N/S	N/S	N/S

Table 5.3-4. Fish Habitat Quality and Potential for Fish Presence, Species Captured or Observed
Watercourses in the Project Footprint

Site Location	Fish Habitat Quality	Potential for Fish Presence[a]	Fish Species Captured or Observed

[a] Potential for fish presence is a qualitative rating, based on historic fisheries information; dissolved oxygen levels; connectivity to other permanent watercourses; and overwintering habitat potential.

[b] Not sampled (N/S) due to classification as a wetland or spring, or existing fisheries data, or dry conditions

[c] Does not exist

[d] Not sampled during 2015 survey

Notes:

- = Data were collected in August 2015

N/S = Not sampled.

DNE = Does not exist.

Nil = None, negligible

Site Location 1 Spring

Substrate consisted of silt and fines (Photo 5.3-1). No instream cover was observed. Water levels were high due to warm temperatures and run off from upper reaches south of Highway 16. Fish sampling was not conducted due to low quality fish habitat for both forage and sport fish within the Project Footprint. Channel widths averaged at 0.5 0.7 m and water depths averaged 0.1 0.25 m. Riparian vegetation consisted of shrubs and grasses with upland black spruce (*Picea mariana*).

Site Location 5 (Mountain Creek)

A beaver (*Castor canadensis*) dam was observed upstream of Highway 16 and was limiting flow downstream through a culvert (Photo 5.3-2). Water was not flowing at the time of the assessment and channel bottom was well vegetated with aquatic plants. Substrate consisted of silt and fine materials (Photo 5.3-3). Channel measurements were not taken due to intermittent short sections of channel within the downstream portion. One juvenile northern pike was observed within an isolated channel section. Riparian vegetation consisted of cattails (*Typha latifolia*) and grasses. Spawning habitat was good for northern pike due to instream floodable vegetation. Rearing habitat was low to moderate due to potential dry conditions during the late summer months and intermittent connectivity to habitat downstream near the Athabasca River. Overwintering habitat was poor due to the likelihood this watercourse will freeze to bottom downstream of Highway 16.

Site Location 6 (Roche Miette Creek)

At the time of the assessment, the watercourse was dry with some areas of overland spring flow (Photo 5.3-4). No fish habitat was observed.

Site Location 11 (Athabasca River Side Channel)

Water levels were low at the time of the assessment (Photo 5.3-6). Upstream of the existing powerline right-of-way, the channel was dry. Downstream, channel widths averaged 8 to 12 m. Water depths averaged 0.25-0.4 m. Substrate consisted of fines, gravels, and cobble. Instream cover was provided by aquatic vegetation. Several juvenile northern pike were observed (Photo 5.3-7). Spawning habitat for northern pike was good owing to instream floodable vegetation. Rearing habitat was low to moderate due to lack of cover and low water levels observed in August. Overwintering habitat was poor due to the likelihood this watercourse will freeze to bottom during the winter months.

Site Location 12 (Athabasca River)

Sampling was not conducted due to existing fisheries information for the Athabasca River (see Table 5.4-3.

Site Location 13 (Unnamed Small Permanent)

Water levels were low at the time of the assessment (Photo 5.3-8). Channel and wetted widths averaged 6.2 m and water depths averaged 0.6 m. Substrate consisted of cobbles, boulders, and fines. Morphology was a run-flat with frequent grassy islands. Crown closure was provided by shrubs covering no more than 25 percent of the watercourse. Banks were undercut and consisted of cobbles and fine materials. Riparian vegetation was coniferous with shrubs and grasses. Site Location 13 drained into Site Location 14 watercourse approximately 20 m downstream of the existing TMPL right-of-way (Photo 5.3-9). Historic fisheries data indicates that Burbot (*Lota lota)* were previously present at this location (Terasen Pipeline [Trans Mountain] Inc., 2005) (see Table 5.4-3).

Site Location 14 (Unnamed Small Permanent)

Site Location 14 is the headwater to Site Location 13, with all habitat characteristics being the same. Site Location 14 upstream of the confluence with 13 was an area with observed beaver activity. Flow out of the beaver area was low and no fish were observed during the assessment. Historic fisheries data indicates that Burbot (*Lota lota)* were previously present at this location (Terasen Pipeline [Trans Mountain] Inc., 2005) (see Table 5.4-3).

Site Location 15 (Unnamed Small Permanent)

At the time of the assessment, water levels were low (Photo 5.3-10). Channel widths averaged 0.94 m. Wetted widths averaged 1.21 m. Water depths averaged 0.31 m. Substrate consisted of fines, cobbles, boulders, and small gravels. Morphology was riffle-run and flowed in a meandering pattern. Banks were undercut and composed of fine materials. Instream cover consisted of boulders, small and larger woody debris, deep pools, instream vegetation with abundant overhanging vegetation and undercut banks. Spawning habitat for salmonids was good with observed areas of gravels and cobbles. Rearing habitat was good with abundant instream cover. Overwintering habitat was good with sections of deep pools although it is possible the watercourse may freeze to bottom in sections during the winter. Historic fisheries data indicates that brook trout were previously present at this location (Terasen Pipeline [Trans Mountain] Inc., 2005) (see Table 5.4-3).

Site Location 18 (Vine Creek)

At the time of the assessment, water levels at Vine Creek were low. Vine Creek was a cobble-boulder garden with low potential for fish presence and low quality fish habitat (Photo 5.3-11).

Site Location 19 (Unnamed Small Permanent)

At the time of the assessment, water levels were high due to high temperatures melting snow in the upper reaches of the watercourse. Channel widths averaged 1.6 m and wetted widths averaged 1.4 m. Water depths averaged 0.3 m. Substrate consisted of large gravels, cobbles, boulders, and fines. Morphology was riffle-run and flowed in a sinuous pattern (Photo 5.3-12). Instream cover was provided by undercut banks, boulders, deep pools, small and large woody debris, and overhanging and instream vegetation. Crown closure was provided by a mature coniferous forest covering 25-50 percent. Multiple channels were observed downstream of an existing right-of-way. Beaver activity downstream was observed with a beaver pond (Photo 5.3-13). Spawning habitat for salmonids was good with suitable gravels and cobbles. Rearing habitat was good with instream cover and undercut banks. Overwintering habitat was good in the beaver pond and braided channels downstream although it is possible it may freeze to bottom during the winter months. Historic fisheries data indicates that brook trout were previously present at this location (Terasen Pipeline [Trans Mountain] Inc., 2005) (see Table 5.4-3).

Site Location 21 (Unnamed Small Permanent)

At the time of the assessment, water levels had risen overnight (since gee minnow traps has been set) due to snow melt in the upper reaches. Channel widths averaged 3.5 m. Water depths averaged 0.84 m. Flooded grasses were observed along the left and right banks downstream toward the large pond area (Photo 5.3-14). Substrate consisted of large gravels, cobbles, boulders, and fines. Morphology consisted of a riffle-run-flat and flowed in a meandering and sinuous pattern. Banks were undercut with sloping sections and composed of fine materials. Instream cover consisted of small woody debris, undercuts, overhanging vegetation, and deep pools. Gradient was low. Historic fisheries data for this site classify fish sensitivity as high (Terasen Pipeline [Trans Mountain] Inc., 2005).

Site Location 27 (Snaring River)

Sampling was not conducted as existing fisheries information was available for the Snaring River.

Fish Species Captured

Northern Pike

Northern pike were captured or observed in Site locations 5, 11, and 21. Fish observed and captured within the project area ranged from 10 cm to 15 cm, and likely were hatched within these watercourses in spring of 2015.

Brook Trout

Brook trout were captured in Site locations 15 and 19. Fish observed and captured within the project area ranged from 4.4 cm to 17 cm.

5.3.2 Regulatory Context

5.3.2.1 Fisheries and Oceans Canada - *Fisheries Act*

Proposed construction works within or around water that have the potential to affect fish or fish habitat must be constructed and operated in compliance with the federal *Fisheries Act*. The *Fisheries Act* prohibits serious harm to fish that are part of, or support, a commercial, recreational or Indigenous fishery. Serious harm to fish is defined as “the death of fish or any permanent alteration to, or destruction of, fish habitat” (DFO, 2013a, 2013b). The *Fisheries Act* also has provisions that: prohibit the deposit 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 self-assess to determine if projects near water require DFO review. The Self-Assessment Process outlines types of waterbodies and project activities, along with associated criteria, where DFO review may not be required. If a project takes place in a waterbody type listed in the DFO Self-Assessment Process or the activity associated with a project is included in the Self-Assessment Process and the criteria associated with that activity are met, then review by DFO is not required (DFO, 2015). Proponents are still required to avoid causing serious harm to fish by providing mitigation such as those measures described in the Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO, 2013b).

If a project proponent is unable to meet the above criteria, then the project must be submitted to DFO for review. If it is determined during the review that the project will not cause serious harm to fish, the project may be allowed to proceed as planned, or may be allowed to proceed with additional mitigation. If, however, it is determined that the project is likely to cause serious harm to fish notwithstanding the application of proposed mitigation measures, proponents must apply for a *Fisheries Act* authorization (Paragraph 35[2][b] of the *Fisheries Act*) from the responsible Minister. The authorization process will require proponents to demonstrate that measures and standards have been applied to first avoid, then mitigate and then finally, offset any residual serious harm to fish. None of the planned works were determined to require DFO review.

5.3.2.2 Transport Canada - *Navigation Protection Act*

The *Navigation Protection Act* (*NPA*) (formerly the *Navigable Waters Protection Act*) is a federal law administered by Transport Canada which came into effect April 1, 2014 and is designed to protect the public right of navigation. The Navigation Protection Program (formerly the Navigable Waters Protection Program) ensures that works constructed in navigable waterways are reviewed and regulated to reduce the risks to navigation and is enforced under the provisions of the *NPA*. A “work” is defined as any structure, device or thing—temporary or permanent—made by humans that is in, on, over, under, through, or across any navigable water. A navigable water is any waterway capable of carrying a vessel of any size (e.g., canoe/kayak) and where the public has the right to navigate the water as a highway).

Under the new legislation, a list of Scheduled Waters was introduced to indicate navigable waterways under the *NPA* which require regulatory approval and Notice to the Minister for any works on those waterways that may interfere with navigation. For non-scheduled navigable waters, the Minor Works Order and the Minor Repairs Order were developed to allow for works to proceed without Notice to the Minister as long as the works comply with the requirements of the Orders. Works meeting the criteria under the Minor Works Order are classed as “designated works” and include the following classes of works (Transport Canada, 2016):

- Erosion-Protection Works
- Aerial Cables — Power and Telecommunication

It is the responsibility of the owner of the works to ensure the works meet the legal requirements set out in the Orders and that the works do not impede with the public right of navigation by allowing free and unobstructed passage over the waterway. All of the watercourses assessed were not listed under the list of Scheduled Waters and were, therefore, assessed under the Minor Works Order except the Athabasca River, which is listed as a Scheduled Water. Mitigations measures will be developed in accordance with Ministerial approval for Scheduled Water and in accordance with the Minor Works Order for non-scheduled navigable waters.

5.3.2.3 Species at Risk Act

Environment and Climate Change Canada (ECCC) has a shared responsibility for implementation of the *SARA* with Parks Canada and DFO. *SARA* represents a federal government commitment to prevent indigenous species, subspecies, and distinct populations from becoming extirpated or extinct and secure the necessary actions for their recovery. It provides for the legal protection of wildlife species and the conservation of their biological diversity.

SARA protects endangered/threatened species listed on Schedule 1 of *SARA* found on federal land (e.g., national parks). Protection extends to the individuals of the species as well as their critical habitat. An order may be made under subsection (2) of Section 34 to extend protection of species and their habitat to lands that are not federal lands.

No fish species identified within the Project Footprint were listed under the *SARA*.

5.3.2.4 Canadian National Parks Act

Under the *CNPA*, Parks Canada requires a Research and Collection Permit be obtained prior to work that involves collecting, holding, or sampling fish for inventory, research, educational, or promotional purposes. If project activities are to be conducted within an isolated work area in a fish-bearing watercourse, a Parks Canada Research and Collection Permit will be required for fish salvages of the isolations prior to construction activities.

5.3.3 Aquatic Wildlife and Ecosystems Effects Assessment

This subsection presents the assessment of the potential effects of the Project on aquatic wildlife and ecosystems. The potential effects are identified in consideration of the existing conditions information presented in Section 5.3-2, and the potential residual effects are characterized and assessed according to the methods presented in Section 4.

5.3.3.1 Identification of Potential Effects, Mitigation Measures and Residual Effects

The potential effects associated with the construction and operations of the Project (as outlined in Section 2.5) on aquatic wildlife and ecosystems were identified by the assessment team. The potential effects identified for aquatic wildlife and habitat are:

- Alteration of natural surface water flow patterns
- Increased surface runoff
- Alteration or loss of riparian habitat function
- Reduction in surface water quality
- Fish mortality and injury
- Interbasin transfer of aquatic organisms

The key mitigation measures proposed in Table 5.3-5 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys and Walker, 1998). =

The potential residual effects listed in Table 5.3-5 were identified according to the method described in Section 4, which considers the effects remaining after mitigation is implemented.

The following potential effects on aquatic wildlife and ecosystems are eliminated through the implementation of mitigation:

- Alteration of natural surface water flow patterns
- Increased surface runoff
- Direct mortality or injury to fish due to project activities
- Interbasin transfer of aquatic organisms

Localized Alteration of Natural Drainage Patterns

The potential effects associated with the localized alteration of natural drainage patterns were considered to be minimal, since standard construction mitigation measures are designed to avoid circumstances that result in the diversion or unnatural retention of water, including culverts. With the implementation of the proposed key mitigation measures identified in Table 5.3-5, no potential residual effects were identified for this potential effect.

Increased Surface Runoff

The potential effects associated with increased surface runoff were considered to be minimal, since natural ground cover will be retained to the greatest extent practical along the transmission line and at the substation. With the successful implementation of the proposed key mitigation measures identified in Table 5.3-5, no potential residual effects were identified for this potential effect.

Direct Mortality or Injury to Fish due to Project Activities

The potential effects associated with direct mortality or injury to fish due to project activities minimal, due to the lack of planned instream work and avoidance of culvert installation for vehicular crossings. With the successful implementation of the proposed key mitigation measures identified in Table 5.3-5, no potential residual effects were identified for this potential effect.

Table 5.3-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Aquatic Wildlife and Ecosystems

Potential Effect	Project Component	Geographic Extent	Key Mitigation Measures [Project EPP Reference]	Potential Residual Effect(s)
1. Alteration of natural surface water flow patterns	Entire Project	LA	• Limit disturbance to natural drainage channels during grading, avoid blocking channels with graded material, and avoid installation of culverts. • Do not place windrowed or fill material in watercourses, waterbodies, or marsh or shallow water wetlands during grading. • Backfill to the surface and mound to allow for drainage away from the structure and settlement of soils. Mounding should not exceed 30 cm above grade. • Feather-out excess spoil from structure excavations. • Restore area around structures and along the travel lane to as close to pre-construction contours as practical during reclamation. • Unless culverts were installed during surface preparation activities, remove approaches to prevent blockage of spring runoff in ditches. • Ensure topsoil berms do not interfere with local surface water drainage patterns. Do not store topsoil in low areas. • Maintain drainage across the proposed transmission line right-of-way during all phases of construction. Carry out construction activities in a manner that mitigates ponding of water or channelization of surface flow. • Remove temporary crossing structures prior to spring freshet. Mechanically breach ice bridges and snowfills to the natural ice level prior to spring break-up. • Construct temporary vehicle and equipment crossings in accordance with the Alberta *Code of Practice for Watercourse Crossings*. • Retain backup equipment (such as pumps and generators) onsite and ready to use immediately in the event that any operating equipment fails during crossing activities. • Watercourses should not be realigned or straightened in any way nor have their hydraulic characteristics changed.	• No potential residual effect was identified for localized alteration of natural drainage patterns

Table 5.3-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Aquatic Wildlife and Ecosystems

Potential Effect	Project Component	Geographic Extent	Key Mitigation Measures [Project EPP Reference]	Potential Residual Effect(s)
2. Increased surface runoff	Related facilities Permanent access Temporary access	LA	• Ensure runoff, storm, and melt water from the substation site do not directly drain into a watercourse or waterbody. • Establish vegetation cover in disturbed, non-gravelled areas where possible.	• No potential residual effect identified
3. Alteration or loss of riparian habitat function	Proposed transmission line right-of-way Permanent access Temporary access	Project Footprint	• Use existing bridges and crossings where possible to minimize the development of new crossings. • Maintain compatible vegetation or vegetated ground mat within the riparian area of watercourses, waterbodies, and marsh or shallow water wetlands where the right-of-way crosses these areas, to the extent practical. • Where ground disturbance is anticipated, topsoil will be salvaged and replaced. Topsoil depth will depend on soil type, but the upper 15 cm of a forest soil will be considered sufficient. Additional and separate salvage and replacement of the upper 2.5 cm of the topsoil may be directed by Parks Canada if a source of seeds of native plants is required [Appendix C: Axys and Walker, 1998 – Section 5.2.8.2]. • Restore native vegetation along disturbed areas of the proposed right-of-way by seeding disturbed non-wetland areas with native seed or implementing seeding alternatives outlined in Section 5.2.8.2 [Section 9.0, Appendix C: Axys and Walker, 1998]. • Where additional protection of topsoil is warranted, apply geotextile and gravel, or access matting as needed. • Use low ground pressure equipment and/or install access mats, matting, and geotextiles or construct a subsoil ramp, to limit effects to watercourses, waterbodies, and marsh or shallow water wetlands, if warranted and if surface conditions require (i.e., non-frozen). ***Works In-and-About a Stream:*** • Brushing on the right-of-way will not be permitted within 10 m of the high watermark of any stream unless: - a vehicle crossing structure is required at the stream to access work sites on either side of the stream; and - maintenance sites fall within this buffer zone [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2].	• Direct or indirect alteration or loss of riparian habitat function resulting from Project activities

Table 5.3-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Aquatic Wildlife and Ecosystems

Potential Effect	Project Component	Geographic Extent	Key Mitigation Measures [Project EPP Reference]	Potential Residual Effect(s)
3. Alteration or loss of riparian habitat function (cont'd)	See above	See above	• Brushing widths will be limited within the 10 m buffer zone to a 5 m wide corridor for access purposes (e.g., bridge installation), unless otherwise approved by Parks Canada. Where trenching activities are required for maintenance purposes within this zone, brushing will be restricted to the width of the permanent right-of-way [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. • No off right-of-way clearing or brushing for extra workspace development will be undertaken within the 10 m buffer zone, unless otherwise authorized by Parks Canada. Any off right-of-way extra workspace required for operations will be located beyond this zone [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. • Where right-of-way brushing is permitted within the 10 m buffer zone, walk-down small trees and shrubs or complete brushing by hand. All slash will be removed from the zone for disposal [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. Where right-of-way brushing is permitted within the 10 m buffer zone, walk-down small trees and shrubs or complete brushing by hand. All slash will be removed from the zone for disposal [Axys and Walker, 1998 – Section 5.2.7.2]. • Where pre-construction bank conditions are contributing to a stream's productive capacity for fish (e.g., vertical or overhanging bank structure, overhanging vegetation, large organic debris [LOD]), appropriate bank restoration measures will be undertaken to restore original habitat components to the degree possible, thus avoiding reductions in stream productive capacity. The use of such restoration techniques as vegetated crib walls, brush layering or live staking [see Figures 5.2.7-6 to 5.2.7-8, Appendix 3] will be reviewed with Parks Canada personnel in the development of the restoration plan [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2].	• See above

Table 5.3-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Aquatic Wildlife and Ecosystems

Potential Effect	Project Component	Geographic Extent	Key Mitigation Measures [Project EPP Reference]	Potential Residual Effect(s)
4. Reduction in surface water quality	Proposed transmission line right-of-way Permanent access Temporary access	LA	• Where right-of-way brushing is permitted within the 10 m buffer zone, walk-down small trees and shrubs or complete brushing by hand. All slash will be removed from the zone for disposal [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. Where right-of-way brushing is permitted within the 10 m buffer zone, walk-down small trees and shrubs or complete brushing by hand. All slash will be removed from the zone for disposal [Axys and Walker, 1998 – Section 5.2.7.2]. • Where pre-construction bank conditions are contributing to a stream's productive capacity for fish (e.g., vertical or overhanging bank structure, overhanging vegetation, large organic debris [LOD]), appropriate bank restoration measures will be undertaken to restore original habitat components to the degree possible, thus avoiding reductions in stream productive capacity. The use of such restoration techniques as vegetated crib walls, brush layering or live staking [see Figures 5.2.7-6 to 5.2.7-8, Appendix 3] will be reviewed with Parks Canada personnel in the development of the restoration plan [Appendix C: Axys and Walker, 1998 – Section 5.2.7.2]. • Where practical, locate structures at least 30 m from the high watermark of watercourses, waterbodies, and marsh or shallow water wetlands to maintain ground cover and prevent erosion. • Inspect any temporary erosion and sediment control structure installed on approach slopes on a regular basis throughout crossing construction. Repair the structures, if warranted, as soon as practical after noticing repairs are necessary. • Use techniques to reduce water erosion, where warranted (such as, install cross-ditching to intercept and divert surface runoff from roadways to areas of heavy vegetation or brush; or install berms to direct surface water to a protected ditch). • Install berms on approach slopes to watercourses, waterbodies, and wetlands, as warranted, where soil erosion is anticipated to be high. Erect silt fences or other sediment control structures near the base of approach slopes to watercourses, waterbodies, and wetlands prior to grading, where disturbed soil will be within 10 m of a riparian area or the banks of a watercourse.	• Reduction in surface water quality due to increased sediment concentrations resulting from erosion from approach slopes and banks

Table 5.3-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Aquatic Wildlife and Ecosystems

Potential Effect	Project Component	Geographic Extent	Key Mitigation Measures [Project EPP Reference]	Potential Residual Effect(s)
4. Reduction in surface water quality (cont'd)	See above	See above	• Store mineral spoil a minimum of 5 m from embankments, slumps, cuts, pits, watercourses, waterbodies, and marsh or shallow water wetlands and a minimum of 1 m from topsoil windrows. • Where warranted, discharge from dewatering of excavations will flow through a sediment removal system, as approved by the Qualified Environmental Professional. • Pump water from excavation onto stable and well-vegetated areas, tarpaulins, or sheeting in a manner that does not cause erosion or allow any unfiltered or silted water to directly enter a watercourse, waterbody, or wetland. Place pumps on polyethylene sheeting above the high watermark of the watercourse, waterbody, or wetland. • Use dams made of non-earthen material, such as water-inflatable portable dams, concrete blocks, sandbags, sheet piling, clean rock, or other appropriate designs to separate the dewatered work site from flowing water. • If granular material is used to build dams, use clean material that is adequately sized to withstand anticipated flows during construction.	• See above
5. Fish mortality and injury	Transmission line right-of-way Structure locations Related facilities Permanent access Temporary access	LA	• For any construction activities near or within watercourses, follow all applicable DFO *Measures to Avoid Causing Harm to Fish and Fish Habitat* (DFO, 2013b) to comply with the federal *Fisheries Act*. • In the event that water is withdrawn from watercourses, waterbodies, or wetlands during concrete preparation or ice bridge construction, place pump intakes in a manner that they do not disturb the streambed (including placing intakes 300 mm above the streambed). Screen intakes with a maximum mesh size of 2.54 mm and approach velocity of 0.038 m/s. Where pumps larger than 15 cm in diameter are used, place the intakes in a mesh cage (2.54 mm) to reduce the approach velocity to which fish are exposed and to prevent fish and eggs from being impinged on the intakes. • Withdraw no more than 10% of the instantaneous streamflow at any given time, if water extraction from watercourses is necessary. Withdraw no more than 5% of volume from waterbodies, if water extraction from standing water is necessary.	• No potential residual effect identified

Table 5.3-5. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Aquatic Wildlife and Ecosystems

	Potential Effect	Project Component	Geographic Extent	Key Mitigation Measures [Project EPP Reference]	Potential Residual Effect(s)
5.	Fish mortality and injury (cont'd)	See above	See above	• Implement mitigation measures identified in point (4) of this table to reduce instream sediment deposition that could harm developing fish eggs, embryos, or juveniles within the streambed, as well as to reduce suspended sediments in the water that could cause abrasions of fish gill tissue. • Project personnel are not permitted to fish on the work site.	• See above
6.	Interbasin transfer of aquatic organisms	Transmission line right-of-way Temporary access Permanent access	LA	• Ensure that all construction equipment is clean prior to crossing any watercourse, waterbody, or wetland. • Ensure that any water withdrawn from one drainage basin will not enter surface waters in another drainage basin to prevent interbasin transfer of aquatic organisms or diseases.	• No potential residual effect identified

Interbasin Transfer of Aquatic Organisms

The potential effects associated with interbasin transfer of aquatic organisms were considered to be minimal since no instream work is planned and the project is entirely within a single basin. With the successful implementation of the proposed key mitigation measures identified in Table 5.3-5, no potential residual effects were identified for this potential effect.

5.3.3.2 Characterization of Potential Residual Effects

The method set out in Section 4 was adopted for the characterization of potential effects for aquatic wildlife and ecosystems.

Alteration or Loss of Riparian Habitat Function

Riparian vegetation within the Project Footprint will be disturbed during construction activities, particularly for construction of temporary vehicle and equipment crossings. During construction, disturbance to riparian vegetation will be kept to a minimum, leaving as much existing vegetation intact as practical, and measures to control erosion and sedimentation in disturbed areas will be implemented. Disturbed riparian areas will be seeded during post-construction activities with the appropriate seed mix, based on consultation with the applicable regulatory authority, landowners, and the Qualified Environmental Professional. Additional associated key mitigation measures are presented in the Project EPP (Appendix 1).

The potential residual effect of construction on clearing riparian vegetation is of short to extended-term duration, depending on the pre-existing vegetation community. For example, grasses are expected to grow back in the short-term, and shrubs regenerate within several years (medium-term), however, tree regrowth will extend beyond the operational life of the Project and, therefore, has a duration of extended-term. Clearing or disturbance of riparian vegetation can affect fish and instream habitat through: an increase in sedimentation in the watercourse; decreased bank and approach stability; decreased leaf litter and woody debris; reductions in stream shading potential; increased water temperatures; and the loss of instream and overhead cover (Murphy and Meehan, 1991; Platts, 1991). Riparian vegetation structure and aquatic ecosystems, if disturbed, will be reclaimed following construction as per the mitigation outlined in Table 5.3-5, the Project EPP (Appendix 1) and the Best Available Methods for Common Leaseholder Activities Guidelines (Axys and Walker, 1998). Reclamation and monitoring will continue for 5 years following Project construction until reclamation is determined to be on a trajectory to meet the MO/DERS established in the Terms of Reference (Parks Canada, 2015), or baseline environmental conditions. The MO/DERs will be verified prior to construction to establish a baseline of pre-disturbance status and conditions.

The potential residual effect is of moderate magnitude, since construction and maintenance activities will result in a measurable change to the biophysical function and a measurable loss in function. The potential residual effect is short to extended-term in duration, of moderate magnitude, and reversible, therefore, the potential residual effect is rated low.

Reduction in Surface Water Quality due to Increased Sediment Concentrations Resulting from Erosion from Approach Slopes and Banks

If bank grading is required, it is possible for some erosion to occur on approach slopes and banks that could cause inputs of sediments to surface water. Any sediments resulting from erosion will be carried downstream within the SA associated with the transmission line until it disperses and naturally settles out.

Although erosion and entry of sediment to watercourses may occur from approach slopes and banks, the proposed mitigation measures are expected to reduce the magnitude of suspended sediment effects on surface water quality to minor to moderate levels, depending upon the amount of grading required, and the stability and slope of the bank. This potential residual effect is short-term in duration, and reversible. Consequently, the potential residual effect is rated low.

Combined Residual Effect(s) on Aquatic Wildlife and Ecosystems

Changes riparian habitat and reduction in surface water quality are inherently related and may interact to have a combined effect on aquatic wildlife and ecosystems. The criteria characterization for the combined effect on aquatic wildlife and ecosystems assumes non-independence between effects pathways. With the implementation of key mitigation measures presented in Table 5.3-5, the residual effect of the combined effect on aquatic wildlife and ecosystems as a result of Project construction and operations is considered to be extended-term in duration, and minor to moderate in magnitude (Table 5.3-6).

The characterization and criteria rating determination of the residual effects of the construction and operations of the electrical transmission line, and the decommissioning of Palisades, on aquatic wildlife and ecosystems is summarized in Table 5.3-6. The criteria ratings are based on the rationale described above, and in consideration of the context described in Sections 5.3.2.

Table 5.3-6. Residual Effects Characterization for Aquatic Wildlife and Ecosystems

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Direct or indirect alteration or loss of riparian habitat function resulting from Project activities	**Context:** The sensitivity of riparian habitat and function varies among watercourses depending upon the reliance of resident fish species on the particular riparian habitat, riparian habitat attributes (such as, rarity and importance to different life stages of fish), and the nature and timing of disturbance. For example, resilience is expected to be greater in riparian areas with vegetative communities that recover more rapidly, while resilience is expected to be lower in riparian communities subjected to more severe growing conditions. The successional stage of the plant community may also affect resilience (e.g., old growth forests are less resilient than younger forest communities).	
	Geographic Extent: Project Footprint	Clearing or disturbance of riparian vegetation is confined to the area of disturbance along the Project Footprint.
	Duration: Short to extended-term	The duration varies depending upon the pre-existing vegetation community and corresponding regrowth time (e.g., grasses [short-term], shrubs [medium-term], or trees [long-term]); vegetation regrowth may extend beyond the operational life of the Project (extended-term).
	Frequency: Isolated to occasional	The direct or indirect alteration or loss of riparian habitat function resulting from Project activities may result from construction (isolated) or from operations and maintenance (occasional) activities of the Project.
	Reversibility: Reversible	The effects of direct or indirect alteration or loss of riparian function resulting from Project activities are reversible to pre-construction or equivalent conditions.
	Magnitude: Moderate	Direct or indirect alteration or loss of riparian function is of moderate magnitude, with the successful implementation of key mitigation measures.

Table 5.3-6. Residual Effects Characterization for Aquatic Wildlife and Ecosystems

Potential Residual Effect	Criteria Rating	Effects Characterization
b. Reduction in surface water quality due to increased sediment concentrations resulting from erosion from approach slopes and banks	**Context:** The sensitivity of a watercourse to increased concentrations of suspended solids resulting from erosion from approach slopes and banks depends on the fish species present (e.g., watercourses containing salmonid species are likely to be more sensitive then watercourses containing only cyprinid or other small bodied fish species). The sensitivity of the watercourse to erosion from approach slopes and banks is also influenced by several physical factors such as existing riparian vegetation and bank shape, height, and stability (e.g., steep and unstable banks are likely to be more susceptible to erosion).	
	Geographic Extent: Aquatic SA	Any sediment caused by erosion will be carried downstream until it disperses and naturally settles out.
	Duration: Short to medium-term	Depending upon the watercourse, duration may vary. For watercourses with gentle banks and approach slopes, vegetation may be re-established on the approach slopes and banks within 1 year of construction (short-term), while revegetation of steeper approach slopes and banks may take longer than 1 year (medium-term).
	Frequency: Isolated to occasional	Erosion from approach slopes and banks may occur due to proposed transmission line right-of-way clearing during the construction phase or due to grading of vehicle approaches during construction or operations.
	Reversibility: Reversible	Reduction in surface water quality due to erosion will return to pre-construction or equivalent conditions after the banks have been restored and stabilized, and vegetation has re-established.
	Magnitude: Minor to moderate	Depending on the amount of erosion that occurs, magnitude may vary. For watercourses with gentle banks and approach slopes, vegetation may be re-established on the approach slopes and banks within 1 year of construction resulting in less erosion (minor magnitude). Some watercourses may have unstable, vertical and erosional banks, will erode more and contribute to increased sediment concentrations within a watercourse (moderate magnitude).
c. Combined Effect of the Project on aquatic wildlife and ecosystems	**Context:** Changes riparian habitat and reduction in surface water quality are inherently related and may interact to have a combined effect on aquatic wildlife and ecosystems. Loss of riparian areas or function can contribute to increased sedimentation and a resulting decrease in surface water quality.	
	Geographic Extent: Aquatic SA	The combined effect on aquatic wildlife and ecosystems may extend beyond the Project Footprint to the SA.
	Duration: Extended-term	Combined effects of the Project on aquatic wildlife and ecosystems will extend beyond the operations phase of the Project, until vegetation has regenerated in the Project Footprint to conditions similar to pre-construction or adjacent habitats.
	Frequency: Continuous	Combined effects on aquatic wildlife and ecosystems will occur continuously over the life of the Project and following decommissioning until habitat is restored.
	Reversibility: Reversible	The combined effect on aquatic wildlife and ecosystems will be reversible following decommissioning of the Project and restoration of natural vegetation communities.
	Magnitude: Minor to moderate	The key mitigation measures outlined in Table 5.3-5 are expected to mitigate the combined effect on aquatic wildlife and ecosystems to minor to moderate in magnitude.

5.3.4 Summary and Recommendations

During construction, CH2M recommends that appropriate mitigation measures, as provided in Table 5.3-5 and in the Project EPP (Appendix 1), be implemented to address potential effects of the Project on aquatic wildlife and ecosystems. It is recommended that work sites near watercourses and drainages be monitored for adherence to mitigation measures, in particular, those related to protection of riparian areas, and implementation and maintenance of erosion and sediment control measures.

With the implementation of the proposed key mitigation measures, and as identified in Table 5.3-5, the potential residual effects of the Project on aquatic wildlife and ecosystems will range from minor to moderate in magnitude.

5.3.5 Cumulative Effects Assessment

Alteration or loss of riparian habitat function

The Project will act cumulatively with existing activities and reasonably foreseeable developments (Section 4.8 of the DIA) to affect aquatic wildlife and ecosystems in JNP. Activities such as bridge repair and the Kinder Morgan Canada Inc. (KMC) project (Table 4.9-1) have the potential to act cumulatively on the alteration or loss of riparian areas or function. Given the Project's routing (i.e., paralleling existing linear corridors for 99 percent of its length), landscape-scale cumulative effects are unlikely to occur as a result of the Project. Furthermore, key mitigation measures to reduce effects on riparian habitat will be implemented to reduce Project effects and the Project's potential to interact cumulatively with other habitat disturbances (Table 5.3-5). Other operators of existing activities and reasonably foreseeable developments within the RA (e.g., KMC, Parks Canada) are expected to implement mitigation to reduce the loss or alteration of wildlife habitat and reduce incremental cumulative effects. No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.3-5 are recommended. The cumulative effect of the loss and alteration of riparian habitat is reversible in time with habitat restoration, and is anticipated to be of moderate magnitude.

Reduction in Surface Water Quality

The Project will act cumulatively with existing activities and reasonably foreseeable developments (Section 4.8 of the DIA) to affect aquatic wildlife and ecosystems in JNP. Existing activities that have affected aquatic wildlife and ecosystems in the RA are largely attributed effluent and point source contamination. Activities such as bridge repair and the KMC project (Table 4.9-1) have the potential to act cumulatively on the reduction in surface water quality. Given the Project's routing (i.e., paralleling existing linear corridors for 99 percent of its length), landscape-scale cumulative effects are unlikely to occur as a result of the Project. Furthermore, key mitigation measures to reduce effects on surface water quality will be implemented to reduce Project effects and the Project's potential to interact cumulatively with other disturbances (Table 5.3-5). Other operators of existing activities and reasonably foreseeable developments within the RA (e.g., KMC, Parks Canada) are expected to implement mitigation to reduce effects to surface water quality and reduce incremental cumulative effects. No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.3-5 are recommended. The cumulative effect of the reduction in surface water quality is reversible, and is anticipated to be of minor to moderate magnitude.

Combined Effect of the Project on Aquatic Wildlife and Ecosystems

The Project may act cumulatively with all existing sources, and reasonably foreseeable sources, of alteration of riparian habitat function and reduction in surface water quality. As outlined in Section 5.3.3.2, these sources may all interact and have a combined effect on aquatic wildlife and ecosystems. However, given the Project's extensive paralleling of existing linear corridors (99 percent), and the proposed key mitigation measures as outlined in Table 5.3-5, the Project is expected to have a small incremental cumulative effect on aquatic wildlife and ecosystems. The combined cumulative effect of the Project and other activities within the RA is considered to be of minor to moderate magnitude, reversible, and extended-term in duration.

5.3.6 References

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5.3.6.2 GIS Data and Mapping References

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5.3.7 Photographs

Photo 5.3-1. Site Location 1 spring upstream view

Photo 5.3-2. Site Location 5 beaver dam upstream of Highway 16, limiting flow into downstream reach

Photo 5.3-3. Site Location 5 isolated pocket with juvenile northern pike

Photo 5.3-4. Site Location 6 dry boulder garden

Photo 5.3-5. Site Location 6 spring flowing over boulders

Photo 5.3-6. Site Location 11 view downstream

Photo 5.3-7. Site Location 11 juvenile northern pike

Photo 5.3-8. Site Location 13 view downstream

Photo 5.3-9. Site Location 14 view downstream from existing right-of-way towards confluence with KP 21.1

Photo 5.3-10. Site Location 15 view downstream within existing right-of-way

Photo 5.3-11. Site Location 18 Vine Creek cobble-boulder garden habitat. View upstream towards existing access road

Photo 5.3-12. Site Location 19 view upstream of channel near the existing right-of-way

Photo 5.3-13. Site Location 19 view downstream beaver pond area

Photo 5.3-14. Site Location 21 view downstream towards pond area

5.4 Wetlands and Hydrology

5.4.1 Existing Conditions and Ecological Context

This subsection summarizes the existing information regarding wetlands (i.e., aquatic ecosystems), including the related aspects of hydrology, and hydrogeology encountered by the Project Footprint. The scope and methods necessary to adequately assess wetlands were determined using the guidance of federal and provincial policies and legislation.

5.4.1.1 Spatial Boundaries

Spatial boundaries were determined by the potential zones of interaction between aesthetics and visual resources and the Project. The project components were considered in relation to a Project Footprint (the Project Footprint, as defined in Section 4.3.1 of the DIA).

- The Project Footprint is the area directly disturbed by Project activities, including associated physical works and activities (i.e., right-of-way, structure locations, permanent access and temporary workspace, laydown areas, temporary access, substation and decommissioning activities at Palisades).
- The Wetlands and Hydrology SA is defined as a 2 km wide band centered on the transmission line and substation.

5.4.1.2 Overview of Existing Conditions

The Project is located entirely within JNP, within the Athabasca River Basin. The Project Footprint crosses several named watercourses including the Athabasca River, which are discussed in Section 5.3 of the DIA. The Athabasca River originates from the Columbia Glacier and flows north and east through the park and drains into the Peace-Athabasca Delta. The Athabasca River and its numerous tributaries provide unique habitat for wildlife along the shores, riparian and adjacent wetland areas. A number of swamps, marshes and shallow open water wetlands identified within the SA are surficially connected to the tributaries of the Athabasca River.

Wetlands are important ecosystems and provide numerous functions, including habitat for a variety of species (e.g., waterfowl, amphibians, invertebrates, and hydrophytic plants), hydrological attributes (e.g., water storage and groundwater recharge), and biogeochemical properties (e.g., carbon sequestration, sediment retention, and nutrient cycling) in the surrounding landscape. Various wetland classes perform different types of wetland functions and no individual wetland can provide all the functions necessary to maintain a natural equilibrium within the environment.

Wetland and Hydrology Desktop Review and Wetland Delineations

A desktop review of relevant and available documents, maps and databases was conducted to assist with the description of wetland ecosystems, hydrology and hydrogeological features encountered by the Project Footprint. Documents and maps reviewed to assist with the descriptions include:

- Alberta Wetland Classification System (AWCS) (Government of Alberta, 2015a)
- Wetland Regions of Canada (Energy, Mines and Resources Canada, 1986)
- Distribution of Freshwater – Wetlands (Natural Resources Canada, 2009)
- Facts About Water in Alberta (Government of Alberta, 2010)
- Alberta Water Well Information Database (AEP, 2016)
- Locations of Alberta Springs (Alberta Energy Regulator/Alberta Geological Survey, 2009)
- Digital Flood Hazard Mapping (AESRD, 2013a)

Results of Desktop Review – Wetlands

Wetland Definition

The definition of what constitutes a wetland ecosystem is variable, but most definitions typically include hydrological, habitat, and biogeochemical characteristics.

The AWCS defines wetlands as follows:

> "…land that is saturated with water long enough to promote formation of water altered soils, growth of water tolerant vegetation and various kinds of biological activity which are adapted to wet environments" (Government of Alberta, 2015a).

These definitions encompass a wide range of ecosystems, from fens, bogs, and swamps (i.e., mossy-peat to woody-peat wetlands) to marshes and shallow waters (i.e., mineral and shallow open water wetlands). Wetlands include a wide range of ecosystem types, from those continually inundated by shallow water and dominated by aquatic processes to sites dominated by woody vegetation with unsaturated soils.

Satellite Imagery Interpretation and Wetland Delineation

A desktop review was conducted using satellite imagery interpretation to provide a high-level summary of wetland class and distribution for the Project Footprint. Satellite imagery was reviewed at a scale of approximately 1:2,000 to 1:20,000. Varying scales were utilized to aid in the refinement of wetland delineations and to capture temporary or tree covered wetland features. Wetlands were identified using features such as geomorphology, surficial hydrology, and vegetation. During the wetland satellite imagery interpretation, wetland class and type were assigned according to the AWCS (Government of Alberta, 2015a). A hydroperiod descriptor was also assigned to describe the water permanency of marshes and shallow open waters. Lakes and artificial ponds, although not included in the AWCS, were also considered in this review, since the open water provides potential habitat for waterfowl.

Satellite imagery interpretation was conducted to provide an understanding of overall wetland distribution within the Project Footprint. The inconspicuous physical characteristics of some wetlands may have potentially hindered their identification during satellite imagery interpretation because of their small size or often ephemeral and temporary occurrence within forested areas.

Natural Regions of Alberta

Natural regions in Alberta are geographically defined areas that are mapped based on differences in landscape patterns and physiographic features, such as vegetation, soils, and topography (NRC, 2006). The Project Footprint encounters the Montane Natural Subregion of the Rocky Mountain Natural Region.

The Montane Natural Subregion occurs at lower elevations along the front ranges and along the upper elevations of the Porcupine Hills and Cypress Hills. The Montane Natural Subregion contains rolling and hilly foothills. In the foothill areas, Orthic Black Chernozems are typical of grassland areas with Orthic Dark Grey Chernozems found in more wooded areas. Eutric Brunisol soils dominate in the river valleys. Vegetation communities are mainly comprised of closed forest communities dominated by lodgepole pine, Douglas-fir, aspen, and white spruce. Deciduous forests occur on fluvial fans, terraces, and floodplains and open grasslands occur on dry and exposed sites. Wetlands are rare in the Montane Natural Subregion, with fens and marshes occupying approximately 2 percent of the subregion (NRC, 2006).

Wetland Regions of Canada

Wetland Regions in Canada are areas defined by characteristics of similar wetland ecosystems that develop in locations with similar topography, hydrology, and nutrient regime. The Project Footprint is located within the South Rocky Mountain wetlands of the Rocky Mountain Wetland Region (Energy, Mines and Resources Canada, 1986). Wetlands occupy approximately < 5 percent of the land cover in the Rocky Mountain Wetland Region (Natural Resources Canada, 2009).

The Project Footprint encounters South Rocky Mountain wetlands within the Rocky Mountain Wetland Region. South Rocky Mountain wetlands occur from in the Rocky Mountain range from approximately the 55° parallel to the United States border. Characteristic South Rocky Mountain wetlands include bogs, fens, and marshes. Peat accumulation is typically less than 1 m (Energy, Mines and Resources Canada, 1986).

Important Waterbodies and Wetlands

The Project Footprint is located within the North American Waterfowl Management Plan (NAWMP) Canadian Intermountain Joint Venture Priority Area (NAWMP, 2013). Regulatory requirements or guidelines specific to this designation have currently not yet been developed for this area.

The Project Footprint does not occur in any Important Bird Areas (Bird Studies Canada and Nature Canada, 2016), Migratory Bird Sanctuaries (Environment Canada, 2016), National Wildlife Areas (Environment Canada, 2016), Western Hemisphere Shorebird Reserves (WHSRN, 2016), Ramsar Wetlands of International Importance (Bureau of the Convention on Wetlands, 2015), or World Biosphere Reserves (UNESCO, 2016).

Environmentally Sensitive Sites

Pocahontas Ponds is designated as an environmentally sensitive site (ESS) within JNP, as it requires special protection but does not fit within the National Park Zoning System. Pocahontas Ponds are important habitat for a variety of wildlife, including rare species found within the park. Development and construction in the area can result in a change to natural patterns of sedimentation and erosion, and disruption to wildlife (Parks Canada, 2010) The Project was routed parallel to the Trans Mountain pipe in this area to avoid Pocahontas Ponds.

Results of Desktop Review - Hydrology

Athabasca River Basin

The Athabasca River is Alberta's longest river, originating from the Athabasca Glacier in JNP and flowing northeast across the province, draining into Lake Athabasca. The Athabasca River Basin has a drainage area of approximately 138,000 km^2 (Regional Aquatics Monitoring Program [RAMP], 2015). The Project Footprint is located in the Upper Athabasca Subwatershed.

The Water Survey of Canada maintains three hydrometric monitoring stations in Alberta near the Project Footprint (i.e., Miette River near Jasper, Athabasca River near Jasper, and Athabasca River at Hinton). The data from these stations shows flow patterns in the Athabasca and Miette rivers that are influenced by local snowmelt and precipitation and also influenced by glacial snowmelt and precipitation. Flows are highest during the spring (April) and early summer (June) and flows typically decline during the late summer and fall. The lowest recorded flows typically occur during the late fall through winter (October to March) (Environment Canada, 2015).

The Athabasca River is designated as a Canadian Heritage River (Canadian Heritage Rivers System, 2011).

Flood Hazard

Flood hazard mapping has not been completed for the area encountered by the Project Footprint (AESRD, 2013a).

Groundwater Quality, Wells and Springs

Groundwater is the water found beneath the ground surface, in the saturated zone, responsible for filling spaces of air between particles, such as sand and gravel (AENV, 2010a). Groundwater quality varies because of the natural differences in geology, such as presence of sand and gravel, and hydrology, such as precipitation and soil moisture. Groundwater quality can be affected by both natural influences, such as naturally occurring high concentrations of calcium, and anthropogenic influences, such as introduction of fertilizers (AENV, 2010b).

There are 21 known water wells located within 400 m of the Project Footprint. Well uses include monitoring, domestic, municipal, and industrial (AEP, 2016). A 400 m buffer was chosen to provide data for the localized area surrounding the Project Footprint. The legal location and approximate distance of the water wells from the Project Footprint are listed in Table 5.4-1.

There are 10 known springs located within 400 m of the Project Footprint. A 400 m buffer was chosen to provide data for the localized area surrounding the Project Footprint. The legal location and approximate distance of the springs from the Project Footprint are listed in Table 5.4-2.

Table 5.4-1. Summary of Known Water Wells Located within 400 m of the Project Footprint[a]

Legal Location	Approximate Distance from Project Footprint (m)
SE 14-49-27 W5M	35
SE 8-49-27 W5M	103
NE 6-49-27 W5M	29
NE 6-49-27 W5M	108
SW 6-49-27 W5M	287
SW 6-49-27 W5M	245
NW 35-47-1 W6M	39
SW 34-47-1 W6M	158
NW 27-47-1 W6M	137
NW 21-47-1 W6M	109
NE 20-47-1 W6M	81
NW 17-47-1 W6M	310
NE 6-47-1 W6M	79
NW 33-46-1 W6M	261
SW 33-46-1 W6M	82
SW 33-46-1 W6M	340
SE 15-46-1 W6M	218
SE 15-46-1 W6M	19
NE 10-46-1 W6M	258
NW 2-46-1 W6M	147
NW 2-46-1 W6M	130

[a] Given that several records (e.g., well tests, pump tests or chemistry reports) may be listed for a single well, each with a different well ID, only unique well locations have been provided (AEP, 2016).

Table 5.4-2. Summary of Springs Located within 400 m of the Project Footprint[a]

Legal Location	Approximate Distance from Project Footprint (m)
SE 8-49-27 W5M	128
NE 6-49-27 W5M	262
NE 6-49-27 W5M	133
SE 6-49-27 W5M	144
NE 13-48-1 W6M	201
NW 35-47-1 W6M	13
SE 34-47-1 W6M	124
NW 27-47-1 W6M	245
NW 21-47-1 W6M	5
SW 33-46-1 W6M	110

[a] Alberta Energy Regulator/Alberta Geological Survey, 2009.

5.4.1.3 Field Studies

Ground-based wetland surveys were conducted from July 8 to 13, 2015 to confirm wetland classes and to refine wetland boundaries along the Project Footprint identified during the desktop review. Wetlands were classified according to the AWCS (Government of Alberta, 2015a) and key indicators such as hydrologic setting (i.e., geomorphology and hydroperiod), vegetation, substrate (i.e., mineral or peat), habitat, and existing anthropogenic disturbances (e.g., existing roads) were used in wetland characterization.

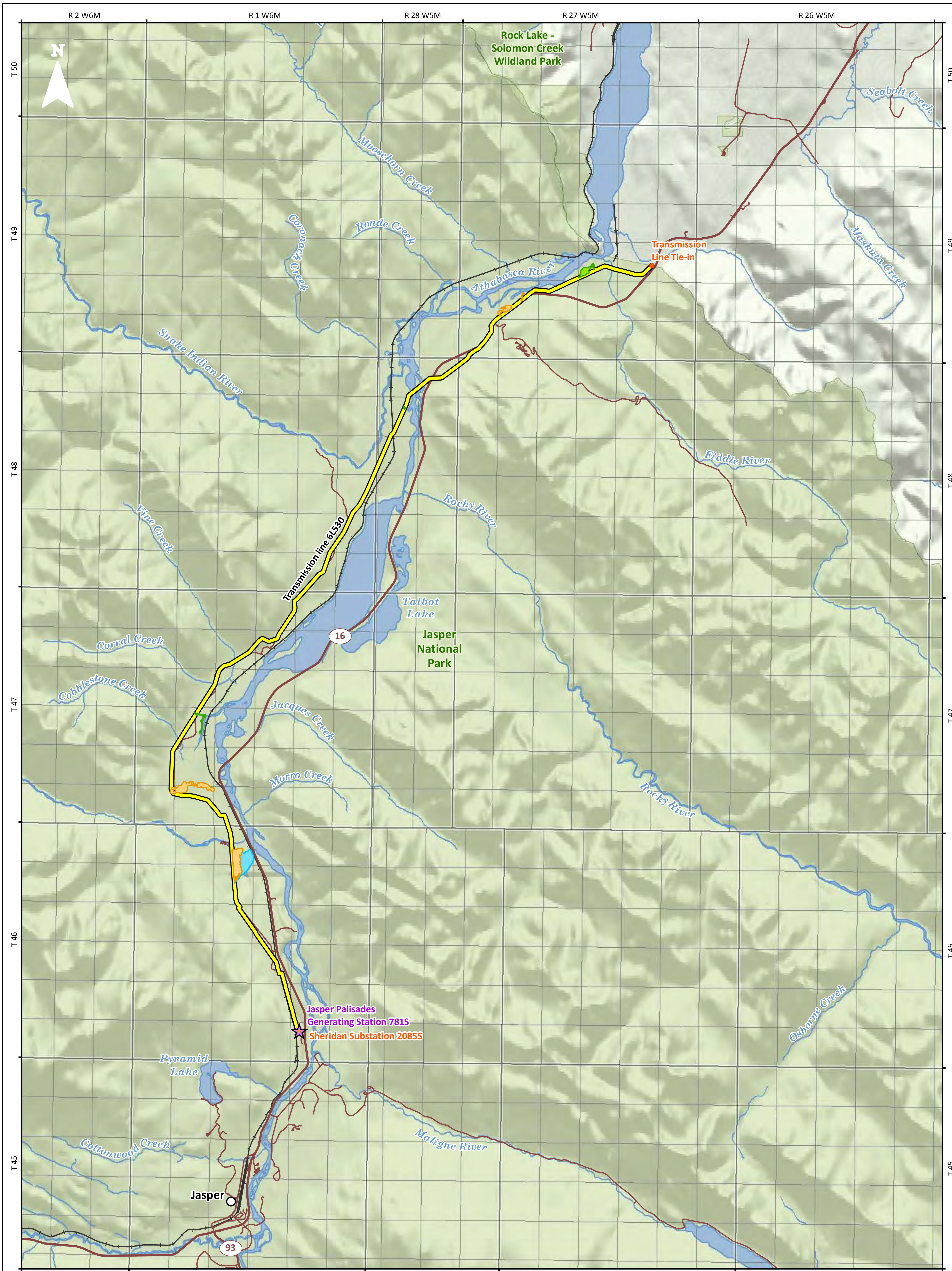
During the ground-based wetland surveys, representative wetland classes were visited to obtain information (e.g., substrate composition, vegetation cover, and hydrologic flow) for each class of wetland encountered by the Project Footprint. Within the Project Footprint, commonly occurring wetlands (e.g., marshes and swamps) are relatively homogenous. Ground-based wetland surveys conducted at each representative wetland allowed for the appropriate mitigation to be recommended for wetlands encountered by the Project Footprint.

A total of 9 wetlands were identified as crossed by the right-of-way, covering a total area of 1.52 ha (4.8 percent of proposed route). Wetlands classes identified include marshes, swamps, and shallow open water wetlands.

Riparian zones were not classified as wetlands, as riverine environment transitions from moving water to upland areas was abrupt enough to limit the establishment of stagnant (i.e., lentic) surface water conditions:

- No wetlands were identified within Pocahontas, Devona, Snaring, and Palisades laydown areas
- No wetlands were encountered at the proposed Sheridan Substation 2085S
- No wetlands area encountered by permanent access roads

A summary of the wetlands crossed by the Project Footprint is provided in Table 5.4-3. A high-level overview of wetland distribution along the Project Footprint is depicted on Figure 5.4-1.



Proposed Route		Bog	
Highway		Estuarine Marsh	
Road		Estuarine Meadow	
Railway		Fen	
Watercourse		Marsh	
Waterbody		Shallow Water	
Park/Protected Area		Swamp	

ATCO Electric

SCALE: 1:150,000

0 1 2 3 4 5 km

(All Locations Approximate)

FIGURE 5.4-1

WETLAND OVERVIEW

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Hillshade: TERA 2008; Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Parks/Protected Areas: NRCan 2016, ATPR 2012; Jasper: NRCan 2003; Generating Station, Substation, Proposed Route in JNP: ATCO Electric Ltd. 2016; Wetland: CH2M 2015.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

\\ch2mhill\common\Shares\CNR\GIS_Proj2\VECA\660380\MAP_FILES\WETLANDS\t660380_WETLAND_OV_Rev01_20170530.mxd

Table 5.4-3. Summary of Wetlands Encountered by the Project Components along the Project Footprint

Project Component	Wetland Classification (AWCS)[a] (Approximate Area of Wetlands Crossed [ha])				
	Marsh – Seasonal (III)	Marsh – Semi-permanent (IV)	Shallow Open Water – Permanent (V)	Treed Swamp	Shrubby Swamp
Proposed Route	2 (0.14 ha)	2 (0.12 ha)	1 (0.01 ha)	2 (0.94 ha)	2 (0.31 ha)
Sheridan Substation 2085S	—	—	—	—	—
Pocahontas Laydown Area	—	—	—	—	—
Devona Laydown Area	—	—	—	—	—
Snaring Laydown Area	—	—	—	—	—
Palisades Laydown Area	—	—	—	—	—
Total Number of Wetlands Encountered by Project Footprint by Wetland Class:	**2**	**2**	**1**	**2**	**2**

[a] The delineations are conservative to include the potential anticipated extent of each wetland and are intended to identify the moisture regime transition zone as accurately as possible.

5.4.2 Regulatory Context

The following federal policies and legislation provide guidance for the protection and conservation of wetlands encountered by the Project Footprint.

For wetland and hydrology concerns that are identified to have an absence of regulatory or environmental thresholds, the JNP Management Plan is considered. Relevant federal legislation includes the *Federal Policy on Wetland Conservation* (FPWC).

Federal legislation applies to this Project; however, consultation with federal regulators (i.e., JNP) will confirm whether Provincial wetland regulatory requirements are appropriate for the Project.

Federal Policy on Wetland Conservation

Wetlands are complex ecological systems and, consequently, the evaluation of wetlands tends to focus on wetland function. The FPWC commits all federal departments to the goal of “no net loss” of wetland function on federal lands and waters (Government of Canada, 1991; Lynch-Stewart, 1992; Lynch-Stewart et al*.,* 1996).

The objective of the FPWC is to promote conservation of Canada’s wetlands to sustain their ecological and socio-economic functions. To support this objective, the following goals have been established by the FPWC:

- “No net loss” of wetland function on federal lands or projects
- Enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands or their functions have reached critical levels
- Recognition of wetland functions in resource planning, management, and economic decision making with regard to all federal programs, policies, and activities

The goals of the FPWC have been considered for the Project, given that JNP is federal land. The FPWC will implement offset requirements for permanent wetland disturbance (commonly in the form of financial compensation). However, consultation with federal regulators (i.e., JNP) will confirm whether it is appropriate to defer to the Alberta Wetland Policy requirements applicable to the vicinity of the Project (i.e., the Green Area), as outlined in the following sections. Consultation with federal regulators (i.e., JNP) will ensure that appropriate federal and provincial wetland regulatory requirements are applied to the Project.

Provincial Legislation and Standards for the Green Area of Alberta

Alberta Water Act

The *Water Act* governs activities affecting surface water and wetlands in Alberta, including construction, water diversions, watercourse crossings and infilling of wetlands. The purpose of the *Water Act* is to conserve and protect Alberta's water resources.

Water Act Approval

As of July 2016, the Alberta Wetland Policy is in effect province-wide, including Alberta's Green Area (boreal forest and eastern slopes) (AEP, 2016). Federally-regulated projects may defer to provincial requirements to confirm that the intent of the FPWC is met. For activities seeking approval under the Alberta *Water Act,* regulatory applicants are expected to operate in accordance with all wetland directives, guides and tools developed to implement the Policy (Government of Alberta, 2013, 2015b, 2015c, 2015d).

Regulatory applicants proposing to disturb wetlands, are expected to demonstrate appropriate consideration for avoidance and minimization of wetland impacts, in accordance with the Wetland Mitigation Directive (Government of Alberta, 2015d).

Where an authorized activity results in the permanent loss of wetland area from the landscape, wetland replacement obligations are enacted (AEP, 2016).

Where an authorized activity does not result in the permanent loss of wetland area (through avoidance or minimization of wetland impacts, or due to an explicit requirement/commitment to reclaim all impacted wetland back to wetland), the applicant will not be subject to wetland replacement requirements (AEP, 2016).

To demonstrate wetland mitigation hierarchy (such as avoidance and/or minimization prior to compensation to offset wetland impact), avoiding any infilling or disturbance within wetland boundaries is preferred, to reduce effects on wetlands, regulatory approval requirements, and compensation costs. Compensation will be required to install new structures or construct substation facilities or permanent access roads within wetlands. It should be noted that substation facilities and all-weather permanent access roads for the Project are not anticipated to impact wetlands.

Alberta *Water Act* approvals are generally granted approximately 6 months to a year after the application is submitted. In order to satisfy the conditions of the *Water Act* approval compensation requirement, ATCO Electric must issue any required payment to the approved Wetland Restoration Agency within 30 days following receipt of *Water Act* approval.

Code of Practice Notification

AEP has implemented the following COP to regulate wetland crossing activities associated with transmission lines:

- *Code of Practice for Watercourse Crossings* (i.e., for vehicle and equipment crossings of wetlands excluding during dry or frozen conditions) (AESRD, 2013c).

In the Green Area of Alberta, only mineral and shallow open water wetlands require COP notification, if construction occurs outside of frozen conditions. COP notifications must be submitted to AEP a minimum of 14 days prior to the start of construction. Wetland crossings must be constructed and operated under the terms of the *Code of Practice for Watercourse Crossings (*AESRD, 2013c).

ATCO Electric is intent on achieving the goal of "no net loss" of wetland function during construction and maintenance during operations of the Project. Where feasible, the proposed transmission line has been routed to reduce potential effects on wetlands by implementing routing and design decisions that considered the following:

- Following existing linear infrastructure (e.g., pipelines, transmission lines, and roads)
- Using the shortest route possible
- Using the desktop wetland digitization to identify and initially avoid facility infrastructure within wetlands, where feasible
- Altering the engineering of the structures themselves, so that a greater span can exist between adjacent structures and so that larger wetlands or complexes can be avoided (or, if a wetland cannot be entirely avoided, so that the structure can be placed in the wetland margin instead of the central [i.e.*,* deepest] portion)

Alberta Wetland Policy

Wetlands in Alberta account for approximately 20 percent of the land surface of the province, where 90 percent of these consist of peatlands (i.e.*,* bogs and fens). They are diverse and productive natural systems that provide a variety of ecological services. Wetlands play an important part in maintaining healthy watersheds.

The goal of the Alberta *Wetland Policy* (AESRD, 2013b, 2014a) is to conserve, restore, protect, and manage Alberta's wetlands. To support this goal, the following objectives have been established:

- Wetlands of the highest value are to be protected for the long-term benefit of all Albertans
- Wetlands and their benefits are to be conserved and restored in areas where losses have been high
- Wetlands are to be managed by avoiding, minimizing, and, if necessary, replacing lost wetland value
- Wetland management will be considered in a regional context

The Alberta Wetland Policy was implemented province-wide as of July 2016 (AEP, 2016).

Jasper National Park Management Plan

JNP has a park-specific management plan which provides strategic direction for resource protection, visitor experience, and public appreciation and understanding (Parks Canada, 2010). The management plan identifies Pocahontas Ponds as an ESS and recommends that development projects be constructed in a manner to avoid negative impacts to the area. The Project has been routed to avoid this ESS, as discussed in Section 5.4.1.2.

The Project encounters areas which are the subject of various municipal and regional development plans. These plans provide broad strategic direction for land use planning within their defined areas. The objectives of these management plans were considered in the development of key mitigation measures for the potential effects related to wetland function identified for the Project. A review of these documents did not identify any objectives related to wetland function that may be incompatible with the Project.

5.4.3 Wetland and Hydrology Effects Assessment

With the implementation of the proposed key mitigation measures developed for the Project, the following potential effects on hydrology are eliminated, with no residual effects:

- Alteration of natural surface water flow patterns with respect to localized alteration of natural drainage patterns
- Disruption of groundwater or springs

Localized Alteration of Natural Drainage Patterns

The potential effects associated with the localized alteration of natural drainage patterns were considered to be minimal, since standard construction mitigation measures are designed to avoid circumstances that result in the diversion or unnatural retention of water. Culvert vehicle crossings will be designed in a manner that maintains the natural drainage patterns where they are installed. With the implementation of the proposed key mitigation measures developed for the Project, no potential residual effects were identified for this potential effect.

Disruption of Groundwater or Springs

The potential effects associated with a reduction in groundwater quantity were considered to be minimal, since excavation activities are expected to have a minimal footprint from permanent disturbances such as substations and structure locations. Areas where groundwater or springs may be encountered will be identified during construction. With the successful implementation of the mitigation measures developed for the Project, no potential residual effects were identified for this potential effect.

5.4.3.1 Identification of Potential Effects, Mitigation Measures and Residual Effects

This subsection presents the assessment of potential effects of the Project on wetland function. The potential effects associated with the construction and operations of the Project on wetland function were identified by the assessment team and are listed in Table 5.4-4.

The key mitigation measures proposed in Table 5.4-4 were principally developed in accordance with ATCO Electric standards, industry, and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys and Walker, 1998).

The potential residual effects listed in Table 5.4-4 were identified according to the method described in Section 4.7 of the DIA, which considers the effects remaining after key mitigation is implemented.

Routing is the primary mechanism for avoiding or reducing potential adverse effects of the Project on wetland function. Criteria used during the route selection process are described in detail in Section 2.6 of the DIA.

Table 5.4-4. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Wetland Function

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Potential Residual Effect(s)
1. Loss or alteration of wetland function (i.e., habitat, hydrology, biogeochemistry) during construction and maintenance activities during operations	Entire Project	Wetland and Hydrology SA	• Develop access within and off the right-of-way so that watercourse, waterbody and wetland crossings will be limited. Preference should be given to access options that avoid crossings. • Do not skid or drag trees across watercourses, waterbodies and/or wetlands during non-frozen conditions. Minimize and remove to the extent possible debris falling into watercourses and waterbodies. • Adhere to identified buffers, setbacks and machine-free zones. • Limit vegetation removal in riparian areas to the minimum necessary. • Ensure a 30 m machine-free zone along rivers, lakes or wetlands for brushing. Adhere to identified buffers, setbacks and machine-free zones. • Use existing trails, roads or cut lines wherever possible to avoid new disturbance to the riparian vegetation and prevent soil compaction. • Schedule crossings of watercourses, waterbodies and wetlands during frozen conditions to the extent possible. • Obtain and follow requirements of temporary water diversion permits when diverting water from water sources for ice bridges or other uses. • Store topsoil in windrow a minimum of 2 m from embankments, slumps, cuts, pits, and a minimum of 30 m from watercourses, waterbodies and/or wetlands. • Flag or stake the right-of-way at crossings of watercourses, waterbodies, wetlands, irrigation canals, rail lines, buried facilities, highways and roads per crossing agreements. • Fall trees away from watercourses, waterbodies and wetlands and away from right-of-way limits to reduce damage to stream banks, beds and adjacent trees. Remove any trees, debris and soil inadvertently deposited within the high water mark in a manner that reduces disturbance of the bed and banks. • Complete brushing and clearing activities under frozen conditions to prevent siltation of watercourses, waterbodies and wetlands and minimize potential adverse environmental effects. • Maintain compatible vegetation or vegetated ground mat on the right-of-way to the extent possible, particularly within the riparian zone of watercourses, waterbodies and wetlands. • Install erosion control measures upslope of wetlands and watercourses where soil has been disturbed within 10 m of riparian areas or watercourse banks. • Maintain compatible vegetation or vegetated ground and mat within the vegetated buffer zone of watercourses, waterbodies and wetlands to the extent possible where the right-of-way crosses these areas. • Consider avoiding environmentally sensitive areas by going around the feature or using helicopters or using pilot wire extensions to support the stringing of conductors over large wetlands, waterbodies, sensitive terrain and/or wildlife habitat. • Avoid grubbing and grading in wet areas, including bogs, fens, swamps, marshes and riparian areas. • Pump water onto stable and well-vegetated areas, tarpaulins or sheeting at least 50 m from any waterbody in a manner that does not cause erosion or allow any unfiltered or silted water to directly enter a watercourse, waterbody or wetland. Place pumps on polyethylene sheeting above the high water mark of the watercourse, waterbody or wetland. • No spoil shall be stored within wetlands, or the bed and banks of a river, creek, stream, or lake. • Erect silt fences or other sediment control structures near the base of approach slopes to watercourses, waterbodies and wetlands prior to grading, as required. Inspect the temporary sediment control structures on a regular basis and repair, if warranted, as soon as possible after noticing repairs are necessary. • Use low-ground-pressure equipment and/or install access mats, matting, geotextiles, or construct a subsoil ramp, to limit effects to watercourses, waterbodies, and wetlands, if warranted and surface conditions require (i.e., non-frozen). • Monitor approaches of roads (from other roads and the right-of-way) to identify areas where disturbed mineral soil/debris might be eroding and depositing within the wetland edges. Implement remedial measures (e.g., install silt fence or equivalent structure) should monitoring identify areas where sediment/debris is being deposited along wetland edges. • Ensure construction equipment is clean prior to crossing any watercourse, waterbody, or wetland. • Prevent water that contacts uncured or partly cured concrete during activities such as equipment washing from directly or indirectly entering a watercourse or waterbody.	• Loss or alteration of habitat function during and following construction and maintenance activities during operations until vegetation is re-established. • Loss or alteration of hydrological function during and following construction and maintenance activities during operations until natural drainage patterns are restored. • Loss or alteration of biogeochemical function during and following construction and maintenance activities during operations until sedimentation is controlled at structure locations, and temporary access locations, vegetation is re-established, hydrology is restored, and biological/chemical processes have recovered.

Table 5.4-4. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Wetland Function

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Potential Residual Effect(s)
1. Loss or alteration of wetland function (i.e., habitat, hydrology, biogeochemistry) during construction and maintenance activities during operations (cont'd)	See above	See above	• Do not deposit, directly or indirectly, any waste concrete, cement, mortar, or other lime-containing construction materials into or near any watercourse, waterbody, or wetland. All forms and caissons, if applicable, will be examined by qualified inspectors prior to pour to ensure they are tight. • Ensure topsoil berms do not interfere with local surface water drainage patterns. Do not store topsoil in low areas. • Final reclamation activities to occur during non-frozen conditions. • Install temporary crossings in a manner that protects and maintains the emergent vegetation. • In frozen conditions, walk down vegetation and use frost packing, snow/ice or matting on the travel and work surfaces to allow vegetation to recover quickly following construction. • Completely isolate work areas within or less than 50 m from watercourses, waterbodies and wetlands to ensure water does not become more alkaline during Project activities. • All grading will be undertaken with the understanding that original contours and drainage patterns will be re-established during clean-up wherever possible. • Monitor wetlands for wetland function (e.g., degraded water quality, loss of habitat potential, changes to surface drainage patterns) and implement appropriate remedial measures if there are indications of impeded wetland function after one or more years following clean-up. • Allow natural regrowth of wetland vegetation. Do not seed wetlands. • Maintain drainage across the right-of-way during construction. Carry out construction activities in a manner that mitigates ponding of water or channelization of surface flow. • Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds, to the extent possible. • Wash, refuel and service machinery and store fuel and other materials for the machinery in such a way as to prevent any deleterious substances from entering the water. • Employees and Contractors shall immediately notify the Construction Supervisor of any spills/releases and provide information about the spill. Ensure that a spill kit of appropriate size is on site. Ensure that operators and the Contractor Employee in Charge (EIC) are trained to contain spills or leakage from equipment. Report all spills and implement the Spills Contingency Plan.	• See above

[a] Detailed mitigation measures are outlined in Axys and Walker, 1998 and the Project EPP (Appendix 1).

5.4.3.2 Characterization of Potential Residual Effects

Loss or Alteration of Wetland Function

Wetland functions are natural processes that are important to the surrounding environment and provide value to human populations (e.g., flood control). Although wetland functions are interconnected, these functions typically separate into three main categories: habitat function, which includes habitat for wildlife and plants; hydrological function, which includes flood control and groundwater recharge; and biogeochemical function, which includes nutrient availability and water quality improvement (Hanson et al., 2008). All three functions are directly and indirectly related to one another, influencing the overall wetland function (Mitsch and Gosselink, 2007). Different wetland classes perform a variety of functions, not all of which are present in all wetlands. For example, if a wetland exhibits an alteration of vegetation as a result of construction activities (i.e., treed to herbaceous), the cleared portion of the wetland may not provide the same function as it did pre-construction (e.g., cover or forage for ungulates). However, if the hydrology and substrate composition is maintained, it still has the potential to provide habitat for other wildlife species (e.g., amphibian breeding ponds).

Although permanent loss of wetland function is not anticipated (except potentially for small areas at structure locations), transmission line construction and maintenance activities during operations have the potential to result in a temporary loss or alteration of wetland habitat, hydrological, and biogeochemical function. This disturbance to wetland function has the potential to remain present until vegetation is re-established, grade and natural flow patterns are restored, and sedimentation is controlled in the undisturbed portions of the wetland or until compensatory measures have been implemented, if warranted.

Alteration of Wetland Habitat Function

Temporary disturbance of the habitat function of wetlands may occur during construction and maintenance activities during operations within wetlands. Permanent habitat loss has the potential to occur at structure locations. Examples of potential adverse environmental effects on wetland habitat function include potential changes in vegetative species composition for some wetland classes, stress on vegetative species, and interruption of wildlife movements and fragmentation of natural habitats.

Wetland sensitivity to disturbance can be described in terms of hydraulic connectivity and resiliency of vegetation (Trettin et al., 1997; Hill and Devito, 1997). Hydrologically isolated wetlands are more susceptible to disturbance as a result of decreased vegetation resilience. For example, shrubs are less resilient than herbaceous species because of the increased regeneration time needed for woody plant species. Consequently, in treed and shrub wetlands (e.g., bogs, fens, and swamps), temporary habitat disturbance can be apparent for a longer period of time than marshes, which are dominated by herbaceous (e.g., grasses and forbs) vegetation.

Plant community composition and structure may change in certain wetland types (i.e., treed and shrub wetlands) following transmission line construction. Larger woody vegetation, mostly trees, are often not allowed to regrow along a right-of-way during the life of the transmission line. This may result in a decrease in wetland habitat function when only the herbaceous vegetation returns to the right-of-way after construction (Santillo, 1993; Shem et al., 1993; Van Dyke et al., 1994). In addition, habitat fragmentation and the removal of woody vegetation potentially compromise the stability of the substrate, and may reduce nesting habitat for songbirds and foraging habitat for ungulates.

Furthermore, tree and shrub removal during operations often results 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, treed wetlands revert to sedge-dominant marshes following an increase in groundwater level, which was previously suppressed by transpiration and water uptake by trees (Lee and Boutin, 2006).

Allowing wetlands to naturally regenerate, especially in wetlands where the presence of standing water is relatively consistent (i.e., seasonal marshes and semi-permanent marshes), can lead to more stable vegetation communities dominated by native species (Bradshaw, 2000; Prach et al., 2001).

Microtopography in wetlands can influence plant community structure (Bruland and Richardson, 2005), hydrology, and physiochemistry (Moser et al., 2008). Wetland plant species have a range of nutrient demands and flood tolerances that influences where they may be located within a wetland. Temporary vehicle crossings have the potential to remove microtopography features (i.e., hummocks and hollows), which may reduce the spatial variability of nutrients and biogeochemical processes (Moser et al., 2008). The loss of habitat variation provided by microtopography features may slow regeneration of wetland vegetation and habitat (Lee and Boutin, 2006). Restoration of microtopography features and microclimate variation following construction (e.g., natural recovery in wetlands and compaction prevention) can accelerate plant community development and re-establishment (Belyea, 1996; Kellner and Halldin, 2002; Malmar and Wallén, 1999). Restoration of small scale vertical changes in wetland topography can positively affect soil nutrients and vegetation establishment (Moser et al., 2008).

A slight reduction in wetland area will not result in an overall loss of wetland habitat function since only partial disturbance to the wetland is anticipated as a result of permanent disturbance only occurring at structure locations. With the implementation of key mitigation measures as well as potential wetland compensation projects to be carried out if warranted through either reclamation, restoration, or financial contribution, the potential loss of wetland habitat function is considered to be reversible (along the right-of-way during dry or frozen conditions, along the right-of-way where grading or ramp construction/removal is needed and at structure locations) and of minor magnitude (herbaceous and shrub-dominated wetlands) to moderate magnitude (treed wetlands).

Alteration of Wetland Hydrological Function

Potential changes to hydrologic flow (i.e., surface or groundwater flow) have the potential to result from the construction and maintenance activities during operations of the Project. These include wetland drainage, water diversion, and natural flow impedance.

Vertical and horizontal water movements in wetlands are easily disrupted (Olson and Doherty, 2012). The hydraulic conductivity of the wetland substrate can be affected by compaction. Excessive wetland drainage or diversion will result in an unnatural decrease of wetland area while flow impedance (i.e., inadequate drainage) may modify or create wetland habitat (Johnson et al., 2005; Olson and Doherty, 2012; Vance et al., 2013). As mentioned above, the removal of vegetation along the right-of-way will alter the hydrological regime and increase the soil moisture of wetlands in areas where trees and shrubs were removed.

Alteration of wetland hydrology can affect aquatic invertebrates and amphibian populations. Changes in vegetation structure within wetlands can affect invertebrates' food sources and breeding sites. Alteration of the hydroperiod of a wetland (i.e., seasonal to permanent) can influence the invertebrate community present. Increases in wetland hydroperiod from unnatural ponding can result in a shift in the composition of invertebrates that can be found in the wetland (i.e., from those that are adapted to temporary or seasonal hydroperiods to those that require more permanent water levels). This has the potential to result in an increase in the invertebrate taxa richness (Euliss and Muschet, 2004).

It is not anticipated that the construction and maintenance activities during operations of the Project will result in permanent changes to the hydrological function of wetlands since the permanent disturbance to wetlands at structure locations will be confined to a small area.

With appropriate construction and implementation of key mitigation measures, most of the adverse effects on wetland hydrological function can be successfully reduced by allowing natural hydrological patterns on the landscape to be maintained. With the implementation of potential wetland compensation projects to be carried out through either reclamation, restoration, or financial contribution, the potential loss of wetland hydrological function is considered to be reversible with intervention and of moderate magnitude.

Alteration of Wetland Biogeochemical Function

Activity in or near wetlands during construction and maintenance activities during operations of the Project may result in increased sediment deposition and turbidity of surface waters. These effects may thereby decrease overall biogeochemical function, although this will be reduced through implementation of appropriate key mitigation measures to prevent wetland area disturbance adjacent to the construction or maintenance site. In addition, permanent infilling is detrimental to a wetland's capacity to reduce overland flow and provide sediment retention.

Increased levels of sediment deposition from installation of structures within wetlands can result in increases in the turbidity of surface waters, affecting water chemistry and biological processes (e.g., photosynthesis) (Bayley et al., 2013; Scheffer and van Nes, 2007). Given the application of sedimentation control mitigation measures (e.g., sediment fencing) for adjacent wetlands, the likelihood of an alteration of nearby wetlands will be reduced.

Compaction also has the potential to affect biogeochemical function by increasing the bulk density and lowering the soil moisture (Olson and Doherty, 2012). The use of mats and low load-bearing machinery, and/or constructing during dry or frozen conditions may reduce any potential soil compaction resulting from Project construction.

With the implementation of key mitigation measures as well as potential wetland compensation agreements with approved Wetland Restoration Agencies, the potential loss of wetland biogeochemical function is considered to be reversible and of moderate magnitude.

Overall Loss or Alteration of Wetland Function

Based on the proposed key mitigation measures and the Post-Construction Monitoring Program literature, wetlands have been shown to be resilient provided that hydrological, habitat, and biogeochemical functions are not permanently altered. Permanent loss or alteration of wetland function is only anticipated at structure locations, if required, and confined to a small area, which will not result in an overall loss of wetland habitat function since only partial disturbance to the wetland is expected.

Key mitigation measures implemented during construction and maintenance activities during operations for infrastructure (i.e., right-of-way, temporary workspace, and temporary access) will reduce the potential residual effect of the alteration of wetland function. The potential residual effect of Project construction and maintenance activities during operations on wetland function is considered to be reversible (at sites of reduced disturbance such as the right-of-way during frozen conditions, or at sites of temporary disturbance and permanent disturbance with compensation agreements in place), is of minor magnitude (herbaceous and shrub-dominant wetlands) to moderate magnitude (treed wetlands), and of medium to extended-term duration (Table 5.4-5, point [a]).

The methods set out in Section 4 of the DIA were adopted for the characterization of potential effects on wetland function.

A combination of quantitative and qualitative methods was considered the most appropriate method to evaluate the effect ratings of the potential residual effects on wetland function depending upon the availability of quantitative data and accepted standards, guidelines, and ecological thresholds. Where appropriate, this qualitative assessment, supported by quantitative information (wetland area within the Project Footprint of the proposed transmission line route), relied on available literature and the professional experience of the assessment team.

The wetland desktop review and ground-based surveys determined that there was approximately 1.52 ha of wetland habitat within the Project Footprint.

The characterization of the potential residual effects of the construction and operation of the Project on wetland function is summarized in Table 5.4-5.

Table 5.4-5. Residual Effects Characterization for Wetland Function

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Loss or alteration of wetland habitat, hydrological, and biogeochemical function during and following construction and maintenance activities during operations of the transmission line until vegetation is re-established, natural drainage patterns are restored, sedimentation is controlled at structure locations, and biological/chemical process have recovered.	**Context:** Wetlands are resilient to temporary disturbance provided that habitat, hydrological, and biogeochemical function are not permanently altered. Permanent disturbance has the potential to occur only at structure locations, and will only affect a small portion of the wetland so overall loss of function within wetlands is not expected.	
	Geographic Extent: Wetland and Hydrology SA	The potential residual effect of loss or alteration of wetland habitat (e.g., changes in species composition, stress on plant species, interruption of wildlife movements, and fragmentation of natural habitats), hydrological (e.g., wetland drainage, natural flow impedance), and biogeochemical (e.g., increased sediment deposition and turbidity of surface waters) function resulting from transmission line construction and maintenance activities during operations may extend beyond the right-of-way.
	Duration: Medium to extended-term	The potential residual effect of loss or alteration of wetland habitat, hydrological, and biogeochemical function from transmission line construction activities during operations potentially extends into the operation phase for up to 10 years (as vegetation and local hydrology re-establish) but may extend beyond the operational life of the Project (e.g., in locations where tree removal elevates the local water table; different hydrophytic species will establish [graminoids and shrubs] and if increased moisture conditions persist, trees may never re-establish).
	Frequency: Periodic to continuous	The potential residual effect of alteration of wetland habitat, hydrological, and biogeochemical function (i.e., construction and maintenance activities during operations) occurs intermittently but repeatedly over the assessment period. Loss of wetland habitat, hydrological, and biogeochemical function at structure locations and permanent access occurs continually over the assessment period.
	Reversibility: Reversible	The potential residual effect of loss or alteration of wetland habitat, hydrological, and biogeochemical function is reversible to pre-construction or equivalent conditions with removal of the effect source (i.e., cessation of construction along the right-of-way) in the absence of intervention. The residual effect at structure locations is reversible.
	Magnitude: Minor to moderate	The potential residual effect of loss or alteration of wetland habitat, hydrological, and biogeochemical function may result in a measurable change (i.e., at structure locations) but can be mitigated such that environmental or regulatory standards is not exceeded.

5.4.3.3 Summary

With the implementation of the key mitigation measures (Table 5.4-5), the residual effects on wetland function are considered to be medium to extended-term in duration, reversible and range from minor to moderate magnitude.

5.4.4 Cumulative Effects Assessment

Permanent loss of wetland area is not anticipated to result from either the construction or operations phases of the Project. No long-term alteration or permanent loss of wetland hydrological and biogeochemical functions are expected as the result of the Project and no permanent loss of overall wetland habitat function is anticipated. Consequently, the potential for cumulative effects of the Project on wetland disturbance focuses on alteration of the wetland habitat function.

As surface disturbances affect wetland habitat, existing activities and the Project will act cumulatively with reasonably foreseeable developments to increase disturbance of wetland habitat function in the SA. Existing activities and reasonably foreseeable future developments that have affected or will affect wetland habitat function are largely attributed to visitor experience activities, utility activities, transportation activities, oil and gas pipelines and utility activities, as well as various residential and commercial developments. With proper implementation of industry-accepted standard mitigation measures, contribution of the Project to the alteration of wetland habitat function following the activity phase will likely be minor. No mitigation measures beyond the Project-specific mitigation already proposed in Table 5.4-4. Within the SA, the Project's contribution to the alteration of wetland habitat is considered to be less than the contributions from existing activities and reasonably foreseeable developments.

The cumulative effects to wetland habitat function is considered to be reversible and of medium to extended-term duration depending on the recoverability of wetland habitat function (e.g., weedy plant species could potentially delay the recovery of native wetland species). In addition, other wetland functions (i.e., water quality and hydrology) will be reduced until vegetation cover is re-established. It is anticipated that the cumulative effect on wetland habitat function will be of minor to moderate magnitude and that the habitat function of wetlands will be restored within the medium to extended-term following the activity phase of the Project.

5.4.5 References

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5.5 Wildlife and Wildlife Habitat

5.5.1 Existing Conditions and Ecological Context

This subsection summarizes available information and potential interactions of the Project with wildlife and wildlife habitat within the spatial boundaries outlined in Section 5.5.1.1. The existing condition of wildlife and wildlife habitat, including identified wildlife areas, are identified and described below. Primary sources of information that were used in the preparation of this Section and Section 5.5.2 include the following:

- FWMIS occurrence records (AEP, 2015a)
- Parks Canada identified wildlife areas (Parks Canada, 2011, 2012, 2013, 2014, 2015a)
- Migratory Bird Sanctuaries (ECCC, 2016a)
- National Wildlife Areas (ECCC, 2016a)
- Important Bird Areas (Bird Studies Canada and Nature Canada, 2016)
- WHSRN (2013) and Ramsar wetlands (The Secretariat of the Convention on Wetlands, 2015)
- Available federal and provincial species-specific recovery strategies and management plans
- Available best management practices and industry standard documents such as the Enhanced Approval Process (Government of Alberta, 2013a), Axys and Walker (1998) and ATCO Electric (2011, 2016)
- Data and reports from Parks Canada

5.5.1.1 Spatial Boundaries

The geographic extent of the identified potential effects on wildlife and wildlife habitat is considered within the framework outlined in Section 4 of the DIA. The following spatial boundaries describe the spatial scales at which potential effects on wildlife and wildlife habitat were assessed:

- Project Footprint: the area directly disturbed by Project activities, including associated physical works and activities (i.e., right-of-way, structure locations, permanent access and temporary workspace, laydown areas, temporary access, substation work and decommissioning activities at Palisades)
- Wildlife and Wildlife Habitat SA: defined as a 2 km wide band centered on the proposed route option (i.e., 1 km on both sides) and additional facilities (i.e., a 1 km radius), and including the Project Footprint
- Wildlife and Wildlife Habitat RA: the area extending beyond the SA to the JNP boundaries (including the Project Footprint and the SA)

5.5.1.2 Overview of Existing Conditions

The Project is located entirely within JNP, which is considered to have exceptional wildlife habitat (Parks Canada, 2015a; National Geographic, 2011) with a variety of wildlife species from most major taxonomic groups (mammals, birds, amphibians). Wildlife habitat along the proposed route has been previously disturbed by the existing utility and transportation activities paralleled by the Project route. Uncleared areas within the Project footprint and adjacent habitat consist mainly of mature coniferous-dominated forests, with lodgepole pine, Douglas-fir, white spruce, and aspen the predominant overstory species. The vegetation understory is diverse, with communities comprised of Canada buffaloberry, white meadowsweet, snowberry, pine grass, willow, rose, and alder. Forested habitats are interspersed with wetlands, watercourses and floodplains. Open grasslands containing species such as June grass, northern and western wheatgrass, and Kentucky bluegrass are found on dry and exposed sites. Terrain along the route is mostly flat or gently undulating.

The Project crosses the Athabasca River, Snaring River and Fiddle River. The Project Footprint also encounters 9 wetlands. Most of the wetlands encountered are swamps (shrubby and coniferous-dominated) and marshes; however, one shallow open water wetland is also encountered.

Although JNP overall has relatively little urban or industrial development and disturbance, millions of tourists (Parks Canada, 2014) visit the park each year for recreational and sight-seeing opportunities. Effects of tourism and recreational use on wildlife in the park may include the modification of movement patterns, a shift in habitat use that is unrelated to seasonal habitat quality, increased hormonal stress and predation rates, and lower survivorship and mating success (Green and Higginbottom, 2001; Martin and Reale, 2008). The sensitivity of wildlife to the large volume of tourists, and the various demands and stresses that tourists place on them, likely differs between the summer and winter as JNP receives about twice the number of tourists in the summer than it does in the winter (Parks Canada, 2014). Given this pattern of seasonality, potential tourist-induced effects on wildlife are likely higher for species with sensitive life history stages during the spring and summer months. However, as much of the development within JNP is constrained to the Municipality of Jasper and the Three Valley Confluence (i.e., where the Athabasca, Maligne and Miette rivers converge), and the Project is located within the major transportation corridor through the Park (i.e., Highway 16, CN Railway and pipeline rights-of-way), existing effects on wildlife (be they seasonal or otherwise) likely stem from traffic and recreation (e.g., campgrounds and trails).

5.5.1.3 Species with Special Conservation Status

A list of wildlife species with special conservation status that have the potential to occur within the Study Area is provided in Appendix 5.5-1. The species listed include those with designations under Schedule 1 of the *SARA* (Government of Canada, 2016), COSEWIC (2015), Schedule 3 of the *CNPA,* or provincial status designations (ASRD, 2012; AESRD, 2014), which have the potential to interact with the Project. Potential interaction was determined based on species that occur within the Montane, Alpine, and Subalpine Natural Subregions of the Rocky Mountain Region and the Upper Foothills Natural Subregion of the Foothills Natural Region (NRC, 2006), habitat information in the area, species ranges, species habitat requirements, and professional knowledge. Appendix 5.5-1 additionally contains a search of the provincial online FWMIS database (AEP, 2015a) and reports the occurrence records of wildlife species at risk within 1 km of the Project.

Although the Project is outside the southern mountain caribou Local Population Unit (LPU) and subpopulation boundaries currently delineated in the Recovery Strategy for the Woodland Caribou, Southern Mountain Population (*Rangifer tarandus caribou*) (Environment Canada, 2014), Parks Canada has advised that the Project will interact with Type 2 Matrix range critical habitat (Dia, 2017, pers. comm.). Therefore, caribou is included in the list of wildlife species in Appendix 5.5-1. Further information on potential interaction with caribou critical habitat is provided in Section 5.5.2 under *SARA*. There are no other critical habitats identified under *SARA* encountered by the Project.

Within the body of this report, “wildlife species at risk” refers to those species listed federally on Schedule 1 of *SARA* (Government of Canada, 2016) or by COSEWIC (2015), as well as those listed under the Alberta *Wildlife Act* (AESRD, 2014) or designated as Special Concern by the ESCC (AESRD, 2014). These species are listed on the federal or provincial regulatory frameworks because of long-term population declines for a variety of reasons, and are considered to be especially sensitive to habitat loss or alteration or other effects that may further reduce these species’ populations. Species listed on Schedule 3 of *CNPA* are not included within this definition as they are species of management concern (i.e., large carnivores and ungulates) or are already listed under other regulatory frameworks. For those species listed on Schedule 3 of *CNPA*, but not also under any of the other regulatory frameworks, the decision to exclude them from the definition of species at risk does not imply that these species are not important. In general, however, their populations are healthy or stable and are less likely to show the same degree of sensitivity to potential Project effects (Section 5.5.3.1) relative to species that are listed under, for example, *SARA* or COSEWIC.

5.5.1.4 Wildlife Field Studies

Wildlife field studies were completed along select segments of the Project route from June 24 to 27, 2015. Wildlife surveys were conducted to collect information on wildlife presence, distribution, and habitat use along and adjacent to the proposed route, and consisted of an aerial overflight, a waterfowl survey, a raptor nest survey, and a Columbia ground squirrel survey. Consultation was completed with Parks Canada to discuss and comment on the surveys and methods proposed prior to the field studies being conducted. Based on this consultation with Parks Canada certain surveys (i.e., wolf den survey and breeding bird survey) listed in the Terms of Reference for the DIA were determined to not be required.

The information collected during field studies was used to document baseline conditions that inform the assessment of potential effects on wildlife and wildlife habitat and support the development of appropriate key mitigation measures that will avoid or reduce potential Project effects on wildlife and wildlife habitat (see Section 5.5.3.1). Wildlife field methodology is outlined in Appendix 5.5-2, and formal wildlife field results are presented below. Complete wildlife field observations are included in Appendix 5.5-3.

Results

During the waterfowl surveys, 21 suitable wetlands or waterbodies were visited along the Project within JNP. One common goldeneye and one mallard were observed on a small wetland (SW 06-49-27 W5M), and four common loon were observed on a large, permanent waterbody (NE 09-49-27 W5M). No waterfowl were observed at any of the other surveyed sites; however, shorebirds such as Wilson’s snipe and solitary sandpipers were identified at select locations. Amphibian breeding activity (i.e., numerous frog sp. tadpoles) was observed at one of the surveyed locations (a treed wetland near NW 05-47-01 W6M.

Twelve suitable locations were surveyed for Columbian ground squirrels along the Project route within JNP. No Columbian ground squirrels were seen or heard at the sites visited for field studies. Incidental mammal observations either enroute to or from sites, or within Columbian ground squirrel survey sites, included tracks of wolf, elk, deer and black bear.

No active raptor nests were observed during the field studies along the Project or during the aerial overflight. Raptor species observed included merlin and red-tailed hawk.

Commonly-observed incidental songbird species identified during field studies included clay-coloured sparrow, dark-eyed junco, Lincoln’s sparrow, song sparrow, white-throated sparrow, Swainson’s thrush, and yellow-rumped warbler.

A bank swallow colony was found during wildlife field studies. The colony was identified on a northern-exposure bank of the Athabasca River (15-9-49-27 W5M) (approximately 70 m from the route). No other site-specific wildlife habitat features (such as mineral licks, active migratory bird nests, or dens) were identified.

Bank swallow (Threatened by COSEWIC) was the only species at risk detected during the wildlife field studies for the Project. All wildlife species observed during the wildlife field studies, including incidentally observed species, are listed in Appendix 5.5-3.

5.5.2 Regulatory Context

Regulatory context for wildlife originates from identified wildlife areas, federal and provincial legislation, and park management plans. Relevant federal legislation includes the *SARA*, the *Migratory Birds*

Convention Act (*MBCA*), the *CNPA*, and the National Parks Wildlife Regulations. Relevant provincial legislation includes the Alberta *Wildlife Act*.

Parks and Protected Areas

The Project does not cross any Important Bird Areas (Bird Studies Canada and Nature Canada, 2016), Migratory Bird Sanctuaries (ECCC, 2016a), National Wildlife Areas (ECCC, 2016a), Western Hemisphere Shorebird Reserves (WHSRN, 2013), or Ramsar wetlands (The Secretariat of the Convention on Wetlands, 2015).

The Project is located entirely within JNP. Section 2.5.4 outlines the various zoning and land use considerations within JNP. The Project Footprint is not within any land use zones that are designated specifically for wildlife and wildlife habitat objectives.

The JNP of Canada Management Plan provides strategic direction for resource protection, visitor experience, and public appreciation and understanding (Parks Canada, 2010). As it relates to wildlife and wildlife habitat, the management plan has the following objectives:

- Collaborate with regional partners (e.g., federal and provincial agencies, landowners) to implement measures that will keep species from being added to Canada's species at risk list
- Restore predator-prey dynamics in the montane ecoregion, with particular attention to caribou populations
- Adopt management strategies that support the range of natural variability in the abundance, distribution and behaviour of native wildlife species
- Develop and implement a strategy to restore appropriate elk distribution and abundance and reduce the number of elk-human conflicts in the Three Valley Confluence
- Work with regional land managers, non-governmental organizations and industry to ensure populations of grizzly bear, caribou and other wide-ranging species remain viable
- Identify threats to the survival of sensitive species and improve our knowledge of their population dynamics and habitat requirements
- Manage large areas of the park as wilderness, where minimal facilities and low levels of human use contribute to meeting the requirements of wide-ranging species
- Reduce human-caused mortality of wildlife, particularly woodland caribou, grizzly bears and carnivores; address sources of both direct and indirect mortality
- Reduce wildlife habituation and increase public safety through public awareness programs and more intensive measures where required (e.g., rerouting trails, restrictions on use, fencing, vegetation management)
- Facilitate the movement of wildlife between key habitats, particularly in the montane ecoregion
- Ensure activities and facilities do not have any additional impact on key wildlife corridors; examine ways to make improvements

The park management plan additionally outlines targets relating to grizzly bear mortality risk as well as elk recruitment. Targets for grizzly bear target include maintaining female grizzly bear mortality below 1.2 percent of the estimated grizzly bear population maintaining a minimum of 68 percent habitat security in all areas of JNP, except for the Three Valley Confluence, which has a lower target (53 percent) because of the higher amount of development and activity within the area (Parks Canada, 2010). Habitat security values reported for 2014 in the landscape management units crossed by the Project are in line with the park management plan objectives (i.e., 75 percent secure habitat in the Lower Athabasca landscape management unit and 55 percent secure habitat in the Three Valley Confluence landscape management unit) (Shepherd, 2016, pers. comm.).

The management target for elk recruitment, relates to the calf to cow ratio, which is a measure of population size and growth. The target aims to reduce the current calf to cow ratio to 20:100 or lower (Parks Canada, 2010).

The objectives of the park management plan were considered in the development of key mitigation measures for the potential effects related to wildlife and wildlife habitat identified for the Project. None of these objectives are considered to be incompatible with the Project.

Parks Canada Identified Wildlife Areas

Parks Canada delineated geographically-distinct wildlife polygons for a variety of important wildlife habitat and areas within JNP (Parks Canada, 2011, 2012, 2013, 2014, 2015a) (Table 5.5-1). Recommendations and guidelines were compiled from consultation with Parks Canada and best management practices (Section 5.5.1), and have been incorporated into the key mitigation measures for the Project (Section 5.5.3.1).

Table 5.5-1. Parks Canada Identified Wildlife Areas and their Interaction with the Project

Area	Project Interaction	Recommendations or Guidelines[a]
Raptor Nests	The Project route does not encounter any identified raptor nest locations.	A 250 m setback is recommended for all known raptor nests, with timing windows of February 15 – June 1 for owls, April 1 – July 15 for hawks, and May 1 – August 15 for osprey and eagles.
Mineral Licks	The Project route does not encounter any identified mineral licks.	A 200 m setback is recommended for all known mineral licks, with a timing window that limits continuous activities to one working day between May 1 and July 31.
General Movement Corridors	The Project route intersects identified general movement corridors in five locations.	Mitigation to reduce use of rights-of-way as human trails in proximity to wildlife movement corridors (Shepherd, 2016, pers. comm.).
Environmentally Sensitive Sites: Pocahontas Ponds	The Project route avoids the Pocahontas Ponds area.	None specified (avoidance is primary mitigation).
Mountain Goat Ranges	The Project route crosses identified winter range and kidding range for mountain goat, but avoids important kidding range near Disaster Point (approximately 590 m from route), Windy Point (approximately 165 m from route) and Ram Pasture (approximately 200 m from the route and across Highway 16).	A 500 m protective buffer around goat kidding range is recommended between May 15 and July 15. Mitigation to prevent barriers to wildlife movement during the rutting period (November 1 to December 15), including installing gaps in snow piles along the right-of-way.
Bighorn Sheep Ranges	The Project route crosses identified winter range, lambing range and rutting range for bighorn sheep, but avoids important rutting and lambing areas near Disaster Point, Windy Point and Ram Pasture (see distances above).	A 500 m setback around sheep lambing range is recommended from May 1 – June 30. Mitigation to prevent barriers to wildlife movement during the rutting period (November 1 to December 15), including installing gaps in snow piles along the right-of-way.
Elk Calving Areas	The Project route crosses identified elk calving areas.	A 500 m setback around elk calving areas is recommended from May 1 – June 30.

Table 5.5-1. Parks Canada Identified Wildlife Areas and their Interaction with the Project

Area	Project Interaction	Recommendations or Guidelines[a]
Ungulate and Moose Winter Ranges	The Project route crosses identified ungulate and moose winter ranges.	None specified.
Wolf dens/rendezvous sites and fox dens	The Project route crosses areas identified as having wolf and fox dens, and wolf rendezvous sites, south of the Snake Indian River and west of the Athabasca River.	None specified.
Waterfowl staging and feeding areas	The Project route avoids identified staging and feeding areas for waterfowl associated with the Athabasca River and Pocahontas Ponds. The route interacts with waterfowl habitat at the Fiddle (Brule) wetland complex (9, 15 and 16-49-27 W5M), Mile 9 Ponds (28-46-1 W6M) and Moberly Flats (17-47-1 W6M).	Install avian markers on overhead shield wires near water features where there is a high risk of waterfowl collision. The migratory bird breeding period recommended by Parks Canada for JNP is April 1 to August 31.

[a] Detailed mitigation measures are outlined in Axys and Walker, 1998, ATCO Electric, 2016 and the Project EPP (Appendix 1).

Canada National Parks Act, S.C. 2000, c. 32 and National Parks Wildlife Regulations, SOR/81-401

The *CNPA* is enforced by the PCA, and aims to maintain or restore ecological integrity through the protection of natural resources and natural processes throughout all national parks within Canada. Under Section 16(1), the *CNPA* addresses “the protection of fauna, the taking of specimens of fauna for scientific or propagation purposes, and the destruction or removal of dangerous or superabundant fauna”. Under Schedule 3 of the *CNPA*, several protected species are listed that occur in JNP. These species are included in Appendix 5.5-1, and include listings on Part 1 and Part 2 of Schedule 3. Species that are listed on Part 1 are generally considered “threatened” and are at greater risk than species that are listed on Part 2, which are generally considered “protected” (Parks Canada, 2015b).

The National Parks Wildlife Regulations under the *CNPA* protects wildlife within Canadian national parks other than Wood Buffalo National Park, and is enforced by the PCA. Specific regulations that are relevant to the Project include provisions that no person shall “hunt, disturb, hold in captivity or destroy any wildlife within, or remove wildlife from, a park” (Section 4(1)(a)), “in any park other than a park referred to in paragraph (b), or outside a park, be in possession of any wildlife killed or procured within a park, unless the wildlife is in that person’s possession in accordance with subsection (4)” (Section 4(1)(c)), “disturb or destroy a nest, lair, den or beaver house or dam in a park” (Section 4(1)(e)), or “touch or feed wildlife in a park or entice wildlife that is in a park to approach by holding out or setting out decoys or any such devices, foodstuffs or bait of any kind” (Section 4(1)(f)). General regulations that are relevant to the Project include the provision that no shall person “carry out any action that unreasonably interferes with fauna or the natural beauty of the Park” (Section 32(1) (c)).

Species at Risk Act, S.C. 2002, c. 29

SARA protects species listed on Schedule 1 as Extirpated, Endangered, and Threatened, and affords species listed as Special Concern the benefits of management planning. Species included on Schedule 1 are established by the federal Cabinet and are based on recommendations by COSEWIC and consultation with government, Indigenous groups, and the public. *SARA* applies to federal lands; the Act also applies to other lands when provincial protection is deemed inadequate by the Federal Minister of the Environment. *SARA* also applies to all lands in Canada for Schedule 1 bird species cited in the *MBCA*. Species that were designated At Risk by COSEWIC before the creation of *SARA* must be reassessed 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 under *SARA*.

Appendix 5.5-1 includes a list of the federally-listed species at risk (under *SARA* or COSEWIC; 13 in total) with potential to interact with the Project, and their status designations. These include carnivores (southern mountain caribou, grizzly bear, wolverine), bats (little brown and northern myotis), riparian and water birds (bank swallow, horned grebe, rusty blackbird), forest-dwelling birds (olive-sided flycatcher), cliff-dwelling birds (black swift, peregrine falcon), birds that use anthropogenic structures or disturbances (barn swallow, common nighthawk) and amphibians (western toad).

A multi-species action plan that addresses Parks Canada's recovery plan for species at risk in Canada's Rocky Mountains national parks, including JNP, is pending. Federal recovery strategies and management plans under *SARA* are available for the following species with potential to occur along the Project route:

- Little brown myotis recovery strategy (proposed) (Environment Canada, 2015a)
- Northern myotis recovery strategy (proposed) (Environment Canada, 2015a)
- Common nighthawk recovery strategy (Environment Canada, 2016a)
- Olive-sided flycatcher recovery strategy (proposed) (Environment Canada, 2016b)
- Peregrine falcon, *anatum* subspecies management plan (proposed) (Environment Canada, 2015b)
- Rusty blackbird management plan (Environment Canada, 2015c)

Most of the goals and strategies outlined within the federal recovery strategy for little brown myotis and northern myotis are related to the rapid and massive population declines that have occurred as a result of white-nose syndrome, a disease that is caused by a fungus (Environment Canada, 2015a). Broader goals of the recovery strategy for little brown myotis and northern myotis include maintaining (and increasing, where feasible) the current population level and distribution (Environment Canada, 2015a).

The goals of the federal recovery strategies for common nighthawk and olive-sided flycatcher include maintaining their current distribution, a short-term goal of halting their Canada-wide decline 10 years after each respective recovery strategy was developed, and a long-term goal of ensuring a positive 10-year population trend thereafter (Environment Canada, 2015b, 2015c). The federal recovery strategies maintain that common nighthawk and olive-sided flycatcher recovery is feasible. However, much of the information needed to achieve recovery has not yet been collected and, therefore, many of the strategies relate to further species-specific research. Studies have been planned by the federal government and the Boreal Avian Monitoring (BAM) group, among others, in order to inform and delineate common nighthawk and olive-sided flycatcher critical habitat (Environment Canada, 2015b, 2015c).

The objective of the management plan for peregrine falcon is to support a self-sustaining population throughout its Canadian range by 2025 (Environment Canada, 2015b). For rusty blackbird, the objectives of the management plan are first to halt its current population decline and maintain the population at 2014 levels, and second, to support a sustained increase in the population over the next 10 years (Environment Canada, 2015e). To meet these objectives, the management plans outline four strategies, with projected timelines ranging from 2015 to 2023: to address key knowledge gaps concerning peregrine falcon and rusty blackbird basic biology; to identify the main threats throughout both species' range; to develop appropriate mitigation for those identified threats; and to encourage collaborations as they relate to conservation and management opportunities (Environment Canada, 2015b, 2015b).

The Project is located at the southern periphery of the A La Peche LPU for southern mountain caribou, and north of the Jasper/Banff LPU, as currently delineated by the Recovery Strategy (Environment Canada, 2014). Parks Canada has advised that critical habitat maps for southern mountain caribou are undergoing revisions by ECCC, and the Project will be located within Type 2 Matrix range for southern mountain caribou (Dia, 2017, pers. comm.). Type 2 Matrix range is outside the boundaries of southern mountain caribou annual ranges, but is important for caribou recovery because predator/prey dynamics within Type 2 Matrix range can influence caribou predation within their ranges. Type 2 Matrix range also provides connectivity between caribou LPUs and subpopulations. The Recovery Strategy identifies critical habitat for Type 2 Matrix range as habitat that provides an overall ecological condition that will allow for low predation risk, defined as wolf population densities less than 3 wolves/1,000 km^2 (Environment Canada, 2014). There are no other defined areas of critical habitat for wildlife species listed under *SARA*, that are crossed by the Project.

Migratory Birds Convention Act, S.C. 1994, c. 22

The *MBCA* protects and prescribes the management of migratory birds and their habitat in Canada. ECCC administers the *MBCA* through the Canadian Wildlife Service. The *MBCA* prohibits "the killing, capturing, injuring, taking or disturbing of migratory birds or the damaging, destroying, removing or disturbing of nests." Under the Migratory Birds Regulations, no person shall "disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird."

ECCC has provided generalized nesting calendars based on discrete zones across Canada (ECCC, 2016b). These calendars give approximate start and end dates that inform when, based on confidence intervals, the majority of nesting activity is expected to take place within a given nesting zone. Within JNP, ECCC suggests that the migratory bird nesting period begins and ends between April 20 and August 15, with 95 percent confidence (ECCC, 2016b). Parks Canada identifies the migratory bird nesting period within JNP as April 1 to August 31 (Parks Canada, 2015c), which encompasses the timeframe during which some migratory birds are arriving and beginning to establish nesting territories (Shepherd, 2016, pers. comm.). The April 1 to August 31 timing window will be applied to mitigation for the Project.

Alberta Wildlife Act

The Alberta *Wildlife Act* protects species legislated as Endangered or Threatened. Under the *Wildlife Act*, an assessment must be made prior to construction to identify any provincially listed species that would be potentially influenced by a proposed project. Under Section 36(1), no person shall "willfully molest, disturb or destroy a house, nest or den of prescribed wildlife or a beaver dam in prescribed areas and at prescribed times." Species designated as Special Concern by the ESCC in Alberta are afforded the benefits of management planning, including prevention strategies, until they are reassessed in a higher category and are protected under the *Wildlife Act*.

Appendix 5.5-1 includes a list of all provincially-listed species at risk (under the Alberta *Wildlife Act*; 5 in total) with potential to interact with the Project. This list includes grizzly bear and peregrine falcon (both are also federally listed), as well as harlequin duck, barred owl and long-toed salamander.

Provincial Recovery and Conservation Management Plans

Provincial recovery and conservation management plans are available for the following species with potential to occur along the Project route:

- Grizzly bear recovery plan (AEP, 2016)
- Peregrine falcon recovery plan (Alberta Peregrine Falcon Recovery Team, 2005)
- Harlequin duck conservation management plan (ASRD, 2010a)
- Long-toed salamander conservation management plan (ASRD, 2010b)

The goals of the provincial recovery plan for grizzly bear are to: ensure that human access does not limit the grizzly bear population in the Recovery Zone delineated by the recovery plan; ensure grizzly bears have access to secure habitat and are able to successfully disperse across major road corridors; and facilitate public support for grizzly bear conservation and management activities (AEP, 2016). To support this goal, the recovery plan outlines six primary objectives that relate to population targets (e.g., population density and trends, mortality rates), habitat objectives within specified zones (i.e., the Recovery Zones and Habitat Linkage Zones), and public support (AEP, 2016).

The goal of the provincial recovery plan for peregrine falcon is to return its population to the estimated size prior to the introduction of organochlorine pesticide pollutants (Alberta Peregrine Falcon Recovery Team, 2005). To support this goal, the recovery plan outlines three objectives: to achieve a well-distributed population of 70 breeding falcon pairs by 2010; to monitor pesticide contaminants in non-viable eggs and ensure residual DDT (1,1,1-trichloro-2-2 bis [p-chlorophenyl] ethane) levels remain below 7.5 parts per million (ppm); and to use management techniques to ensure an average fledging rate of more than 1.25 young/pair/year within Alberta (Alberta Peregrine Falcon Recovery Team, 2005). As it relates to the first objective, 68 territorial pairs were observed within the province in 2010, and DDT levels were found to be below 5.0 ppm (Government of Alberta, 2013b). Existing management actions are on-going and continually evolve as new information and data are received and analyzed (Government of Alberta, 2013b).

The goal of the harlequin duck conservation management plan is to maintain its current distribution and occupation of breeding streams within Alberta (ASRD, 2010a). In support of this goal, the conservation management plan outlines four objectives: to design and implement monitoring protocols that allow tracking of population trends and identification of potential risks to populations and habitat; to set guidelines that protect harlequin duck habitat from industrial, recreational and fisheries enhancement activities; to address knowledge gaps; and to inform recreational users about harlequin duck breeding habitat and associated timing constraints (ASRD, 2010a). The proposed key mitigation measures outlined in Section 5.5.3.1 align with the suggested mitigation within the harlequin duck conservation management plan (e.g., avoiding the harlequin duck breeding window, maintaining riparian vegetation and coarse woody debris).

The goal of the long-toed salamander conservation management plan is to maintain the current distribution and breeding populations of this species within Alberta (ASRD, 2010b). In support of this goal, the conservation management plan outlines three objectives: to monitor priority ponds and track population trends in the Athabasca and Bow Valley, as well as to conduct surveys to identify long-toed salamander distribution in the Peace River region; to implement habitat protection and management for breeding and non-breeding habitat; and to educate and communicate with government, industry, the public, and landowners (ASRD, 2010b). The proposed key mitigation measures outlined in Section 5.5.3.1 align with the suggested mitigation within the long-toed salamander conservation management plan (e.g., maintaining riparian vegetation and coarse woody debris, limiting removal of vegetation adjacent to wetlands).

5.5.3 Wildlife and Wildlife Habitat Effects Assessment

This subsection presents the assessment of the potential effects of the Project on wildlife and wildlife habitat. The potential effects are identified in consideration of the existing conditions information presented in Section 5.5.1, and the potential residual effects are characterized and assessed according to the methods presented in Section 4 of the DIA.

5.5.3.1 Identification of Potential Effects, Mitigation Measures, and Residual Effects

The potential effects associated with the construction and operations of the Project (as outlined in Section 2.5) on wildlife and wildlife habitat were identified by the assessment team and reviewed with Parks Canada. The potential effects identified for wildlife and wildlife habitat are:

- Change in habitat
- Change in movement
- Change in mortality risk
- Combined effect on wildlife

Wildlife populations and individuals can experience effects from the three main pathways (changes in habitat, movement and mortality risk), either singularly or simultaneously. Each of the effect pathways interact and overlap to some degree to have an overall effect on wildlife species. For example, linear disturbances (change in habitat) may facilitate or impede travel for some species (a change in movement), which may lead to a higher probability of predatory encounters with prey (a change in mortality risk). To account for the interactions between effects pathways, the combined effect on wildlife resulting from changes in habitat, movement, mortality risk, and their interactions was assessed as a residual effect.

Wildlife species at risk (Appendix 5.5-1) are considered in the assessment of all residual effects. The assessment also considers the more common and abundant species that occur in the Study Area and that may interact with the Project.

The key mitigation measures proposed in Table 5.5-2 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the *Best Available Methods for Common Leaseholders* (Axys and Walker, 1998), *ATCO Electric's Environmental Protection Plan for JNP* (ATCO Electric, 2011), and the Project EPP (Appendix 1). Although the Project is not regulated by the Enhanced Approval Process (Government of Alberta, 2013a), wildlife-specific Enhanced Approval Process guidelines were considered in the development of Project-specific mitigation.

Routing is the primary mechanism for avoiding or reducing many of the potential effects of the Project on wildlife and wildlife habitat. Criteria used during the route selection process are described in detail in Section 2.5, and include using existing access and overlapping existing disturbances to minimize new disturbance and clearing for the Project right-of-way, utilizing existing distribution lines where practical to reduce habitat fragmentation, and minimizing transmission line length along environmentally sensitive areas such as watercourses and wetlands. In addition, scheduling Project activities outside of sensitive periods for wildlife to the extent feasible will further reduce residual effects on wildlife and wildlife habitat.

Table 5.5-2. Recommended Wildlife Mitigation Measures

Concern	Mitigation Measures [Project EPP Reference]
Habitat Loss/Alteration	• Parallel existing linear corridors and reduce the proposed transmission line right-of-way width to the extent possible. • Locate structures, temporary workspace and the proposed transmission line right-of-way to avoid known locations of site-specific wildlife habitat features and abide by recommended species-specific setbacks (Axys and Walker, 1998; Government of Alberta, 2013b), where possible. In the event that a wildlife habitat feature is identified within the recommended species-specific setback distance, and narrowing the cleared width of the proposed transmission line right-of-way is not possible to maintain the recommended setback, consult with Parks Canada to discuss practical options and mitigation measures. • Limit the amount of temporary workspace required for project construction to the extent possible. • Temporary workspace, where required, will be located within previously disturbed areas, wherever possible. • Structures and temporary workspace, where possible, have been located a minimum of 30 m back from the ordinary high watermark of a watercourse, waterbody, or wetland. This area should be clearly marked prior to clearing. In the event structures or temporary workspace are necessary within this area, limit clearing to only areas required to accommodate construction. • Develop access within and off the right-of-way so that watercourse, waterbody, and wetland crossings will be limited. Preference should be given to access options that avoid crossings.

Table 5.5-2. Recommended Wildlife Mitigation Measures

Concern	Mitigation Measures [Project EPP Reference]
Habitat Loss/Alteration (cont'd)	• Schedule crossings of watercourses, waterbodies, and wetlands during frozen conditions to the extent possible. • Do not clear or grade beyond the staked boundaries of the right-of-way and workspace in identified in the Development Permit. • Fall trees away from watercourses, waterbodies and wetlands and away from right-of-way limits to reduce damage to stream banks, beds and adjacent trees. Remove any trees, debris, and soil inadvertently deposited within the high watermark in a manner that reduces disturbance of the bed and banks. • Do not skid or drag trees across watercourses, waterbodies and/or wetlands during non-frozen conditions. Minimize and remove to the extent possible debris falling into watercourses and waterbodies. • Limit vegetation removal in riparian areas to the minimum necessary as approved by Parks Canada and in accordance with the Tree Removal Permit. • Fall trees by hand within riparian zones or as required under the Tree Removal Permit. • Complete brushing and clearing activities under frozen conditions to prevent siltation of watercourses, waterbodies, and wetlands and minimize potential adverse environmental effects. • Maintain compatible vegetation or vegetated ground mat within the vegetated buffer zone of watercourses, waterbodies, and wetlands to the extent possible where the right-of-way crosses these areas. • All small diameter slash not already mulched and disturbed through mowing operations will be scattered flush to the ground in off right-of-way vegetation, or chipped or mulched with a truck or trailer mounted chipper/mulcher. Chips/mulch will be sufficiently scattered to avoid accumulations exceeding 5 cm in depth [Appendix A]. • Avoid grubbing and grading in wet areas, including bogs, fens, swamps, marshes, and riparian areas. • Use clearing equipment that limits surface disturbance, soil compaction, and topsoil loss. • Stake/plant shrubs and tree seedlings of compatible species (i.e., low, slow-growing) on the proposed transmission line right-of-way in select locations to be identified on the Environmental Alignment Sheets and in consultation with Park Canada. • Consider avoiding environmentally sensitive areas by going around the feature or using helicopters or using pilot wire extensions to support the stringing of conductors over large wetlands, waterbodies, sensitive terrain, and/or wildlife habitat. • Where ground disturbance is anticipated topsoil will be salvaged and replaced. Restore native vegetation along disturbed areas of the proposed right-of-way by seeding disturbed non-wetland areas with native seed or implementing seeding alternatives outlined in Section 5.2.8.2 [Section 9.0, Appendix C: Axys and Walker, 1998]. If it is deemed required in areas of ground disturbance, intact sod mats will be salvaged and replaced as mitigation of sensitive eco-sites (e.g., riparian, Aeolian dunes, rare plant occurrences), for control of runoff for watershed protection or to assist revegetation [Appendix C: Axys and Walker, 1998 – Section 5.2.8.2]. • Rough clean-up will occur concurrently with construction. Commence initial site clean-up activities immediately following conductor stringing. • Install erosion control measures upslope of wetlands and watercourse where soil has been disturbed within 10 m of riparian areas of watercourse banks. • Erect silt fences or other sediment control structures near the base of approach slopes to watercourses, waterbodies and wetlands prior to grading, as required. Inspect the temporary sediment control structures on a regular basis and repair, if warranted, as soon as possible after noticing repairs are necessary. • Limit vegetation control along the right-of-way during the operational phase of the Project, to the extent possible.

Table 5.5-2. Recommended Wildlife Mitigation Measures

Concern	Mitigation Measures [Project EPP Reference]
Access Management	• Use existing trails, roads, or cutlines for access wherever possible. • In select locations (such as, Sheep Lambing Areas, Elk Calving Area, General Movement Corridors) identified through consultation with Parks Canada, access management to control off-road vehicle use along the proposed transmission line right-of-way may be implemented and include rollback, berms, mounding, installing gates, where appropriate, and planting vegetation. • Decommission and/or restore all new temporary access. • Retain materials for rollback (non-merchantable salvaged timber used as coarse woody debris), as needed, in locations identified for implementation of access control. • Remove all vehicle crossing structures, if installed during construction. • All existing gates on utility access roads will be kept locked during and after work hours, unless otherwise authorized by Parks Canada [Appendix A].
Barriers/Filters to Wildlife Movement	• Leave gaps in the topsoil windrow, if warranted, at obvious drainage courses, access roads/trails and wildlife trails to allow vehicles, visitors, and wildlife to cross the right-of-way. • Create gaps in snow berms caused by ploughing along the right-of-way or access roads to facilitate wildlife movement. The locations of gaps should coincide with gaps in spoil and slash piles, where applicable. • Following construction, extend the existing constructed barriers across the right-of-way, where these occur on the existing adjacent TMPL right-of-way. Use natural materials, such as logs cleared from the right-of-way, or suitable dense vegetation to construct barriers.
Wildlife Disturbance and Attraction of Wildlife During Construction	• Schedule clearing and construction to avoid sensitive time periods (Axys and Walker, 1998; Government of Alberta, 2013b) for wildlife species and discuss scheduling with Parks Canada to determine the appropriate timing of activities. Speak with an Environmental Advisor for project-specific time restrictions and setback distances. • Abide by applicable timing constraints and guidelines when using helicopters to string conductors through areas with wildlife timing constraints. Refer to the Environmental Advisors for project-specific time restrictions and setback distances. • Consider avoiding environmentally sensitive areas by going around the feature or using helicopters or using pilot wire extensions to support the stringing of conductors over large wetlands, waterbodies, sensitive terrain and/or wildlife habitat. • Recreational use of all-terrain vehicles or snowmobiles within the Park by staff or contractors will be strictly prohibited. Work-related all-terrain vehicle or snowmobile use will require Special Activity Permits from Parks Canada, and will be restricted to designated utility corridors only [Appendix A]. • Use multi-passenger vehicles to transport workers to and from the work site, to the extent possible. • Staff and contractors will not be permitted to have firearms or pets in project vehicles or at maintenance/construction sites with the Park [Appendix A]. • The feeding, harassing or destruction of any wildlife will be strictly prohibited and will be grounds for employee dismissal from the work [Appendix A]. • No on-site food waste receptacles will be established at the work site. Food wastes will be collected, secured inside vehicles, and removed daily from the site to approved disposal receptacles [Appendix A]. • All project personnel will receive education regarding bear awareness and staying safe in bear country. Implement the Bear-Human Conflict Management Plan [Appendix O]. • Nuisance wildlife and carcasses of large mammals observed in the vicinity of a work site will be immediately reported to Parks Canada personnel (dispatch) [Appendix A].

Table 5.5-2. Recommended Wildlife Mitigation Measures

Concern	Mitigation Measures [Project EPP Reference]
Wildlife Disturbance and Attraction of Wildlife During Construction (cont'd)	• Implement bear smart practices into construction and operation of the Project (Government of Alberta, 2011). • Check to determine that noise abatement equipment on machinery is in good working order. • Project roads encountering high wildlife density areas with a high probability of vehicle/wildlife conflicts will be identified to project personnel to reduce the probability of vehicle/wildlife interactions. Reduced speed limits for project personnel will be implemented and enforced where practical [Appendix A]. • Schedule of reclamation activities shall not conflict with wildlife or bird timing restrictions without express permission of Parks Canada. • During operation, schedule aerial and ground patrols to avoid sensitive wildlife timing windows to the extent possible.
Migratory Birds	• Avian markers will be installed on overhead shield wire at the Athabasca River crossing. ATCO Electric will conduct a risk assessment to determine the need for avian markers at other locations along the route where risk of waterfowl collision has been identified. The assessment will consider factors such as the proximity of the route to the water feature, size of the feature, tree cover, and direction of flight relative to the orientation of the right-of-way. Results of the evaluation will be communicated with Parks Canada to identify any additional locations where installation of avian markers on overhead shield wires is appropriate to mitigate high collision risk. • Schedule clearing and construction activities outside the recommended migratory bird nesting period of April 1 to August 31 (Parks Canada, 2015c). In the event that clearing or construction activities occur within these periods, Environmental Advisors will consult with PCA Environmental Surveillance Officers to determine appropriate mitigation measures and ensure that appropriate permits have been obtained. In the event that an active nest is found, site-specific mitigation measures should be developed (such as, clearly marked, species-specific buffer around the nest or non-intrusive monitoring). • Use "avian-safe" designs for the transmission line and substation to reduce bird electrocution risk, following the recommendations of the APLIC (APLIC, 2006, 2012), including: - A minimum separation of 150 cm between phase conductors, and phase conductors and grounded hardware/conductors - Use of appropriate coverings (such as, phase covers, covered conductors) on phase conductors, grounding conductors and bonded hardware where there is electrocution risk to birds (i.e., where a minimum 150 cm separate cannot be maintained) • Where a minimum 150 cm separation and/or coverings cannot be used, install perch preventers to deter birds from landing at hazardous locations on structures. • Install guards and/or wildlife protectors at the substation site to protect wildlife or deter birds from landing on electrical infrastructure.
Bank Swallow Colony (15-9-49-27-W5M)	• Schedule clearing and construction activities outside of the migratory bird nesting period (April 1 to August 31) and avoid disturbance to the banks of the Athabasca River, to the extent practical. • A suggested 50 m setback distance should be implemented from active bank swallow colonies (Environment Canada, 2015c).

Table 5.5-2. Recommended Wildlife Mitigation Measures

Concern	Mitigation Measures [Project EPP Reference]
Amphibian Breeding Sites	• Implement the measures relating to watercourse, waterbodies and wetlands listed in Habitat Loss/Alteration. Structures have been located a minimum of 30 m from the ordinary high watermark of watercourses, waterbodies, and wetlands, where warranted. • Where practical, schedule construction activities during frozen conditions to avoid the sensitive breeding period for amphibians. • Remove all vehicle crossing structures, if installed during construction. All crossing structures shall be removed prior to spring break-up. Remove all crossing structures by physical means. Remove temporary vehicle crossings in a manner that protects and maintains emergent vegetation. • Restore disturbed stream banks and approaches immediately following the removal of vehicle crossing structures, if applicable; Bio-engineering of streambanks. • Restore original contours within all workspaces and access areas ensuring that no drainages are blocked. • Restore site drainage to original patterns and directions and ensure compatibility with surrounding landscape. Re-contour the surface to be consistent with adjacent contours and compatible with present and intended land use. Structures or built up features left in place should not negatively affect drainage or adjacent vegetation growth, and require previous approval from the applicable regulator. • Remove all construction material, equipment and access materials. • Use existing trails, roads or cut lines wherever possible to avoid new disturbance to the riparian vegetation and prevent soil compaction. Ensure a 30 m machine-free zone along rivers, lakes or wetlands for brushing. • In the event a western toad breeding site is discovered, implement a 100 m setback (Government of Alberta, 2013a). In the event that narrowing the area of cleared vegetation within the proposed transmission line right-of-way is not possible to maintain the recommended setback, consult with the appropriate regulatory agencies to discuss practical options and mitigation measures. • Obtain appropriate permits in the event that amphibians may need to be moved off the construction footprint during construction and/or if an amphibian salvage from a breeding pond is required. Contact the appropriate regulatory agency for permitting requirements, and discuss the salvage plan with Parks Canada prior to this activity.
Bighorn Sheep Ranges	• Implement the measures listed in Habitat Loss/Alteration, Access Management and Barriers/Filters to Wildlife Movement above. • No activities within 500 m of a sheep lambing area from May 1 to June 30 (Axys and Walker, 1998).
Elk Calving Areas	• Implement the measures listed in Habitat Loss/Alteration, Access Management and Barriers/Filters to Wildlife Movement above. • No activities within 500 m of an elk calving area from May 1 to June 30 (Axys and Walker, 1998).
Mountain Goat Ranges	• Implement the measures listed in Habitat Loss/Alteration, Access Management and Barriers/Filters to Wildlife Movement above. • Mitigation to prevent barriers to wildlife movement during the rutting period (November 1 to December 15), including installing gaps in snow piles along the right-of-way. No activities within 500 m of a mountain goat kidding area from May 15 to July 15 (Axys and Walker, 1998).
General Movement Corridors	• Implement the measures listed in Habitat Loss/Alteration, Access Management and Barriers/Filters to Wildlife Movement above.

Table 5.5-2. Recommended Wildlife Mitigation Measures

Concern	Mitigation Measures [Project EPP Reference]
Accidental Spills	• All spills within JNP will be reported as soon as possible to Parks Canada by calling 780-852-3100 (Jasper Dispatch). Parks Canada staff will be briefed on the location, size and contents of the spills, as well as the spill response measures undertaken or proposed. The Contractor will be responsible for implementing soil replacement or other spill contingency and restoration measures required by Parks Canada staff.
Wildlife Species with Special Conservation Status	• In the event that species with special conservation status are observed during construction, implement the Wildlife Species of Concern, Wildlife Feature and Wildlife Encounter Contingency Plan [Appendix M].
Beaver Dam/Lodge	• Beaver management initiatives to reduce flooding problems on access roads will only be undertaken in consultation with Parks Canada. The *Operational Guidelines for the Management of Beaver- JNP* (Bradford, 2002) available from Parks Canada should be used as a guide to manage problematic beaver activity.
Wildlife Habitat Features (mineral licks, active dens, stick nests)	• In the event that a wildlife habitat feature is identified during construction, work in the area should be stopped, the feature should be flagged and the appropriate mitigation developed in consultation with Parks Canada (Appendix 1 - Section 6.1). Implement the Wildlife Species of Concern, Wildlife Feature and Wildlife Encounter Contingency Plan [Appendix M].

The proposed mitigation will reduce the potential effects of the Project identified above, but will not completely alleviate them. The residual effects listed in Table 5.5-3 were identified according to the method described in Section 4.7 of the DIA, which considers the effects that remain after mitigation is implemented.

Table 5.5-3. Potential Effects, Mitigation Measures and Residual Effects of Construction and Operations of the Project on Wildlife and Wildlife Habitat

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Residual Effects
1. Change in Habitat	Entire Project	Project Footprint to Wildlife and Wildlife Habitat SA	• Refer to Table 5.5-2: habitat loss/alteration; access management; wildlife disturbance and attraction of wildlife; migratory birds; bank swallow colony; amphibian breeding sites; bighorn sheep ranges; elk calving area; mountain goat ranges; general movement corridors; wildlife species with special conservation status; beaver dam/lodge; and wildlife habitat features.	• Habitat loss or alteration.
2. Change in Movement	Entire Project	Project Footprint to Wildlife and Wildlife Habitat SA	• Refer to Table 5.5-2: habitat loss/alteration; barriers/filters to wildlife movement; wildlife disturbance and attraction of wildlife; migratory birds; amphibian breeding sites; bighorn sheep ranges; elk calving area; mountain goat ranges; general movement corridors; wildlife species with special conservation status; and wildlife habitat features.	• Displacement or alteration of movement patterns.

Table 5.5-3. Potential Effects, Mitigation Measures and Residual Effects of Construction and Operations of the Project on Wildlife and Wildlife Habitat

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Residual Effects
3. Change in Mortality Risk	Entire Project	Project Footprint to Wildlife and Wildlife Habitat RA	• Refer to Table 5.5-2: habitat loss/alteration; access management; wildlife disturbance and attraction of wildlife; migratory birds; bank swallow colony; amphibian breeding sites; bighorn sheep ranges; elk calving area; mountain goat ranges; general movement corridors; wildlife species with special conservation status; beaver dam/lodge; and wildlife habitat features.	• Increased mortality risk.
4. Combined Effect on Wildlife	Entire Project	Project Footprint to Wildlife and Wildlife Habitat RA	• All mitigation measures in Table 5.5-2	• Combined effect of the Project on wildlife.

[a] Detailed mitigation measures are outlined in Axys and Walker, 1998, ATCO Electric, 2016, and the Project EPP (Appendix 1).

5.5.3.2 Characterization of Residual Effects

The method described in Section 4 of the DIA was adopted for the characterization of residual effects for wildlife and wildlife habitat. As outlined in Section 4.1 of the DIA, the determination of significance is the responsibility of the Parks Canada Superintendent (Parks Canada, 2015c). As such, this section provides the characterization of residual effects using standard criteria (i.e., magnitude, geographic extent, duration, frequency, reversibility, and ecological context) but does not provide a significance conclusion. The following subsections inform the characterization of the residual effects. The discussion is based on the best available information drawn from the scientific literature, as well as regulatory documents (e.g., recovery strategies), and provide an insight into how wildlife and wildlife habitat is likely to be affected by the Project. Table 5.5-4 summarizes this discussion and provides the ratings for the aforementioned criteria.

Habitat Loss or Alteration

The Project will have residual effects on wildlife habitat both directly (e.g., vegetation clearing) and indirectly (e.g., sensory disturbance from Project-related activities), and may affect site-specific habitat features (e.g., wildlife trees). Clearing of vegetation and maintenance of the right-of-way and adjacent areas of selective vegetation management over the life of the Project will alter the vegetation community species composition and structure, causing direct habitat loss or alteration. Early seral vegetation will replace cleared forest habitats as the right-of-way regenerates. Introduction and spread of invasive vegetation can reduce habitat value and inhibit regeneration of natural vegetation communities that will, over time, establish a natural successional trajectory to forest ecosystems. Habitat loss and alteration can cause displacement of wildlife, and potentially result in the 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).

Indirect habitat loss or alteration may occur in areas adjacent to the Project Footprint. Reduced habitat effectiveness can occur as a result of fragmentation, creation of edges, or sensory disturbance (e.g., noise, human activity and traffic). Habitat suitability adjacent to the Project Footprint may be altered for some species as the clearing on the Footprint causes changes in adjacent vegetation communities because of increased light penetration at clearing edges, or changes in water quality (e.g., siltation).

A detailed description of ecosites crossed by the Project is provided in Section 5.2. Overall, the Project Footprint is 61.9 ha, of which approximately 32.6 ha (53 percent) overlaps existing disturbances to reduce the area of new habitat disturbance. Project effects on habitat fragmentation are minimized by paralleling existing linear features for 44.1 km (99 percent) of the route. Measures to prevent introduction and spread of invasive species on the Project Footprint will mitigate potential Project effects of weeds degrading habitat quality.

The new substation will be constructed on only a portion of the existing Palisades Power Plant's footprint. The remaining area will be reclaimed to habitat that complements the surrounding area, which will regenerate in time to provide potential wildlife habitat.

Mammals

The Project will change the amount of available habitat for mammals. The likely mechanisms for changes in mammal habitat include vegetation clearing and management, soil handling at structure locations, and sensory disturbance (e.g., human activity and noise). Construction of the Project will alter the structure and species composition of vegetation communities within the Project Footprint, which will adversely affect some aspects of habitat suitability (e.g., necessary requisites such as thermal and protective cover for ungulates, denning for furbearers, etc.). The effectiveness of habitat adjacent to the Project right-of-way may be affected within a zone of influence (ZOI) (i.e., indirect habitat alteration).

Vegetation management (i.e., maintaining specific vegetation species and heights that will not interfere with safe operations of the Project) on and adjacent to the transmission line right-of-way will restrict regeneration of some habitat types, such as mature forests, during the operational phase of the Project. These habitat types may take decades to achieve maturity following the operational life of the Project, which may reduce their use by wildlife that depend wholly or in part on mature-forested habitats such as fisher and marten. Alteration of habitat from mature forest to early seral communities can affect habitat use by species that prefer early seral forage species (e.g., moose, elk). Resultant changes in predator/prey dynamics can have indirect effects on mortality risk for some species, such as caribou (Environment Canada, 2014). The extent of habitat alteration from vegetation clearing is minimized by paralleling existing linear disturbances and using shared workspace and construction techniques to limit the Project right-of-way width to only 10 m (approximately).

Vegetation clearing along a linear disturbance can change wildlife movement patterns, and may increase predator movement or efficiency. By paralleling existing rights-of-way, using construction techniques that limit the new Project right-of-way to 10 m width, and allowing regeneration of low vegetation over the right-of-way during operations, potential residual effects of changes in mammal movement are expected to be minimal and temporary. To further reduce the potential residual effect associated with predator movement and efficiency along the right-of-way, ATCO Electric will extend existing constructed barriers across the right-of-way following construction, where these occur on the adjacent TMPL right-of-way. The barriers will be constructed of natural materials, such as dense vegetation and logs cleared from the right-of-way and set aside during construction.

Changes to vegetation (i.e., conversion to early seral stages) may also temporarily increase forage availability (e.g., insects) for some species of bats (Hein et al., 2009; Jantzen, 2012) such as the *SARA*-listed little brown myotis and northern myotis (Environment Canada, 2015a), and the abundance of browse and forage species for ungulates and bears. As outlined in the Terms of Reference (Parks Canada, 2015c), key mitigation measures (e.g., using seed mixes that do not contain agronomic species such as clover; avoiding regeneration of high densities of palatable browse via long-term maintenance along the transmission line right-of-way; preventing weed introduction and spread on the Project Footprint) will facilitate the reestablishment of native vegetation within the Project Footprint. These key mitigation measures will reduce the Project's residual effects on mammal habitat.

Anthropogenic sensory disturbance (e.g., roads) has been shown to reduce grizzly bear habitat occupancy by up to 500 m from the disturbance (Mace et al., 1996) and can reduce habitat use by other species that are sensitive to noise disturbance (e.g., wolves) and human activity (e.g., wolverine; Lofroth and Krebs, 2007). Ungulates such as deer (Forman et al., 2003), as well as moose and elk (Ferguson and Keith, 1982; Forman et al., 2003; Rowland et al., 2000) have also shown avoidance to anthropogenic disturbances such as roads, trails and seismic lines. The Project is within the ZOI of a road or railway for the majority of the route. Construction activities for the Project will create sensory disturbance that may increase avoidance and reduced use of habitat temporarily, causing a reduction in habitat effectiveness. This effect will be primarily restricted to the construction phase, and any site-specific maintenance activities during Project operations. Operating power lines typically generate crackling and hissing noises (from electric, or corona, discharge) as well as low, continuous tonal humming, particularly during humid or rainy conditions (Strauman, 2011). While research is limited for many wildlife species, evidence suggests that this disturbance is unlikely to result in a behavioural response for some species (e.g., ungulates) (Bartze et al., 2014).

Following the decommissioning of the existing Palisades Power Plant, sensory disturbance associated with the operations of the new substation will be continuous over the life of the Project but reduced from existing noise levels at the Power Plant. Decommissioning and construction activities will create temporary sensory disturbance that most mammal species are expected to avoid, causing a reduction in habitat effectiveness.

Birds

The Project will change the amount of available habitat for birds. Mechanisms that may affect bird habitat include vegetation clearing and management, and anthropogenic noise. Vegetation clearing for the Project will decrease available bird habitat by removing potential nesting, foraging, and brood-rearing habitat features and increasing forest edge; however, these effects are minimized because of the extensive paralleling of existing linear disturbances (99 percent). Where the Project route does not parallel existing linear corridors, there is potential for some species to experience additional edge effects, but whether they are beneficial, neutral or negative depends on the species or species guild in question (Fleming and Schmiegelow, 2002; Gilbert and Chalfoun, 2011; Machtans, 2006). Species that prefer edges (e.g., olive-sided flycatcher), and those that use open spaces for hunting (e.g., short-eared owl), foraging (e.g., barn swallow, common nighthawk) or nesting (e.g., short-eared owl, common nighthawk) may benefit from vegetation clearing (Anderson, 1979; Anderson et al., 1977; King et al., 2009).

Vegetation management along the transmission line right-of-way over the operational life of the Project will result in earlier seral stages replacing previously forested habitats, and will remain this way until such time as the managed areas regenerate in the extended-term following decommissioning and abandonment. As such, vegetation clearing and management will have adverse effects on species that depend on mature, forested habitat (e.g., barred owl).

Foraging habitat for some bird species can be affected as early seral vegetation replaces seed or fruit-bearing shrubs within the right-of-way. Degradation of foraging habitat may also occur if invasive species outcompete regenerating native vegetation. Weed prevention and control measures during construction and operations phases will mitigate this potential effect.

Habitat availability has been suggested as the primary factor determining bird species occurrence, distribution, and abundance, while habitat fragmentation has been suggested to have comparatively little effect in the absence of high-magnitude habitat loss (Fahrig, 1997; Flather and Bevers, 2002; Swift and Hannon, 2010; Trzcinski et al., 1999). Deciphering the realized importance of habitat fragmentation is difficult because of the interaction between a given bird species or species guild and a variety of other factors (e.g., residual patch size; dynamics, duration, and nature of habitat loss; presence of parasitic or generalist predators [Schmiegelow et al., 1997; Schmiegelow and Mönkkönen, 2002]). Despite this, habitat fragmentation was identified as a potential mechanism that has contributed to population declines for some of the avian species at risk with potential to interact with the Project, including rusty blackbird and barred owl (ASRD, 2005; COSEWIC, 2006). However, given that the Project parallels existing linear corridors for 99 percent of the route length and the incremental corridor width is narrow (approximately 10 m), potential Project effects on birds arising from habitat fragmentation will be minimal. The effect will be temporary, as natural vegetation compatible with Project operations will be allowed to regenerate to the extent practical and if must be cut (i.e., if vegetation is considered hazardous or incompatible with the Project) then the remainder will be left as high as possible.

Sensory disturbance (e.g., noise) will be most apparent, and of greatest magnitude, during construction activities. Since construction is scheduled to occur outside of the migratory bird nesting period, it is likely that the residual effect of sensory disturbance and associated reduction in habitat quality will be avoided for most avian species. For resident avian species, short-term sensory disturbance associated with construction may alter habitat use within a ZOI, however most Project activities will occur outside the sensitive breeding and nesting period. Therefore, construction-related sensory disturbance effects on habitat effectiveness for most birds will be minimal.

The Project will produce noise continuously over its operational life, and may have associated fitness costs to birds (e.g., higher energy expenditure to increase song amplitude, higher conspicuousness to predators [Brumm, 2004], or other fitness costs [Francis and Barber, 2013]). Noise associated with the operations activities will occur periodically over the life of the Project for the transmission line (e.g., specified areas of vegetation management), and continuously for the new substation. However, these types of sensory disturbances as a result of the Project are expected to be minor.

Amphibians

The Project will affect terrestrial and aquatic habitats through vegetation clearing and grading. Soil handling at structure locations may degrade or eliminate habitat for amphibians that live in leaf litter (e.g., long-toed salamander). Residual effects to open water wetlands, which have the highest potential to support amphibian breeding, are expected to be limited as a result of the siting of structures to avoid these areas (see Section 5.4 of this DIA for additional key mitigation measures related to hydrology and wetlands). However, there remains potential for the Project to affect amphibian habitat as a result of vegetation clearing (wetland and terrestrial habitats) and soil handling at structure locations. Amphibian abundance is often lower in cleared areas and second-growth stands than in mature forests because of changes in micro-climate (Wind, 1999).

Standard best practices for protecting amphibian habitat include implementing recommended setback distances from amphibian breeding sites for some species (e.g., western toad) (Government of Alberta, 2013a). However, there is evidence that wetland-based buffers may not be sufficient or realistic as measures to protect hibernation or dispersal habitats since some pond-dwelling amphibians (e.g., western toad, long-toed salamander) can move long distances from breeding ponds to hibernation locations (e.g., Browne and Paszowski, 2010; Funk and Dunlap, 1999 in Smith and Green, 2005). By siting structure locations at least 30 m from wetlands, and implementing key mitigation measures such as using minimum ground disturbance techniques where grading is not necessary and allowing natural vegetation to regenerate on the right-of-way during the operations phase, residual Project effects to amphibian habitat will be minimized.

Summary

The residual effect of habitat loss or alteration as a result of the Project is expected to be reduced by the key mitigation measures presented above and in Table 5.5-2. The residual effect of wildlife habitat loss or alteration as a result of Project construction and operations is considered to be short- to extended-term in duration and minor in magnitude with the implementation of key mitigation measures (Table 5.5-4).

Displacement or Alteration of Movement Patterns

The Project has potential to alter wildlife movement by creating barriers or filters to movement and reducing habitat connectivity. A disturbance is considered a barrier when no movement occurs across it or a filter if the rate of movement is less than it would be across undisturbed habitat (Jalkotzy et al., 1997). Habitat connectivity degrades when barriers to movement cause functional separation of habitats into smaller, isolated habitat patches (i.e., fragmentation) (Andrén, 1994; Jalkotzy et al., 1997).

Wildlife movement patterns vary between and within species, with species-specific attributes such as size and life stage, behavioural variation between individuals, and other factors such as time of day and season. Most species or individuals will alter their movement to avoid construction areas (see sensory disturbance and change in effective habitat above), however, some may be less affected by human activity and noise during construction, and may use established trails or movement patterns. Species that have late age of first reproduction, low population densities, low reproductive rates, large home ranges, low fecundity, and that move over large distances to disperse, forage and mate, typically display low resilience to habitat fragmentation (Dunne and Quinn, 2009). Given the relatively low spatial extent of habitat fragmentation within JNP, these effects are expected to be minimal under current conditions. Habitat fragmentation resulting from the Project will be minimal, as the route parallels existing linear disturbances and the right-of-way width is narrow (approximately 10 m).

Changes in wildlife movement patterns may also occur as some species are attracted to early seral vegetation, and species that are edge-adapted, habitat generalists or that use open spaces for hunting are more likely to change their movement patterns and use disturbed areas (Jalkotzy et al., 1997).

Project construction activities and decommissioning of Palisades will produce noise and increase the amount of human activity, which may result in temporary changes to wildlife movement as individuals avoid habitat within a ZOI as a result of sensory disturbance. Sensory disturbance during operations of the transmission line will likely not change relative to existing conditions, since the Project is within ZOIs of other disturbances. The new substation is expected to produce lower noise levels than what is produced by the existing Palisades Power Plant. In time, as vegetation regenerates within the reclaimed area of the Power Plant, some wildlife species that currently avoid the facility may resume habitat use and movement through this area.

Mammals

Physical barriers during construction of the Project (e.g., soil, slash and snow) may limit the movement of mammals, while sensory disturbances (e.g., activity and noise) may alter movement patterns as mammals avoid construction areas. Key mitigation measures such as creating gaps in snow berms along the electrical transmission line right-of-way during construction, will reduce residual effects on mammal movement during the construction phase (Table 5.5-2).

Displacement from important habitats during sensitive life stages may occur where the Project intersects or traverses near kidding, lambing, rutting or winter ranges for mammals. By scheduling to avoid sensitive periods (Table 5.5-2) and avoiding key habitats near Disaster Point, the residual effects of displacement will be reduced.

Vegetation clearings associated with linear disturbances such as transmission line rights-of-way may filter movement of voles, red squirrels and marten (Marklevitz, 2003; Storm and Choate, 2012), and may also block, delay or deflect ungulate movements (Harper et al., 2001). Rights-of-way may also be used as travel routes for some mammal species. Wolverines (Wright and Ernst, 2004), grizzly bears (McKay et al., 2014), cougars (Beier, 1995; Dickson et al., 2005; Knopff et al., 2014) and wolves (James, 1999; Stuart-Smith et al., 1997; Thurber et al., 1994) have all been documented to use rights-of-ways as movement corridors. Some bats have also been shown to use linear landscape features for movement since they act as navigational references and flight corridors (Hein et al., 2009; Verboom and

Huitema, 1997). Given that the Project parallels existing linear corridors for 99 percent of its length, in addition to key mitigation measures such as avoiding reclamation seed mixes that include attractive species (e.g., clover) and allowing regeneration of natural vegetation on the electrical transmission line right-of-way edges (Table 5.5-2), the residual Project effects on mammal movement during operations are expected to be minimal.

Birds

Forest gaps may alter bird movements (Bayne et al., 2005; Desrochers and Hannon, 1997; Fleming and Schmiegelow, 2002), and wider corridors (e.g., >30 m) can exacerbate barrier effects for some species, such as such as yellow-rumped warbler and black-capped chickadee (Desrochers and Hannon, 1997). Parallel forest openings can also induce cumulative barrier effects at the landscape scale for some species (Bélisle and St. Clair, 2001). Although the potential for Project effects on bird movement is minimal because the right-of-way will be only 10 m wide, the cumulative corridor width will typically exceed 30 m where the Project parallels existing linear corridors. Key mitigation measures include minimizing the Project Footprint by utilizing shared workspace where practical, allowing natural vegetation compatible with Project operations to regenerate to the extent practical.

There are no interactions with migratory patterns identified for the Project. Potential interactions with bird movements to and from the Pocahontas Ponds area and identified staging areas on the Athabasca River are avoided by routing the Project away from these areas.

Amphibians

The Project may create barriers to amphibian movement during construction (soil and brush piles, traffic). The construction period is scheduled to occur mainly during the winter (i.e., September – March). There is potential for the Project to interact with amphibian movement as individuals move to wintering habitats. Long-toed salamanders and western toads, for example, enter into hibernation as early as September (ASRD, 2009]) or early-October (Browne et al., 2009).

The extent of amphibian movement across the landscape varies between species. Some may stay in or near the same waterbody during their lifetime, or may migrate seasonally (e.g., western toad, long-toed salamander). Potential Project residual effects on amphibian movement are temporary. Changes in amphibian movement will be alleviated once early seral vegetation regenerates along the electrical transmission line right-of-way following construction.

Summary

The residual effect of displacement or alteration of wildlife movement patterns as a result of the Project is expected to be reduced by the key mitigation measures presented in Table 5.5-2. The residual effect of displacement or alteration of wildlife movement patterns as a result of Project construction and operations is considered to be short- to extended-term in duration, and minor in magnitude for wildlife species with the implementation of key mitigation measures (Table 5.5-4).

Increased Mortality Risk

The Project has the potential to increase wildlife mortality risk as a result of wildlife collisions with vehicles or equipment and the transmission line, loss or alteration of habitat (e.g., clearing and soil handling have the potential to affect occupied nests, dens, overwintering sites), sensory disturbance (e.g., nest abandonment), human-wildlife conflict, and accidental electrocution. Linear corridors can increase mortality risk for some species by altering predator/prey dynamics as a result of forage availability (regenerating early seral vegetation), creating habitat edges, improving access and increasing sight-lines, all of which may lead to increased predator efficiency and chance-encounter rates.

Mammals

The Project may increase mortality risk for mammalian species within the Study Area. Potential mechanisms that alter mortality risk include clearing, human-wildlife conflict, and improved access.

Minimizing the Project Footprint and using minimal disturbance construction techniques to the extent feasible will reduce the potential for the Project to increase mammal mortality risk as a result of forest clearing or soil handling (e.g., grading) that may inadvertently disturb occupied dens or burrows.

The presence of construction workers, generation of attractive wastes and construction traffic will increase the risk of human-wildlife conflicts. Implementation of prevention and mitigation measures, such as enforcing reduced construction traffic speeds, using multi-passenger vehicles, proper waste storage and disposal, and prohibiting pets and firearms on the work site (see Table 5.5-2), are expected to mitigate the residual effect.

Changes in predator/prey dynamics can result from linear corridors. Regenerating early seral vegetation has potential to influence ungulate populations through forage availability. Predator abundance or movement can by affected by changes in abundance or habitat use by prey species. Linear corridors improve access for predators such as cougars (Beier, 1995; Dickson et al., 2005; Knopff et al., 2014) and wolves (James, 1999; Stuart-Smith et al., 1997; Thurber et al., 1994; Whittington et al., 2011), which may increase the risk of predation for prey species. Habitat alteration resulting from the Project will be minimized by paralleling and overlapping existing linear disturbances, keeping the right-of-way width narrow (approximately 10 m). Since the Project parallels existing linear corridors for 99 percent of its total length, the residual effect of improved access for predators is expected to be minimal. Implementation of key mitigation measures in select areas (Table 5.5-2), such as reclamation to native vegetation species that are not attractive to predators or prey species, will further reduce the Project's potential effects on mortality risk associated with predator access.

Human access and its management is the most important factor that drives grizzly bear mortality (e.g., Benn, 1998 in Braid, 2015; McLellan, 2015). Habitat security for grizzly bear in the landscape management units crossed by the Project route is within the objectives of the JNP management plan (see Section 5.5.2). Recent estimates within the Yellowhead Bear Management Area (BMA), which includes the Project Area and the southern portion of JNP, show an increase in the grizzly bear population (approximately 140 individuals) (Stenhouse et al., 2015). Since the Project parallels existing linear corridors for 99 percent of its length, it is unlikely that the Project will contribute to an increase in grizzly bear mortality risk associated with human access. Additional key mitigation measures that reduce bear-human conflicts will be implemented, including training all personnel on Bear Smart practices, appropriate waste storage and disposal, and using seed mixes that do not contain agronomic species such as clover.

Birds

The Project may increase bird mortality risk, primarily through accidental electrocution and collisions with the transmission line during operations, but may also disturb nests, nesting activities or breeding behaviour.

Disturbance of nesting habitats during the breeding season may induce nest failure or abandonment of the breeding area (e.g., Antoniuk and Ainsle, 2003; Hill et al., 1997; Jalkotzy et al., 1997; Richardson and Miller, 1997). This residual effect is avoided for most species since construction is scheduled to occur outside of the migratory bird nesting period. Key mitigation measures including implementing the Wildlife Species of Concern, Wildlife Feature and Wildlife Encounter Contingency Plan (Appendix 1) in the event an active nest is found, will minimize this residual effect for species such as owls, whose nesting period may begin before construction activities are complete in early spring.

Rich et al. (1994) found that the relative abundance of avian nest-predators doubled along transmission line rights-of-way compared to interior forested habitats, and DeGregorio et al. (2014) found that shorter distances to transmission lines was the best predictor to find the highest abundances of several nest predators. Despite these patterns of higher nest predators present nearby transmission line rights-of-way, nest survival does not appear to decrease (DeGregorio et al., 2014; King et al., 2009). The transmission line structures may be used as perches by raptors, potentially increasing mortality risk to prey species such as songbirds, small mammals, amphibians and snakes. Since the Project parallels existing linear corridors for 99 percent of its total length, any residual effect associated with new edge is expected to be minimized.

Accidental avian electrocution on transmission lines (via conductors and structures) has the potential to occur. Generally, larger birds (birds-of-prey, ravens, vultures etc.) are most at-risk of electrocution (Janss, 2000; Haas et al., 2005). Electrocution most often occurs when birds, while perched on conducting cables or structures, or flying through suspended conductors, cause short circuits by contacting two conductors carrying different electrical potential. Given that avian electrocution is typically limited to power lines with voltages <60 kV (Avian Power Line Interaction Committee [APLIC], 2006), and that the Project will abide by APLIC recommendations to maintain "avian-safe" designs (i.e., minimum separation of 150 cm between phase conductors, and between phase conductors and grounded hardware/conductors), the Project is expected to have a low risk of avian electrocution.

Potential for collisions with transmission lines can cause avian mortality, particularly for large transmission lines (Faanes, 1987). Janss (2000) found that birds classified as poor fliers (such as ducks and other waterfowl) had the greatest risk of collisions; however, birds of all flight capabilities risk have the potential of colliding with transmission lines (Haas et al., 2005). The potential for collision is increased in areas of high bird usage (such as breeding and staging waterbodies, foraging sites), and may be greatest where the transmission line is located within 500 m of these areas (Heck, 2007). The Project avoids several waterfowl habitats where there is potential for avian collisions with the proposed transmission line, including:

- Waterfowl staging and feeding areas identified by Parks Canada data on the Athabasca River at NW 26-47-1 W6M and SE 17-47-1 W6M (both areas are approximately 900 m from the Project route)
- Pocahontas Ponds at 6-49-27 W5M (approximately 65 m from the Project route, across Highway 16)

Other water features that have been identified through consultation with Parks Canada as important habitat for waterfowl include the Athabasca River, the Fiddle (Brule) wetland complex 9, 15 and 16-49-27 W5M), Mile 9 Ponds (28-46-1 W6M), and Moberly Flats (17-47-1 W6M), which are crossed by the Project route. To reduce potential for avian collisions with Project infrastructure, ATCO Electric will install avian markers on overhead shield wires at the Athabasca River crossing, and complete a risk assessment of other water features near the route where there is potential risk of avian collisions. The results of the risk assessment will be communicated with Parks Canada, and ATCO Electric will work with Parks Canada to determine whether additional avian markers are warranted to mitigate high risk of avian collision.

Amphibians

The Project may increase the risk of amphibian mortality. Effect pathways include vehicle traffic, construction activities (e.g., vegetation clearing, soil handling, watercourse and wetland crossings), predation risk as a result of clearing of vegetation, and reduced water quality (e.g., sedimentation). Soil compaction from machinery and vehicles may interfere with the ability to burrow into the soil, potentially increasing the risk of desiccation or predation (Russell and Bauer, 1993). Soil handling and vegetation removal (e.g., grubbing and grading) may directly increase mortality risk as some amphibians (e.g., long-toed salamander, western toad) hibernate underground (ASRD, 2010b; COSEWIC, 2012), and long-toed salamander spends much of its time underground or under leaf litter during the active months (ASRD, 2010b). Mitigation to avoid activities during the amphibian breeding season, and minimize soil disturbance and vegetation clearing in riparian areas and within 30 m of wetlands and waterbodies will reduce the potential for amphibian mortality associated with Project activities.

Potential for the Project to increase sedimentation buildup in amphibian waterbodies is expected to be minimized as a result of routing and siting of the structures (i.e., >30 m away from watercourses and wetlands). Key mitigation measures to limit disturbance to wetlands, stream channels and riparian areas, and prevent erosion and sedimentation, are outlined in Section 5.4 of this DIA, and are expected to reduce the residual effects of the Project on water quality, thereby avoiding potential issues with amphibian health or mortality associated with water quality.

Summary

The residual effect of increased wildlife mortality risk as a result of the Project is expected to be reduced by the routing of the Project parallel to existing linear disturbance and the key mitigation measures presented in Table 5.5-2. The residual effect of increased wildlife mortality risk as a result of Project construction and operations is considered to be short to extended-term in duration, and minor in magnitude (Table 5.5-4).

Combined Effect of the Project on Wildlife

Changes in wildlife habitat, movement and mortality risk are inherently related and may interact to have a combined effect on wildlife. Wildlife populations and individuals can experience all three effect pathways, either singularly over time or simultaneously. The criteria characterization for the combined effect on wildlife assumes non-independence between effects pathways, and accounts for the variability in the response of individuals within a population and between species. With the implementation of key mitigation measures presented in Table 5.5-2, the residual effect of the combined effect on wildlife and wildlife habitat as a result of Project construction and operations is considered to be extended-term in duration, and minor in magnitude (Table 5.5-4).

The characterization and criteria rating determination of the residual effects of the construction and operations of the electrical transmission line, and the decommissioning of Palisades, on wildlife and wildlife habitat is summarized in Table 5.5-4. The criteria ratings are based on the rationale described above, and in consideration of the context described in Sections 5.5.1 and 5.5.2.

Table 5.5-4. Residual Effects Characterization for Wildlife and Wildlife Habitat

Residual Effect	Criteria Rating	Effects Characterization
a. Habitat loss or alteration.	**Context:** Habitat specialists and species at risk typically show lower resilience to habitat alteration than habitat generalists and abundant populations. The Project route crosses or is adjacent to sensitive wildlife areas including but not limited to mountain goat kidding range, sheep lambing range, moose winter range, and other important seasonal habitats and sensitive areas identified by Parks Canada (Section 5.5.2). The Project has potential to interact with habitat used by species at risk. Type 2 Matrix range for southern mountain caribou is the only federally-identified critical habitat (under *SARA*) encountered by the Project. Type 2 Matrix range is outside the annual ranges of caribou, where predator/prey dynamics have potential to influence caribou predation risk inside their ranges. The residual effect applies to all Project components.	
	Geographic Extent: Project Footprint to Wildlife and Wildlife Habitat SA	Changes in habitat may extend beyond the Project Footprint into the SA. Direct effects of habitat alteration are generally limited to the Project Footprint. Indirect effects may reduce habitat effectiveness within a ZOI, which varies by species, habitat and disturbance.

Table 5.5-4. Residual Effects Characterization for Wildlife and Wildlife Habitat

Residual Effect	Criteria Rating	Effects Characterization
a. Habitat loss or alteration. (cont'd)	**Duration:** Short to extended-term	Portions (edges) of the electrical transmission line right-of-way and temporary workspace will be allowed to regenerate to natural vegetation over the life of the Project (i.e., in the medium- to long-term). Extended-term habitat loss will occur at the proposed structure locations and the substation, where restoration of disturbed habitat will not occur until the Project is decommissioned. The duration of effects on habitat effectiveness within ZOIs will vary depending on species sensitivity. The ZOI for many species may be alleviated as low vegetation regenerates over the Project Footprint (medium to long-term), while more sensitive species may have an extended-term reduction in their use of habitat within a ZOI until revegetation achieves mature forest following reclamation after the end of the Project's life. Reduced habitat effectiveness caused by sensory disturbance is primarily associated with construction and power plant decommissioning activities and, therefore, temporary (short-term). Localized operations activities will also be short-term.
	Frequency: Isolated to continuous	Sensory disturbance effects on habitat effectiveness caused by construction and decommissioning activities are isolated to the construction phase, and periodically during operations. Habitat alteration effects from vegetation clearing are continuous.
	Reversibility: Reversible	Habitat loss and alteration is reversible over time, once vegetation is restored on the Project Footprint or sensory disturbances that reduce habitat effectiveness cease.
	Magnitude: Minor	Residual effects are mitigated to minor levels by paralleling existing linear disturbances for 99 percent of the route, which reduces fragmentation and habitat loss. Minimizing the Project Footprint, avoiding sensitive habitats (e.g., locating structures at least 30 m from waterbodies), and implementing the key mitigation measures in Table 5.5-2 further mitigate the residual effect to minor magnitude.
b. Displacement or alteration of movement patterns.	**Context:** Sensitivity and resilience of wildlife to displacement or alteration of movement patterns varies. The Project route crosses six identified General Movement Corridors, and seasonally important habitats where wildlife may be more sensitive to displacement (e.g., during lambing, kidding, rutting or wintering periods). The residual effect applies to all Project components.	
	Geographic Extent: Project Footprint to Wildlife and Wildlife Habitat SA	Changes in wildlife movement may extend beyond the Project Footprint and into the SA.
	Duration: Short- to extended-term	The Project may create temporary barriers to wildlife movement or disturbance causing displacement during construction (short-term). During operations, the Project right-of-way is narrow and unlikely to filter wildlife movement for species that are hesitant to cross openings; however cumulative corridor widths may restrict movement of some species over the medium to long-term until vegetation regenerates over the Project Footprint. Similarly, improved movement for species that use rights-of-way for travel or foraging will extend over the medium to long-term.
	Frequency: Isolated to continuous	Displacement or changes in movement resulting from construction or periodic maintenance activities are isolated. The residual effects on wildlife movement resulting from habitat avoidance, hesitance to cross or selection of the cleared right-of-way for ease of travel will be continuous, until woody vegetation has regenerated over the Project Footprint.
	Reversibility: Reversible	Displacement and changes in wildlife movement to avoid construction or operations disturbance (e.g., noise, activity) are reversible upon completion of activities. Changes in movement for wildlife that use the right-of-way for travel or foraging, or alternatively, alter movement to avoid the right-of-way, are reversible once vegetation regenerates on the Project Footprint.

Table 5.5-4. Residual Effects Characterization for Wildlife and Wildlife Habitat

Residual Effect	Criteria Rating	Effects Characterization
b. Displacement or alteration of movement patterns. (cont'd)	**Magnitude:** Minor	Routing parallel to existing linear disturbances, avoiding the important mountain goat and bighorn sheep habitats near Disaster Point, avoiding displacement of wildlife from important habitats during sensitive life stages (e.g., adhering to timing windows for kidding and lambing), maintaining gaps in soil and snow piles during construction, and restoring natural vegetation in the Project Footprint will mitigate the residual effect to minor magnitude.
c. Increased mortality risk.	**Context:** Resilience of wildlife to increased mortality risk varies by species, depending on population dynamics and potential interactions with Project components. The residual effect applies to all Project components.	
	Geographic Extent: Project Footprint to Wildlife and Wildlife Habitat RA	Increased mortality risk associated with construction activities on the electrical transmission line right-of-way as well as aboveground infrastructure (i.e., collisions with structures, accidental electrocution) is restricted to the Project Footprint. Increased mortality risk for wildlife during construction may result from vehicle collisions to and from the work site (i.e., within the SA or RA).
	Duration: Short- to extended-term	Mortality risk resulting from construction and periodic operations activities will be short-term in duration. Effects associated with habitat alteration (such as edge effects relating to increased predation pressure) will extend over the medium- to extended-term, depending on habitat type, until vegetation regenerates on the Project Footprint. Avian collision and electrocution risk will continue for the operational life of the Project until decommissioning (extended-term).
	Frequency: Isolated to continuous	Mortality risk caused by construction and intermittent operations activities is isolated to periodic. The residual effect is continuous for effects associated with the wildlife interaction with Project components (collision, electrocution) or habitat change (predation risk, edge effects).
	Reversibility: Reversible	Mortality risk from all identified pathways is reversible to pre-construction or equivalent conditions once construction and operations activities (including deactivation and reclamation activities) cease and vegetation regenerates on the Project Footprint.
	Magnitude: Minor	Paralleling existing linear disturbances and the key mitigation listed in Table 5.5-2 will mitigate residual effects on wildlife mortality risk to minor magnitude.
d. Combined Effect of the Project on Wildlife.	**Context:** Changes in wildlife habitat, movement and mortality risk are inherently related and may interact to have a combined effect on wildlife. The criteria characterization for the combined effect on wildlife assumes non-independence between effects pathways, and accounts for the variability in the response of individuals within a population and between species. The residual effect applies to all Project components.	
	Geographic Extent: Wildlife and Wildlife Habitat SA	The combined effect on wildlife will extend beyond the Project Footprint to the SA.
	Duration: Extended-term	Combined effects of the Project on wildlife and wildlife habitat will extend beyond the operations phase of the Project, until vegetation has regenerated in the Project Footprint to conditions similar to pre-construction or adjacent habitats.
	Frequency: Continuous	Combined effects on wildlife will occur continuously over the life of the Project and following decommissioning until habitat is restored.
	Reversibility: Reversible	The combined effect on wildlife will be reversible following decommissioning of the Project and restoration of natural vegetation communities.
	Magnitude: Minor	The key mitigation measures outlined in Table 5.5-2, routing parallel to existing linear corridors, minimizing the Project Footprint, and scheduling construction to avoid key sensitive periods for wildlife, are expected to mitigate the combined effect on wildlife to minor magnitude.

5.5.3.3 Summary

With the implementation of the key mitigation measures (Table 5.5-2), the residual effects on wildlife and wildlife habitat are considered to be short- to extended-term in duration, reversible and minor magnitude.

5.5.4 Cumulative Effects Assessment

Habitat Loss or Alteration

The Project will act cumulatively with existing activities and reasonably foreseeable developments (Section 4.8 of the DIA) to affect wildlife habitat in JNP. Existing activities that have affected wildlife habitat in the RA are largely attributed to clearing and ground disturbance associated with commercial development in the Municipality of Jasper; recreational development in the form of numerous campsites, trails, and a ski resort in JNP; transportation activities (i.e., road maintenance; CN Railway); oil and gas activities; and utilities (e.g., distribution lines). Given the Project's routing (i.e., paralleling existing linear corridors for 99 percent of its length), landscape-scale cumulative effects from habitat fragmentation are unlikely to occur as a result of the Project. Furthermore, key mitigation measures to reduce habitat disturbance and restore wildlife habitat will be implemented to reduce Project effects and the Project's potential to interact cumulatively with other habitat disturbances (Table 5.5-2). Other operators of existing activities and reasonably foreseeable developments within the RA (e.g., Kinder Morgan, Parks Canada, and ATCO Pipelines) are expected to implement mitigation to reduce the loss or alteration of wildlife habitat and reduce incremental cumulative effects. No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.5-2 are recommended. The cumulative effect of the loss and alteration of wildlife habitat is reversible in time with habitat restoration, and is anticipated to be of minor magnitude.

Displacement or Alteration of Movement Patterns

The Project will act cumulatively with existing activities and developments and reasonably foreseeable developments that affect wildlife movement. Potential cumulative interactions of the Project to cause displacement of wildlife during Project construction and periodic operations activities will be temporary and short-term. Cumulative effects on wildlife movement (e.g., filters for species hesitant to cross openings) are contingent on individual habituation to disturbance, as well as the re-establishment of vegetation within disturbance footprints and, therefore, medium- to extended-term in duration. The magnitude of the Project's incremental cumulative effect on wildlife movement is expected to be minor since the Project parallels existing linear corridors for 99 percent of its length, vegetation will regenerate over the life of the Project, and decommissioning of Palisades will reduce noise-associated cumulative effects on wildlife displacement. No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.5-2 are recommended. Overall, the cumulative effect of displacement or alteration of wildlife movement patterns is considered to be of minor magnitude and reversible.

Increased Mortality Risk

The Project may act cumulatively with existing and reasonably foreseeable developments to affect wildlife mortality risk. The Project avoids incremental cumulative mortality risk from human and predator access by paralleling existing linear disturbances and implementing access management measures (Table 5.5-2). Key mitigation measures such as limiting traffic volumes and speeds, proper waste storage and disposal, bear-awareness and safety training, and avoiding species-specific sensitive timing periods (e.g., the migratory bird nesting period) will further reduce the Project's potential to contribute cumulatively to wildlife mortality. Other operators of existing activities and reasonably foreseeable developments that could interact with the Project to increase wildlife mortality risk are expected to implement similar measures. No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.5-2 are recommended to address cumulative increases in wildlife mortality risk. The cumulative effect of increased wildlife mortality risk within the RA is considered to be of minor magnitude and reversible.

Combined Cumulative Effects on Wildlife and Wildlife Habitat

The Project may act cumulatively with all existing sources, and reasonably foreseeable sources, of wildlife habitat loss or alteration, wildlife displacement or alteration of movement patterns, and wildlife mortality risk. As outlined in Section 5.5.5.4, these sources may all interact and have a combined effect on wildlife and wildlife habitat. However, given the Project's extensive paralleling of existing linear corridors (99 percent), and the proposed key mitigation measures as outlined in Table 5.5-2, the Project is expected to have a small incremental cumulative effect on wildlife and wildlife habitat. The combined cumulative effect of the Project and other activities within the RA is considered to be of minor magnitude, reversible, and extended-term in duration.

5.5.5 References

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5.5.5.3 GIS Data and Mapping References

Parks Canada. 2011. Parks Canada Agency unpubl. data reproduced with the permission of Parks Canada Agency - Jasper National Park of Canada, P.O. Box 10, Jasper, AB T0E 1E0 (digital files). Edmonton, AB. Received by ATCO Electric: September 1, 2011. Received by CH2M: September 1, 2015.

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5.6 Air Quality and Greenhouse Gas Emissions

5.6.1 Existing Conditions and Context

Ambient air quality along the Project is primarily affected by anthropogenic sources of emissions from transportation corridors (e.g., Highway 16, the CN Railway and local roads), and sources typical of municipal development such as home heating and the existing Palisades located within the Atmospheric RA. The Atmospheric RA is defined in Section 5.6.1.1.

The following contaminants were chosen for assessment since it was expected that Project activities would produce these emissions during construction, and operations: nitrogen oxides (NO_x); carbon monoxide (CO); coarse particulate matter (PM_{10}) and respirable particulate matter ($PM_{2.5}$)

Regional air quality in the vicinity of the Project is monitored at a number of stations operated by the Alberta West Central Airshed and data is collected by the Environmental Monitoring and Science Division of the Alberta Government. The Project lies immediately west of the West Central Airshed Society Airshed Zone (AEP, 2015a). The nearest air quality monitoring station to the Project is the Hinton Continuous Air Quality Monitoring Station (Hinton Station), located approximately 28.2 km northeast of the JNP East boundary. The Environmental Monitoring and Science Division of the Alberta Government collects and reports ambient air quality throughout all of Alberta. The Environmental Monitoring and Science Division's Ambient Air Data Management System was used to retrieve daily continuous monitoring results from a representative station to characterize existing air quality within the Atmospheric RA. The Hinton Station was chosen as a representative monitoring station for the Project since it is nearest to Jasper, both towns have similar elevation, and the population size of Hinton is similar to Jasper.

The climate data were taken from the Jasper East Gate weather station. Climate Normals were downloaded from the ECCC website. The Jasper East Gate is located approximately 0.8 km northeast of the Project and the climate summary from the Jasper East Gate weather station is considered representative of the Atmospheric RA for the Project.

The greenhouse gases (GHGs) included in the Project inventory are: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) since these are substances emitted by the combustion of carbonaceous fuels. Sulphur hexafluoride (SF_6) was considered from leakage of substation transformers. GHG emissions are usually expressed as carbon dioxide equivalents (CO_2e), which represent GHG emission quantities in terms of their global warming potential (GWP) relative to CO_2. Emissions of other GHGs such as hydrofluorocarbons, and perfluorocarbons are not expected from the construction or operations phases of the Project and are not assessed.

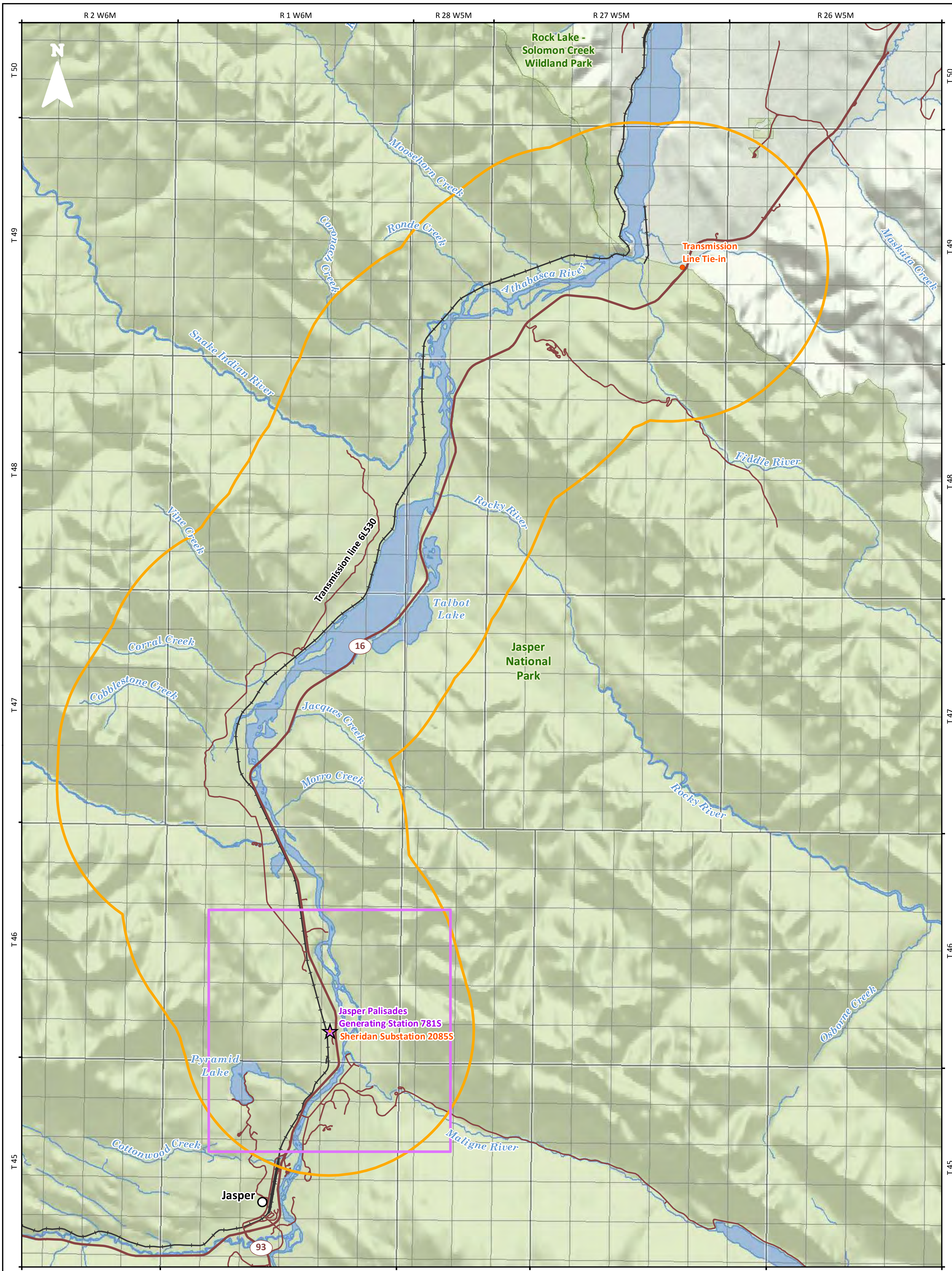
5.6.1.1 Spatial Boundaries

The Project components were considered in relation to the Project Footprint (the Project Footprint, as defined in Section 4 of this DIA).

The Atmospheric RA is defined as a 6 km wide band centered on the proposed centreline of the transmission line. For the proposed substation the Atmospheric RA is considered a 10 km by 10 km square centered on the proposed substation site.

The Atmospheric RA was defined such that it provides a representative analysis of the effects of the Project on the atmospheric environment and on any sensitive receptors. Other factors considered in determining the size of study area include the nature and magnitude of the Project related emissions and existing environment.

The Atmospheric RA is shown in Figure 5.6-1. An Atmospheric SA was not defined for the purpose of this DIA. In addition, this assessment uses an international spatial boundary when assessing potential Project and cumulative effects of GHG.



Proposed Route		Waterbody	
Highway		Park/Protected Area	
Road		Proposed Route Atmospheric RA	
Railway		Sheridan Substation 2085S Atmospheric RA	
Watercourse			

ATCO Electric

SCALE: 1:150,000

0 1 2 3 4 5 km

(All Locations Approximate)

FIGURE 5.6-1

AIR QUALITY AND GHG EMISSIONS SPATIAL BOUNDARIES

JASPER INTERCONNECTION PROJECT

ch2m

UTM Zone 11N
Hillshade: TERA 2008; Alberta Township System: AltaLIS 2009; Roads: NRCan 2015; Railways: NRCan 2012; Watercourse, Waterbody: IHS Inc. 2004; Parks/Protected Areas: NRCan 2016, ATPR 2012; Jasper: NRCan 2003; Generating Station, Substation, Proposed Route in JNP: ATCO Electric Ltd. 2016; Atmospheric RA: CH2M 2016.

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.

June 2017	660380
Mapped By: JDR	Checked By: MB

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5.6.2 Regulatory Requirements

5.6.2.1 Air Quality

In the Province of Alberta, concentrations of common air pollutants in ambient air are compared to the Alberta Ambient Air Quality Objectives (AAAQO). The AAAQO have been established under Section 14 of the *EPEA*. Canada-wide Standards (CWSs) are also used as regulatory thresholds at both the federal and provincial levels to characterize air quality issues and to assess levels of regulatory compliance. These pollutant concentration thresholds are set to protect human and environmental health across Canada. These limits provide regulatory benchmarks against which pollutant concentrations can be measured and assessed. Both CWSs and Canadian Ambient Air Quality Standards (CAAQS) were used for the comparison of existing particulate matter $PM_{2.5}$ concentrations with respective regulatory requirement (CCME, 2016a). The Project is located within the boundaries of the Upper Athabasca Regional Plan. As this plan has not yet been drafted, there are no regional objectives or management frameworks related to air quality applicable to the Project (AEP, 2015b).

Table 5.6-1 presents the applicable AAQO standards for the contaminants of interest used in this assessment.

Table 5.6-1. Ambient Air Quality Objectives and Standards in Alberta

Contaminant	Averaging Period	Applicable AAQOs			
		AAAQO		CWS	CAAQS
		µg/m³	Ppb	µg/m³	µg/m³
NO_2	1 hour	300	159	--	--
	Annual	45	24	--	--
CO	1 hour	15,000	13,000	--	--
	8 hours	6,000	5,000	--	--
$PM_{2.5}$	1 hour	80[a]	--	--	--
	24 hours	30	--	30	28[b]

Sources: AESRD, 2013; CCME, 2016a, 2016b.

[a] Alberta's *Ambient Air Quality Guideline* number derived from 2007 CWS.

[b] Future standard for $PM_{2.5}$ to be reviewed in 2016 (CCME, 2016b).

Notes:

-- = Denotes no objective or standard exists for the given averaging period for contaminants of interest.

ECCC has established thresholds for Criteria Air Contaminants (CACs) and related pollutants based on the quantity released to air. This is in contrast to National Pollutant Release Inventory requirements which are based on quantities manufactured, processed and otherwise used (ECCC, 2016). Reporting requirements apply to any facility that releases a total quantity of a CAC substance to air is greater than or equal to the release threshold specified in Table 5.6-2.

Table 5.6-2. Release Thresholds for Criteria Air Contaminants

Criteria Air Contaminant Release	Release Threshold (tonnes)
Nitrogen oxides (expressed as nitrogen dioxide)	20
Carbon monoxide	20

Table 5.6-2. Release Thresholds for Criteria Air Contaminants

Criteria Air Contaminant Release	Release Threshold (tonnes)
Particulate matter with a diameter less than or equal to 10 micrometres (PM_{10})	0.5
Particulate matter with a diameter less than or equal to 2.5 micrometres ($PM_{2.5}$)	0.3

Source: ECCC, 2016.

Predicted emissions for Project operations were calculated as total annual emissions. Therefore, the ECCC release thresholds for CACs were used to compare predicted Project emissions. ECCC release thresholds apply facilities and do not apply to construction events.

5.6.2.2 Greenhouse Gas Emissions

Federal and provincial legislation are in place to address GHG emissions. All facilities emitting more than 50,000 tonnes per year of CO_2e are required to submit a report under ECCC's GHG Emissions Reporting Program (Environment Canada, 2013). The reporting program does not set absolute or facility GHG emission limits. Alberta's 2008 Climate Change Strategy (AENV, 2008) outlines actions to reduce GHG emissions by 50 Megatonnes (Mt) of CO_2e by year 2020 over the business-as-usual case. The strategy is supported by AEP's Specified Gas Reporting Regulation and Specified Gas Emitters Regulation, which requires facilities emitting more than 50,000 tonnes of CO_2e annually to report to the provincial registry (AESRD, 2014a, 2014b). For facilities emitting more than 100,000 tonnes of CO_2e annually, verification is required, and new facilities must reduce their emission intensity stepwise by 12 percent. In November 2015, a Climate Change Advisory Panel for the Alberta Government published the Climate Leadership Report which advised on a set of policy measures to reduce Alberta's GHG emissions. At the time of writing this DIA, no new changes to the Specified Gas Reporting Regulation and Specified Gas Emitters Regulation have been made as a result of the Climate Leadership Report (Government of Alberta, 2016a). The Specified Gas Reporting Regulation and Specified Gas Emitters Regulation are not expected to be applicable to the Project as facility emissions are anticipated to be below the reporting threshold for these regulations.

The *Canadian Environmental Protection Act* requires reporting of GHG emissions to ECCC for facilities that emit over 50,000 tonnes of CO_2e. Canada announced several climate change initiatives in late 2015 and early 2016, but no details have been provided and there are no specific new regulatory requirements (Government of Canada, 2016).

5.6.3 Desktop Studies

5.6.3.1 Climate

Temperature

During the winter months, the area within the Atmospheric RA associated with the Project is frequently exposed to Arctic air masses, while Pacific air masses bring warmer temperatures in the summer.

The Jasper East Gate is located approximately 0.8 km northeast of the Project and station identification information is provided in Table 5.6-3.

Table 5.6-3. Jasper East Gate Weather Station Identification

Climate ID	World Meteorological Organization ID	Latitude	Longitude	Elevation
3063523	None	53° 14'00	-117° 49'00	1,002.8 m

Source: Environment Canada, 2014.

A summary of the historical seasonal and mean air temperatures at the Jasper East Gate weather station, operated by ECCC, is shown below in Table 5.6-4, and is representative of the area within the Atmospheric RA associated with the Project. The seasonal temperatures range from a low of -5.9°C in the winter to a high of 14.1°C in the summer. The annual average mean temperature is 4.1°C. Average daily temperature maxima and minima ranges from -1.1°C and -10.8°C, respectively, in the winter, to 21.4°C and 6.8°C, respectively, in the summer.

Table 5.6-4. Seasonal and Daily Mean Temperatures – Jasper East Gate

	Winter	Spring	Summer	Autumn	Annual
Averages (°C)	-5.9	4.1	14.1	4.1	4.1
Daily Maxima/Minima (°C)	-1.1/-10.8	10.6/-2.5	21.4/6.8	9.5/-1.3	10.1/-2.0

Source: Environment Canada, 2014

Precipitation

Monthly mean and maximum daily rainfall, snowfall, and total precipitation, as observed at the Jasper East Gate weather station, are summarized in Table 5.6-5. The months of June and August are generally the wettest months of the year on average at the observation site. The highest daily rainfall, 75.0 mm, occurred in the month of June. The most snowfall on a monthly basis occurs at Jasper East Gate weather station in March and November, with 27.2 cm and 26.5 cm, respectively. The highest daily snowfall occurred in November, with 58.4 cm. The highest total precipitation occurs in the months of June and August, while the driest month is typically February with 16.8 mm.

Table 5.6-5. Rainfall, Snowfall, and Total Precipitation – Jasper East Gate Weather Station

Parameter	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
Rainfall (mm)													
Mean Monthly	2.0	0.8	2.5	17.6	59.7	89.9	88.9	91.5	63.5	25.7	4.0	1.6	447.7
Extreme Daily	12.0	9.9	13.5	48.0	67.0	75.0	52.1	51.5	46.2	24.2	25.4	15.5	--
Snowfall (cm)													
Mean Monthly	20.6	16.0	27.2	16.3	6.0	0.0	0.0	0.0	5.1	15.1	26.5	18.3	151.0
Extreme Daily	55.9	25.0	30.0	25.0	44.0	1.0	0.0	0.0	45.0	31.0	58.4	50.0	--
Total Precipitation (mm)													
Mean Monthly	22.6	16.8	29.7	33.9	65.6	90.0	88.9	91.5	68.6	40.8	30.5	19.8	598.7
Extreme Daily	55.9	25.0	30.0	48.0	67.0	75.0	52.1	51.5	46.2	31.0	58.4	50.0	--

Source: Environment Canada, 2014.

Winds

The wind rose diagram was derived from data obtained from AEP. The *Air Quality Model Guideline* (AESRD, 2013) requires the use of a certain set of meteorological data and this data set was used as follows to generate representative wind data for the Atmospheric RA. The Fifth Generation Penn State/National Center for Atmospheric Research Mesoscale Model (MM5) data for the years 2002 through 2006 were processed using Multi-Model Extraction Utility for use in the WRPLOT View software (version 8.7.1). The wind rose for the Project location corresponding to the approximate start of the ATCO Electric corridor at 2-46-1 W6M (approximately 7 km north-northeast of Jasper along Highway 16) is shown in Figure 5.6-2. The wind rose summarizes hourly data over the entire 5-year period.

Figure 5.6-2 shows winds are predominantly from the southwest and a smaller component from the northeast with an average wind speed of 3.71 m/s.

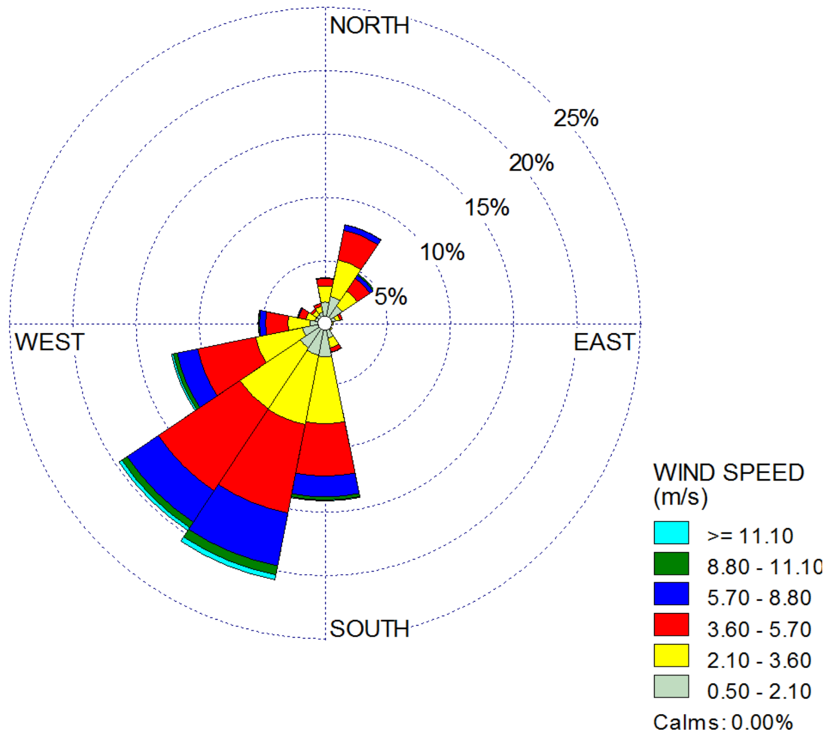

Figure 5.6-2. Project Wind Rose

Wind rose location is for the approximate end of the Project Footprint at 2-46-1 W6M

5.6.3.2 Air Quality

Ambient Background Concentrations

The results from regional ambient air quality monitoring stations were reviewed to determine background contaminant concentrations. The nearest monitoring station to the Project is the Hinton Station, located approximately 28.2 km northeast of the JNP East Gate. Data from the Hinton Station were obtained to provide a general indication of regional background pollutant concentrations and status of compliance with AAAQOs for the contaminants of concern. The Hinton monitoring station is located closer to a populated area (e.g., Town of Hinton) than to the Project, which affects the monitoring results and, therefore, better air quality is expected in the Atmospheric RA. The calculated 8-hour, 24-hour, or annual average concentrations, which reflect averaging periods required by AAAQO or CAAQS, of NO_2, CO, PM_{10} and $PM_{2.5}$ gases present along the Project route are provided in Table 5.6-6. One of the contaminants of interest, CO, is not monitored at the Hinton Station, however, CO measurements from another monitoring station (Steeper Continuous Air Quality Monitoring Station [Steeper Station]) were considered representative of this area and are provided in Table 5.6-6. PM_{10} speciation monitoring is not conducted in the West Central Airshed where the Project is situated (Government of Alberta, 2016b).

Table 5.6-6. Summary of Monitoring Results at the Hinton Station (2014 to 2016)

Criteria Air Contaminants and Measurement Averages	AAAQO ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	Existing Average Concentrations ($\mu g/m^3$)
NO_2			
Annual average	45	--	13.5[a]
CO			
8-hour average	6,000	--	306.0[b]
$PM_{2.5}$			
24-hour average	30	28	9.8[c]

Sources: AESRD, 2013; CCME 2016a; Government of Alberta, 2016b

[a] Average of the 1-hour concentration value averaged over 3 years.

[b] Assumed the same as 1-hour concentration, adopted from Steeper Station

[c] Maximum 24-hour concentration average over 3 years.

Note:

"--" mark denotes no objective or standard exists for the given averaging period for contaminants of interest.

Existing emissions levels for the contaminants of interest are likely lower in the Atmospheric RA for the Project than those measured at Hinton Station since the monitoring station is within close proximity to municipal and industrial emission sources, whereas potential emission sources in JNP and the Atmospheric RA are limited.

Existing Greenhouse Gas Emissions

Existing provincial and national GHG emissions were obtained from ECCC's most recent 2013 National Inventory Report (Environment Canada, 2015). Table 5.6-7 lists 2013 total annual GHG emissions in Alberta and Canada. These provincial and national GHG emission totals were based on GWPs for N_2O and CH_4 from the Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (Environment Canada, 2015).

Table 5.6-7. Total Provincial and National 2013 Annual GHG Emissions

Jurisdiction	CO_2e (Megatonnes)
Alberta	267
Canada	726

Source: Environment Canada, 2015; Tables A9-3 and A10-9 in Part 3 of National Inventory Report on GHG.

For the purposes of this assessment, the following explanation of the GWP concept from the National Inventory Report (Environment Canada, 2015) is best: "a GWP is the time-integrated change in radiative forcing (measured in watt per square meter) due to the instantaneous release of 1 kg of the gas expressed relative to the radiative forcing from the release of 1 kg of CO_2". GWPs are used to compare how much the individual GHG gas can trap heat in atmosphere compared to CO_2. Since GWPs have changed after 2012, pre-2012 and post-2012 GWPs are provided in Table 5.6-8 for comparison.

Table 5.6-8. Global Warming Potential

Gases	Pre-2012 GWPs Based on the IPCC Second Assessment Report	Post-2012 GWPs Based on the IPCC Fourth Assessment Report
CO_2	1	1
N_2O	310	298
CH_4	21	25
SF_6	23,900	22,800

Source: Environment Canada, 2015.

5.6.3.3 Field Studies

No field studies were completed for this Project since potential emissions can be accurately estimated based on desktop studies.

5.6.4 Air Quality and Greenhouse Gas Effects Assessment

This subsection presents the assessment of the potential effects of the Project on the air quality and GHGs. The potential effects are identified in consideration of the existing conditions information presented in Sections 5.6-1 to 5.6-4, and the potential residual effects are characterized and assessed according to the methods presented in Section 4 of the DIA.

5.6.4.1 Sources of Air and Greenhouse Gas Emissions

The sources of air emissions during construction will be primarily from fuel combustion by transportation and construction equipment (e.g., dozers, excavators, cranes, haul trucks, etc.), dust generation related to the use of transportation vehicles, heavy-duty construction equipment, material handling, and emissions from slash burning during land clearing where timber salvage is not feasible. During the operations phase of the Project, the primary source of air emissions will result from site-specific maintenance activities along the transmission line and are limited to right-of-way surveillance by light trucks, and related transportation and equipment use during maintenance or inspection activities.

Sources of GHG emissions during construction of the Project include vehicle and equipment operation and emissions from slash burning during land clearing where timber salvage is not feasible. Lesser emissions are also caused by fugitive emissions and equipment and vehicles used for right-of-way surveillance by light trucks and maintenance of substation. Sources of GHG emissions during operations of the Project include fugitive emissions from gas filled transformers in the substation and fuel combustion.

5.6.4.2 Predicted Air and Greenhouse Gas Emissions

Predicted Air Emissions

Air contaminants expected to be emitted from Project-related activities include NO_x, CO, PM_{10}, and $PM_{2.5}$. These are total emissions expected over the entire construction phase of the Project and are not annualized.

Air Emissions Associated with Construction of the Project

Emissions resulting from the construction phase of the Project are summarized in Table 5.6-9.

Table 5.6-9. Summary of Project-Related Air Emissions During Construction of the Project

Activity	Emissions (tonnes)			
	NO_x	CO	$PM_{2.5}$	PM_{10}
Fuel Combustion	4.11	1.53	0.28	0.29
Land Clearing and Slash Burning	-	72.2	7.8	7.8
Material Handling and Unpaved Road Travel	-	-	2.32	23.2
Total Predicted Emissions	**4.11**	**73.68**	**10.40**	**31.29**

Note:

"—" mark denotes no significant emissions from described activity.

Air Emission Associated with Operation of the Project

Air emissions are associated with the operation of the substation and are summarized in Table 5.6-10.

Table 5.6-10. Summary of Project-Related Air Emissions During Operation of Transmission Line and Substation

Activity	Emissions (tonnes)			
	NO_x	CO	$PM_{2.5}$	PM_{10}
Light Truck Right-of-Way Inspections	0.00068	0.00016	0.000022	0.000023
ECCC Release Threshold	20	20	0.3	0.5

Source: ECCC, 2016.

Predicted Greenhouse Gas Emissions

Emissions of three GHGs (CO_2, CH_4 and N_2O) are estimated in the GHG assessment for the Project construction phase and are expressed as CO_2e. During the Project operations phase, SF_6 leakage from gas-filled transformers are included in addition to CO_2 emissions from light truck fuel combustion. Decommissioning of Palisades following Project transmission line construction will result in substantial reductions of GHG emission from that facility. Since the Project schedule is subject to change based on the timing of regulatory approvals, Project construction-related emissions were not estimated on an annual basis. Instead, these emissions are estimated and reported as overall totals. GHG emissions for the Project are summarized in Table 5.6-11.

Table 5.6-11. Summary of Project-Related GHG Emissions

Activity	Emissions (tonnes CO_2e)	
Fuel Combustion during Construction	820.3	
Slash Burning	3397	
Total Predicted Construction -related GHG Emissions [a]	**4,217.3**	
Light Truck Right-of-Way Inspections	0.4	
SF_6 Leakage from Gas-Filled Transformers	2.3	
Annual Predicted Operation-related GHG emissions	**2.7**	
Total provincial and federal GHG emissions for the 2013 reporting year	Alberta (Megatonnes CO_2e)	Total Canada (Megatonnes CO_2e)
	267	726

Table 5.6-11. Summary of Project-Related GHG Emissions

Activity	Emissions (tonnes CO_2e)	
Project's contribution to annual provincial and federal GHG emissions during construction	0.0016%	0.0006%
Project's contribution to annual provincial and federal GHG emissions during operations	0.000001%	0.0000003%

Source: Environment Canada (2015); note that these emissions are based on pre-2012 GWPs.

[a] Estimates are based on post-2012 GWPs.

The total GHG emissions resulting from construction of the transmission line and substation are estimated to be 4,217 tonnes of CO_2e, which is approximately 0.0006 percent of 2013 annual nation-wide emissions. Total GHG emissions associated with construction of the transmission line and substation is 0.0016 percent, when compared to 2013 annual provincial emissions in Alberta. Annual GHG emissions during operations of the Project are predicted to be 2.7 tonnes of CO_2e. The predicted Project GHG emissions during operation are well below the annual provincial and federal GHG emission reporting targets (50,000 tonnes per year of CO_2e) and well within the limits set by the Alberta Specified Gas Reporting Regulation and Specified Gas Emitters Regulation (Environment Canada, 2013; AENV, 2008; AESRD, 2014a, 2014b). The Project construction GHG emissions are a one-time event and, therefore, none of the GHG emission reduction targets are applicable. The decommissioning of the Palisades power plant will result in the cessation of GHG emissions from that facility during operations. Based on natural gas and diesel usage records from Palisades for the year 2015, it is estimated that approximately 40,077 tonnes of CO_2e will no longer be emitted from that facility on an annual basis.

5.6.4.3 Identification of Potential Effects, Key Mitigation Measures and Residual Effects

The potential effects associated with the Project on air quality and GHG emissions were identified by the assessment team and are listed in Table 5.6-12. The key mitigation measures proposed in Table 5.6-12 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys and Walker, 1998), and *Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities* (Cheminfo Services Inc., 2005).

The potential residual effects listed in Table 5.6-12 were identified according to the method described in Section 4 of the DIA, which considers the effects remaining after mitigation is implemented.

Table 5.6-12. Potential Effects, Key Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Air Quality and GHG Emissions

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Potential Residual Effect(s)
1. Project contribution to air emissions	Entire Project	Atmospheric RA	• Use well-maintained equipment to reduce air pollution and unnecessary noise. • Ensure that all internal combustion engines are fitted with muffler systems. • Use multi-passenger vehicles to transport work crews to and from the work site, to the extent feasible.	• Increase in air emissions during construction of the Project. • Air emissions associated with operations of the Project are negligible. Therefore, no potential effect was identified.

Table 5.6-12. Potential Effects, Key Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Air Quality and GHG Emissions

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Potential Residual Effect(s)
1. Project contribution to air emissions (cont'd)	See above	See above	• All motors will be shut off when not in use unless required for work as defined by the MUNICIPALITY OF JASPER BYLAW #099. • Within the municipality of Jasper any vehicle idling must be in accordance with the MUNICIPALITY OF JASPER BYLAW #099. • Implement dust control measures on high use access roads (e.g., >20 km/hr vehicle passes per week) and the Project right-of-way, where necessary. • Only water or chemical products approved by Parks Canada will be applied to access roads for dust control. • Dust control products will only be applied during calm wind conditions. • No dust control chemicals will be applied to roads within 300 m of a stream or waterbody. • Water requirements for dust control application will be identified by Parks Canada, and sources will be developed in conjunction with Parks Canada. As a general rule, withdrawal rates will not exceed 10% of the flow of the source stream and withdrawal volumes will not exceed 10% of the volume of the source waterbody.	• See above
2. Project contribution to GHG emissions	Palisades power plant, right-of-way and substation	International	• Use well-maintained equipment to reduce air pollution and unnecessary noise. • Ensure that all internal combustion engines are fitted with muffler systems. • Use multi-passenger vehicles to transport work crews to and from the work site, to the extent feasible. • All motors will be shut off when not in use unless required for work as defined by the MUNICIPALITY OF JASPER BYLAW #099.	• Increase in GHG emissions during construction and operation of the Project. • GHG emissions associated with operations of the Project are negligible Therefore, no potential effect was identified.

[a] Detailed key mitigation measures are outlined in Axys and Walker, 1998 and the Project EPP (Appendix 1).

5.6.4.4 Characterization of Potential Residual Effects

The method set out in Section 4 of the DIA was adopted for the characterization of potential residual effects for air quality and GHG emissions.

This assessment of potential residual effects on air quality relied on both a qualitative and quantitative approach to evaluate the Project components. Where appropriate, the qualitative assessment relied on available regulatory guidelines and the professional experience of the assessment team. The most influential assessment criteria for air quality is magnitude since this criteria determines compliance with ECCC release thresholds, although many of the criteria ratings are inherently related.

Increase in Air Emissions during Construction of the Project

Sources of air emissions during construction of the Project include fuel combustion by transportation and construction equipment which will emit NOx, CO, $PM_{2.5}$. As part of land clearing, dust and smoke (containing $PM_{2.5}$ and PM_{10},) emissions are expected from slash burning where tree salvage is not feasible. Construction activities such as topsoil movement and transportation on unpaved roads are expected to result in PM_{10} emissions. The expected duration of air emissions associated with construction will vary depending on the Project component. For example, transmission line construction activities are considered to be progressive along the transmission line route, while construction at the substation site and decommissioning of Palisades is considered stationary and are expected to last several weeks or months. The residual effect characterization relied on review of power ratings of typical construction equipment, review of emission assessments of similar size projects, analysis of ambient air quality observations within the Atmospheric RA and the professional experience of the assessment team. These emissions are total emissions expected over the entire construction phase of the Project and are not annualized.

Emissions of CO and NOx are expected to result in short-term elevated concentrations relative to background. Brief episodes of high ambient concentrations of $PM_{2.5}$ and PM_{10} will likely occur in close vicinity to Project construction which is common during construction of linear infrastructure projects. Based on the professional experience of the assessment team and a review of similar size projects, an increase in CAC emissions during construction is expected relative to existing background CAC concentrations, but expected to stay below the AAAQO for a 24-hour averaging period. A report to the National Pollutant Release Inventory will not be required since emissions are not associated with the operation of a facility and are the results of a short-term isolated event (i.e., construction).

The increases are expected to be reversible since emissions will cease once Project construction activities are completed, be short-term in duration and of minor magnitude since long-term average concentrations are expected to stay below AAAQOs (Table 5.6-13, point [a]).

Increase in Greenhouse Gas Emissions during Construction of the Project

Construction of the Project will result in increased GHG emissions (e.g.*,* from vehicles and equipment operation, and emissions from slash burning).

There are no standards, targets or other established thresholds to define quantitative rating criteria for construction-related GHG emissions as they are usually a one-time event. Therefore, in this assessment, GHG emissions associated with construction of the transmission line and substation were compared to provincial and federal totals following a common practice. The magnitude of the emissions is rated as minor. Although the emissions would be detectable, the contribution to provincial and federal emission levels will be low: approximately 0.0016 percent of provincial and 0.0006 percent of federal GHG emission levels (Table 5.6-13, point [b]).

Combined Residual Effects on Air Quality and Greenhouse Gases

The evaluation of combined effects on the atmospheric environment considered the individual potential residual effects that are likely to occur that could act in combination to adversely affect the atmospheric environment. The following potential residual effects are likely to act in combination to result in overall effects on the atmospheric environment:

- Increase in air emissions during construction of the Project
- Increase in GHG emissions during construction of the Project

Fuel combustion and slash burning will act as sources of CACs and GHG during construction of the Project. Mitigation measures listed in Table 5.6-12 will be implemented to manage potential residual effects. The magnitude of the combined effect on the atmospheric environment is estimated to be minor since both the predicted CAC emissions and GHG emissions associated with the Project are anticipated to be within regulatory reporting thresholds (Table 5.6-13, point [c]).

The characterization of the combined potential residual effects of Project construction on the atmospheric environment is summarized in Table 5.6-13.

Table 5.6-13. Residual Effects Characterization for Air Quality and GHG Emissions

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Increase in air emissions during construction of the Project	**Context:** Sources of air emissions during construction of the transmission line include vehicle and equipment operation, land clearing, and slash burning.	
	Geographic Extent: Atmospheric RA	The increase in air emissions is not expected to extend outside the Atmospheric RA
	Duration: Short-term	Increased air emissions will be short-term for the Project activities since the residual effect is limited to the construction phase.
	Frequency: Isolated	The increase in air emissions during construction and decommissioning works is confined to the construction phase (i.e., isolated).
	Reversibility: Reversible	The effects are expected to be reversible following the completion of Project construction and Palisades decommissioning activities (i.e., air quality will return to pre-construction ambient air quality conditions).
	Magnitude: Minor	Construction and decommissioning activities will cause measurable increases in CAC emissions relative to existing background CAC concentrations but be within the long-term AAAQOs.
b. Increase in GHG Emissions during Construction of the Project	**Context:** Construction of the transmission line will result in increased GHG emissions (e.g., from vehicles and equipment operation and emissions from slash burning).	
	Geographic Extent: International	Potential increases in federal GHG emissions resulting from construction activities would increase global GHG concentrations.
	Duration: Extended-term	The effects of GHG emissions from construction of the Project extends beyond the operational life of the Project since GHGs have more than a 100-year lifetime and they continue to contribute to global climate change long after the activity is completed.
	Frequency: Continuous	The residual effect is continuous throughout the assessment period since GHGs have more than a 100-year lifetime.
	Reversibility: Irreversible	Project construction emissions are expected to result in a permanent addition to global GHG emissions, which in turn are predicted to cause proportional changes in global climate.
	Magnitude: Minor	Project GHG emissions do not contribute substantially to federal or provincial GHG emission totals. Project emissions are estimated to be 0.0016% of provincial GHG emission totals and 0.0006% of federal GHG emission totals.

Table 5.6-13. Residual Effects Characterization for Air Quality and GHG Emissions

Potential Residual Effect	Criteria Rating	Effects Characterization
c. Combined Residual Effects on the atmospheric environment	**Context:** Sources of CAC emissions and GHGs during construction of the Project are likely to act in combination to result in overall effects on the atmospheric environment.	
	Geographic Extent: Atmospheric RA to International	The increase in air emissions is not expected to extend outside the Atmospheric RA while GHG emissions contribute to global climate change and are international in extent.
	Duration: Short to extended-term	Increased air emissions will be short-term for the Project air emissions since the residual effect is limited to the construction while the effects of GHG emissions extends beyond the operational life of the Project and contribute to global climate change long after the activity is completed.
	Frequency: Isolated to continuous	The increase in air emissions during construction and decommissioning works is confined to the construction phase (i.e., isolated). While the Project contribution to GHG emissions is continuous throughout the assessment period since GHGs have more than a 100-year lifetime.
	Reversibility: Reversible to irreversible	The increased air emissions are expected to be reversible following the completion of Project while GHG emissions result in a permanent addition to global GHG emissions.
	Magnitude: Minor	Project air emissions and GHG emissions were estimated and are expected to be within applicable thresholds for CACs and contribute negligibly to provincial and federal GHG totals

5.6.4.5 Summary

Ambient air quality along the Project is primarily affected by anthropogenic sources of emissions from transportation corridors (e.g., Highway 16, the CN Railway and local roads), and sources typical of municipal development such as home heating and the existing Palisades located within the Atmospheric RA. A review of ambient background concentrations of CACs and GHG found that existing average concentrations for all potential CAC of interest in the vicinity of the Project are well within the regulatory objectives. Emissions estimates completed for the Project found that increases in CAC emissions during construction are expected relative to existing background CAC concentrations which, is common during construction activities. However, based on the professional experience of the assessment team, the long-term average concentrations are expected to stay below the AAAQOs for a 24-hour averaging period and therefore, be minor in magnitude. CAC emissions during Project operation were estimated to be negligible. GHG emissions from Project construction were estimated and expected to be minor in magnitude (e.g., 0.0016 percent of provincial GHG emission totals and 0.0006 percent of federal GHG emission totals). Similarly, GHG emissions during operations of the Project are expected to be negligible and not meaningfully contribute to provincial or federal GHG emission totals. In addition, the decommissioning of Palisades will result in the cessation of approximately 40,077 tonnes of CO_2e previously emitted annually from that facility. Mitigation measures in Table 5.6-12 will be implemented to manage potential residual effects and the identified potential effects on the atmospheric environment were determined to be of minor magnitude.

5.6.5 Cumulative Effects Assessment

As acknowledged in the scientific community and amongst policymakers, no individual activity is responsible for global effects on climate due to GHG emissions. Scientific consensus suggests global emissions of GHGs and consequent changes to global climate represent a substantial cumulative effect (International Panel on Climate Change 2007). The Project's GHG emissions will contribute to these cumulative adverse effects, but the contribution will be negligible in a provincial, federal, or global context. Further, the decommissioning of the Palisades power plant will result in the cessation of GHG emissions from that facility during operations. Based on natural gas and diesel usage records from Palisades for the year 2015, it is estimated that approximately 40,077 tonnes of CO_2e will no longer be emitted from that facility on an annual basis. Once the transmission line and substation are commissioned and energized the municipality of Jasper will be serviced by the AIES which draws from multiple energy sources across the province. Indirect emissions associated with servicing the municipality of Jasper by the AIES are expected to be the same or reduced when compared to the previous direct emissions from the diesel and natural gas-powered Palisades facility. Similar or reduced emissions are expected since the electrical draw from the Jasper area previously serviced by Palisades will be same when connected to the AIES and the AIES is powered by a combined 18 percent of renewable sources (e.g., hydro, wind, and biomass) which is slated to increase in future years as the province moves towards the replacement of coal generated power plants with renewable sources (Government of Alberta, 2016c, 2016d).

The key mitigation measures in Section 5.6.4.3 will reduce Project-related contributions to cumulative GHG emissions. It is expected that operators of reasonably foreseeable developments will also implement key mitigation measures developed in accordance with industry standards for GHG emissions. No mitigation measures beyond the Project-specific mitigation already proposed in Table 5.6-12 are deemed warranted. The cumulative effect on global climate is considered to be of negligible magnitude since the emissions will be negligible in a provincial, federal, or global context.

The Project-related air emissions (described in Section 5.6.4.2) will act cumulatively with reasonable foreseeable developments (see Table 4.9-1) and existing air emission sources in that an incremental increase in air emissions will occur. Existing sources of air emissions in the Atmospheric RA include vehicle emissions arising utility maintenance activities (e.g., pipelines and power lines), transportation along local roads and provincial highways, and maintenance activities associated with the operation of JNP and the Municipality of Jasper. The key mitigation measures in Section 5.6.4.3 will reduce the severity of Project-related contributions to cumulative air emissions. It is expected that operators of reasonably foreseeable developments will also implement key mitigation measures developed in accordance with industry standards for air emissions.

No mitigation measures beyond the Project-specific mitigation already proposed in Table 5.6-11 are deemed warranted. The cumulative effect on air quality in the Atmospheric RA is considered to be of minor magnitude since the emissions arising from existing activities, the Project and reasonably foreseeable future developments either are minor enough that no regulatory approvals are required.

5.6.6 References

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5.7 Aesthetics and Visual Resources

5.7.1 Existing Conditions and Regulatory Context

The aesthetics and visual resources of an area refer to the key landscape characteristics as well as any existing disturbances that may determine the visual quality of a landscape. Visual aesthetics are especially important to consider in areas that are readily accessible by the public or frequently visited, as well as areas of high aesthetic or historic importance. Given that the Project is located in a national park, it is expected that visual quality may be affected by Project activities, particularly along Highway 16, and from viewsheds on trails and recreation areas. Other aesthetic attributes could include sensory disturbance such as nuisance visual disturbance (e.g., lighting and temporary activities) and noise.

The JNP of Canada Management Plan outlines key strategies to achieve their mandate, many of which touch on the importance of a visitor's visual experience. In particular, the plan outlines different ways that visitors can connect with their surroundings, which includes a 'View from the Edge'. This type of visitor experience refers to the second-largest visitor segment, made up of people who visit JNP for a short time period and usually do not venture far from the highway and easily accessible park facilities. In the Lower Athabasca region of JNP, especially along the Highway 16 Corridor, visitors have an excellent 'View from the Edge'. This transportation corridor includes Highway 16 and CN Railway; as well as utility infrastructure including Telus Corporation, ATCO Pipelines, and ATCO Electric; and the Kinder Morgan TMPL. In addition, the Athabasca River flows through the corridor providing opportunity to recreational paddlers. Because of this type of visitor experience, the management plan states the importance of careful stewardship and restoration along road, rail and pipeline corridors to preserve the visual and ecological integrity of JNP (Parks Canada, 2010).

Although noise is not specifically mentioned in the JNP of Canada Management Plan, the JNP Regulations outlines the importance of quiet for visitor enjoyment during the day and night. Loud noises in campgrounds, day-use areas and trails are prohibited (Parks Canada, 2015a).

JNP is also a Dark Sky Preserve, which was officially designated by the Royal Astronomical Society of Canada in 2011. This is a commitment to protect and preserve the night sky by reducing or eliminating light pollution in all forms. Special programs regarding the importance of the Dark Sky Preserve status are hosted in JNP throughout the fall and winter months (Parks Canada, 2015b).

There is some existing anthropogenic disturbance in JNP, and around the Project area. This primarily includes linear infrastructure such as Highway 16, local roads, powerlines and pipelines. Other disturbance in the Project area include recreational sites and park facilities, such as trails, cabins, highway turnouts and campsites. Seasonal changes in vegetation could affect the visual quality of certain areas since the vegetation can act as a screen to conceal certain areas. However, the summer (when the foliage is greatest) is the most popular time for park visitors.

5.7.1.1 Spatial Boundaries

The proposed transmission line route was considered in relation to a Project Footprint SA (the Project Footprint, as defined in Section 4 of the DIA) and a Visual and Visitor Experience SA.

The Visual and Visitor Experience SA represents the area where potential visual effects as a result of the Project can be perceived and is defined as a 2 km wide band centered on the transmission line route (i.e., 1 km on both sides of the Project centre line) and a 1 km radius extending outwards from the substation. It is expected that beyond 1 km, effects to visual resources and visitor experience from the Project will be minimal or not perceivable.

An RA was not established for the aesthetics and visual resources assessment since potential effects of the Project are not expected to extend beyond the Visual and Visitor Experience SA.

5.7.1.2 Field Studies

In July 2015, a CH2M representative met with ATCO Electric and the Parks Canada Product Development Specialist in JNP. The purpose of the meeting was to determine potential viewpoints along the proposed route to use in the visual assessment. There were 14 viewpoints selected as representative areas with high public use or aesthetic value (e.g., highway turnouts, trails, or scenic viewpoints) from which the Project could be seen. During this meeting, the 14 viewpoints were visited and GPS coordinates were recorded at each. The viewpoints were selected as sites that have potentially clear views of the Project Footprint as well as one or more of the following:

- Readily accessible by the general public (e.g., highways, trails, campgrounds, roadside turnouts)
- Frequent public use (i.e., popular destinations)
- Aesthetic or historic importance
- Other areas of interest identified by Parks Canada

In September 2015, two CH2M field crew revisited the 14 viewpoints. Photographs (using a GigaPan camera) were taken from each viewpoint towards the Project Footprint. Detailed notes were also recorded at each viewpoint. Although there are an infinite number of possible viewpoints, the objective of this assessment is to provide an initial understanding of the potential visual adverse effects. For this reason, 5 viewpoints were selected based on several criteria to determine the sites with the most potential for visual effects. After discussions with ATCO Electric and the Parks Canada Product Development Specialist, the following viewpoints were chosen for visualizations:

- Viewpoint 1: Highway 16 at Jasper Lake
- Viewpoint 2: Snaring Road
- Viewpoint 3: Celestine Road
- Viewpoints 4 and 5: Pocahontas Cabins and Trails

The visualizations that were produced represent the potential visual effects anticipated for the Project. Visualizations were created by combining GIS, 3D modeling and a spatially accurate photo capturing to produce a final visualization. This included:

- Initial photography: acquiring the necessary images and data in order to recreate the project in a 3D virtual space
- Modelling the transmission line structures: 2 models were created using the drawing specifications supplied by ATCO Electric
- Virtual rendering: the data and images are brought into our software and a virtual representation is created
- Final simulation: a virtual representation of the Project is spatially accurately represented on the captured photograph

The visualizations are provided in Appendix 5.7-1 (Figures 1, 2, 3, 4 and 5).

5.7.2 Aesthetics and Visual Resources Effects Assessment

This subsection presents the assessment of the potential effects of the Project on aesthetics and visual resources. The potential effects are identified in consideration of the existing conditions information presented in Section 5.7.1, and the potential residual effects are characterized and assessed according to the methods presented in Section 4 of the DIA.

5.7.2.1 Identification of Potential Effects, Key Mitigation Measures and Residual Effects

The potential effects associated with the construction and operation of the Project on aesthetics and visual resources were identified by the assessment team and are listed in Table 5.7-1 of the DIA.

The key mitigation measures proposed in Table 5.7-1 of the DIA were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys and Walker, 1998).

Routing and Project design are the primary mechanisms for avoiding or reducing potential adverse effects of the Project on aesthetics and visual resources. Criteria used during the route selection process are described in detail in Section 2.6.

Table 5.7-1. Potential Effects, Key Mitigation Measures, and Potential Residual Effects of Construction and Operations of the Project on Aesthetics and Visual Resources

Potential Effect	Location	Geographic Extent	Key Mitigation Measures	Potential Residual Effect(s)
1. Alteration of viewsheds	Entire Project	Visual and Visitor Experience SA	• Repair all roads damaged by construction vehicles to pre-construction conditions. • Reclaim temporary access roads/trails as part of final clean-up. • Vegetate any disturbed areas by planting and seeding preferably with native trees, shrubs, or grasses	• Alteration of viewsheds
2. Sensory disturbance	Entire Project	Visual and Visitor Experience SA	• Waste and work materials must be removed from JNP. • Where temporary workspace is required in undisturbed natural vegetation communities, grading, and grubbing of this workspace will be avoided to the degree possible to encourage rapid recovery of the site. • Restrict construction traffic to existing roads, the right-of-way, and approved access roads/trails. • Confine work activities to the approved right-of-way and workspace. • Lighting for all construction activities will be directed downwards and, where feasible, lighting will be limited in the evenings to avoid disturbance to the Dark Sky Preserve. • Conduct line construction activity between the hours of 7:00 a.m. and 7:00 p.m. unless authorized by Parks Canada. • No work will occur on Sundays within 1 km of active campgrounds • Advise Parks Canada of significant noise-causing activities and schedule these events to reduce disruption.	• Sensory disturbance for visitors during construction

Note:

- Detailed key mitigation measures are outlined in Axys and Walker, 1998 and the Project EPP (Appendix 1).

5.7.2.2 Characterization of Potential Residual Effects

The method set out in Section 4 of the DIA was adopted for the characterization of potential effects for the aesthetics and visual resources. This qualitative assessment relied on available research literature and the professional experience of the assessment team.

Alteration of Viewsheds

The Project is expected to have longer term visual effects that will begin during construction and last throughout operations. These visual effects are related to the proposed transmission line. The substation is located in the same location as an existing facility and as such is not considered a new alteration to the visual landscape. This may affect the quality or experience of certain viewsheds for some JNP visitors.

The visualizations created show a series of different visual effects during operations (Appendix 5.7-1). Specifically, they present the visual effects from close distances (approximately 10 m) and further distances (approximately 2.0 km). They also present the visual effects of the transmission line in an existing right-of-way as well as areas that require a new right-of-way. Visual effects of the Project differ based on each area's overall visual sensitivity, the presence of existing disturbance, points from which people could view the Project, and the presence of vegetation to act as a screen.

The transmission line will be visible from certain transportation routes and recreation sites, such as the Pocahontas Cabins and trails, Highway 16, highway turnouts, the Athabasca River, Jasper Lake, Snaring Road, Celestine Road and Windy Point. For some portions, the Project route parallels existing linear disturbance, such as travel corridors and the TMPL. Where feasible, the Project reuses the existing distribution power line alignment and has the distribution line understrung on the same structure. Routing the Project along existing disturbance will mitigate the potential visual effects as the change to the existing visual quality will be minimal. For some areas along the route, trees will be cleared to accommodate the right-of-way for the transmission line along Snaring Road, which results in a change in colour and texture of forested portions of the viewshed. In addition, the proposed transmission line design helps to preserve natural viewscapes by utilizing a specialized structure type that minimizes the height and width of the required structures.

Mitigation that will reduce this potential residual effect will include repairing roads to pre-construction conditions, and reclaiming temporary access roads as part of the final clean-up. Temporary workspaces in natural vegetation communities will avoid grading and grubbing in order to encourage rapid recovery of the site. Disturbed areas will be revegetated by planting and seeding with native trees, shrubs, or grasses. In addition, ATCO Electric will use a combination of dark coloured covered conductor and gray metallic bare wire, which will reduce visibility of the transmission line, depending on background ground cover types. Most of the transmission line will utilize wood pole structures, further blending the transmission line into surrounding tree cover.

With the implementation of key mitigation measures, this potential residual effect is considered to be of minor magnitude during operations when the transmission line and some new permanent right-of-way segments will be visible. This potential residual effect is also considered to be continuous over the assessment period, reversible, and long-term in duration. Characterization of the potential residual effect is summarized in Table 5.7-2.

Sensory Disturbance for Visitors during Construction

Nuisance aesthetics effects, such as noise and construction-related visual effects, may disturb visitors in the vicinity of Project construction. Potential effects may include noise from construction equipment and vehicles, as well as visual effects from the construction activities. Periods of night lighting around construction sites may also disturb nearby visitors to JNP.

The nearest human receptors to nuisance noise and construction-related visual effects will be visitors to JNP. Construction is scheduled to begin in Q3 2017, with an anticipated in-service date of May 2018. Most of the construction activities will take place during fall and winter months, when there are less visitors to the park specifically on the Snaring and Celestine roads. However, days will be shorter, and the fall and winter months are popular for the Dark Sky Preserve.

Mitigation that will reduce this potential residual effect will include confining work activities to the approved right-of-way and workspace, and restricting construction traffic to existing roads, right-of-way, and approved access roads. All waste and work material will be removed from JNP. Temporary workspaces in natural vegetation communities will avoid grading and grubbing in order to encourage rapid recovery of the site. Finally, lighting for all construction activities will be directed downwards and, where feasible, lighting will be limited in the evenings to avoid disturbance to the Dark Sky Preserve.

To reduce potential noise effects, construction activities on the proposed transmission line will be conducted between the hours of 7:00 a.m. and 7:00 p.m. (excluding mobilization), and no work will occur on Sundays within 1 km of active campgrounds. Parks Canada will also be advised of significant noise-causing activities and these events will be scheduled at a time that will reduce disruption.

With the implementation of key mitigation measures, this potential residual effect is considered to be of minor magnitude during construction when the construction activities, personnel, and equipment will be visible along the Project Footprint. This potential residual effect is also considered to be short-term in duration since the effect will be limited to the construction phase, isolated in frequency, and reversible. Characterization of the potential residual effect is summarized in Table 5.7-2.

Combined Residual Effects on Aesthetics and Visual Resources

The evaluation of the combined effects on aesthetics and visual resources considers the individual potential residual effects evaluation in Section 5.7.4 that are likely to occur. The following potential residual effects are likely to result in overall effects on aesthetics and visual resources:

- Alteration of viewsheds during operations
- Sensory disturbance to visitors during construction

Key mitigation measures listed in Table 5.7-1 will be implemented to manage and reduce the potential residual effects. The magnitude of the combined effects on aesthetics and visual resources following implementation of these key mitigation measures is considered to be minor.

The characterization of the potential residual effects of the construction and operation of the Project on aesthetics and visual resources is summarized in Table 5.7-2.

Table 5.7-2. Residual Effects Characterization for Aesthetics and Visual Resources

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Alteration of viewsheds during operations	**Context:** The Project will be located in a national park, which protects and preserves areas of natural beauty and significance. The Project parallels existing linear disturbance, including Highway 16, an existing Kinder Morgan Canada Inc. right-of-way, and local roads; however, in some areas additional trees will be cleared to accommodate the Project.	
	Geographic Extent: Visual and Visitor Experience SA	The potential residual effect of alteration of viewsheds during operations may extend beyond the proposed transmission line right-of-way, as the alteration will be visible from different viewpoints in the Visual and Visitor Experience SA.
	Duration: Long-term	The potential residual effect of alteration of viewsheds extends into the operation phase for more than 10 years, but ceases once the operational life of the Project is complete.
	Frequency: Continuous	The potential residual effect of alteration of viewsheds will occur throughout the assessment period.
	Reversibility: Reversible	The potential residual effect of alteration of viewsheds is reversible to pre-construction conditions, but with intervention.

Table 5.7-2. Residual Effects Characterization for Aesthetics and Visual Resources

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Alteration of viewsheds during operations (cont'd)	**Magnitude:** Minor	The potential residual effect of alteration of viewsheds will result in a detectable change to the aesthetics and visual resources environment. However, the change is anticipated to be limited to a minor modification from the existing (baseline) conditions.
b. Sensory disturbance to visitors during construction	**Context:** The Project will be located in a national park, which protects and preserves areas of natural beauty and significance. The Project parallels existing linear disturbance, including Highway 16, an existing Kinder Morgan Canada Inc. right-of-way, and local roads; however, in some areas additional trees will be cleared to accommodate the Project.	
	Geographic Extent: Visual and Visitor Experience SA	The potential residual effect of sensory disturbance during construction may extend beyond the proposed transmission line right-of-way as the alteration will be visible from different viewpoints in the Visual and Visitor Experience SA.
	Duration: Short-term	The potential residual effect of sensory disturbance is limited to the construction phase of the Project.
	Frequency: Isolated	The potential residual effect of sensory disturbance is confined to the construction phase of the Project.
	Reversibility: Reversible	The potential residual effect of sensory disturbance is reversible and will cease once the construction phase is complete.
	Magnitude: Minor	The potential residual effect of sensory disturbance during construction may result in a detectable change to the aesthetics and visual resources environment. However, the change is anticipated to be limited to a minor modification from the existing (baseline) conditions.

5.7.2.3 Summary and Recommendations

During construction, the appropriate visual aesthetics key mitigation measures will be implemented. The recommended aesthetics and visual resources key mitigation measures in Table 5.7-1 will be discussed with Parks Canada prior to the commencement of ground disturbance activities, if warranted.

5.7.3 Cumulative Effects Assessment

The Project will act cumulatively with existing sources of noise and existing and future sources of visual effects. Incremental increases in nuisance noise may occur and could involve an increase of vehicles on Highway 16 and local roads, as well as construction equipment in the Project area. Existing sources of noise that could act cumulatively with the Project include transportation, oil and gas activity (e.g., ongoing pipeline maintenance activities), utilities (e.g., transmission line maintenance activities) and infrastructure upgrades to existing roads, highways, campgrounds, park buildings, and other recreational sites. Similarly, existing sources of visual effects that could act cumulatively with the Project include existing transportation infrastructure (highways and local roads), utilities, and oil and gas infrastructure.

No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.7-1 are recommended. The cumulative effect on the aesthetics and visual resources is considered to be of minor magnitude, and short-term to long-term in duration depending on the Project phase. During construction, when activities may affect visitors because of noise and construction-related visual effects, the effect is considered to be short-term and isolated to the construction phase, and reversible once the construction phase is complete. During the operations phase, the cumulative effect on visual resources is considered to be continuous and long-term when the presence of the transmission line and in select areas, a new right-of-way will be visible.

5.7.4 References

5.7.4.1 Literature Cited

ATCO Electric Ltd. (ATCO Electric). 2011. *ATCO Electric Environmental Protection Plan (EPP) for Jasper National Park*. December 2011. 323 pp.

Axys Environmental Consulting Ltd. and David Walker and Associates. 1998. *Best Available Methods for Common Leaseholder Activities.* Prepared for Line Leaseholder Working Group, Jasper National Park. 144 pp.

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Parks Canada. 2015a. *National Park Regulations*. http://www.pc.gc.ca/eng/pn-np/mtn/reglements-regulations/reglements-regulations.aspx. Accessed February 12, 2016.

Parks Canada. 2015b. *Welcome to Jasper National Park's Dark Sky Preserve.* http://www.pc.gc.ca/eng/pn-np/ab/jasper/edu/cieletoile-darksky.aspx. Accessed January 27, 2016.

5.8 Visitor Experience

5.8.1 Existing Conditions and Regulatory Context

The UNESCO classifies the Canadian Rocky Mountain Parks (Banff, Jasper, Kootenay, Yoho, Mount Robson, Mount Assiniboine and Hamber) as part of the World Heritage list due to their natural beauty and potential for fossils. JNP is located within the province of Alberta, approximately 300 km west from the City of Edmonton. The Project area is located in the northeast of JNP approximately 8 km north of the Municipality of Jasper, extending to the eastern JNP boundary. JNP currently receives over 2.2 million visitors per year with potential for minor yearly fluctuation based on special events in the Park (e.g., 150th Anniversary of Canada's Confederation in 2017). Numerous roads, trails and campgrounds are located within the Project area.

The Project area follows an existing industrial, commercial and transportation corridor. The principal drainage system present within the Project area is the Athabasca River. The area's main transportation and infrastructure corridor runs adjacent to and across the Athabasca River. Within close proximity to the Athabasca River is Alberta Highway 16, existing distribution voltage power lines, existing oil and gas pipelines, recreational lodging and campgrounds and the CN Railway.

Visitors accessing JNP from the northwest enter via Alberta Highway 16. Along this highway, visitors interact with a number of utility and infrastructure features. The addition of a transmission line will add to the level of infrastructure present within this corridor.

The Project encounters areas which are subject to strict development plans. These plans provide broad strategic direction for land use planning within their defined areas. The objectives of these management plans were considered in the development of mitigation measures for the potential effects related to visitor experience identified for the Project. Upon review of these documents, there are no objectives related to visitor experience that are incompatible with the Project.

5.8.1.1 Spatial Boundaries

The proposed transmission line route was considered in relation to a Project Footprint SA (the Project Footprint, as defined in Section 4) and a Visual and Visitor Experience SA.

The Visual and Visitor Experience SA represents the area where potential visual and visitor experience effects as a result of the Project can be perceived and is defined as a 2 km wide band centered on the transmission line route (i.e., 1 km on both sides of the Project centre line) and a 1 km radius extending outwards from the substation. It is expected that beyond 1 km, effects to visual resources and visitor experience from the Project will be minimal or not perceivable.

An RA was not established for the visitor experience assessment since potential effects of the Project are not expected to extend beyond the Visual and Visitor Experience SA.

5.8.1.2 Field Studies

In July 2015, ATCO Electric and CH2M met with a Product Development Specialist from the Visitor Experience department within Parks Canada to discuss and verify key areas along the proposed route that may have an effect on visitor experience. These discussions centered on general park usage, aesthetic effects and routing/structure placement to minimize effects to park users.

Field assessments of the existing corridor, which focused on users of the facilities, attractions and highway access as well as the potential effects of transmission line development on visitor experience, were discussed with Parks Canada in detail. Specific localized effects of routing alignments were discussed over several days of field and office review. The potential for visual disturbance and the mitigation measures anticipated to address potential effects are discussed further in the Aesthetics and Visual Resources section (see Section 5.7).

5.8.2 Regulatory Context

5.8.2.1 Jasper Community Sustainability Plan (2011)

The Jasper Community Sustainability Plan describes the community's vision for a sustainable future and proposes goals, objectives, targets and strategies to achieve that vision. The Plan is structured around the five pillars of sustainability: society, culture, economy, environment, and governance (Municipality of Jasper and Parks Canada, 2011). This Plan is designed to act as a guiding document for development and management within the Municipality of Jasper. The Project is anticipated to have a positive impact on many of the goals that are laid out in the Community Sustainability Plan, including the following.

- Air quality improvements by removing Palisades Power Plant and the localized emissions that result from its operation.
- Practice and promoting green energy services by allowing access to the AIES which is currently comprised of 18 percent renewable energy sources and slated to increase in future years. Electrical consumers will have the potential to export surplus microgeneration back to the AIES. The advantage of being connected to the AIES from a consumer stand point is the ability to export any excess power to the AIES, therefore reducing the need for other sources of generation, as well as the potential to receive some form of compensation.

Additional positive impacts include providing electrical services that are cost-effective to consumers and reducing the environmental impact by removing existing infrastructure that is nearing end of life while working with Parks Canada to reduce environmental impacts of the proposed electrical facilities.

5.8.3 Visitor Experience Effects Assessment

This subsection presents the assessment of the potential effects of the Project on visitor experience. The potential effects are identified in consideration of the existing conditions information presented in Section 5.8.1, and the potential residual effects are characterized and assessed according to the methods presented in Section 4 of the DIA.

5.8.3.1 Identification of Potential Effects, Mitigation Measures and Residual Effects

The potential effects associated with the construction and operations of the Project on visitor experience were identified by the assessment team and are listed in Table 5.8-1.

The key mitigation measures proposed in Table 5.8-1 were developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys and Walker, 1998).

The potential residual effects listed in Table 5.8-1 were identified according to the method described in Section 4, which considers the effects remaining after mitigation measures are implemented.

Construction scheduling, routing and structure type/placement are the primary mechanisms for avoiding or reducing potential adverse effects of the Project on visitor experience. Criteria used during the route selection process are described in detail in Section 2.6.

Table 5.8-1. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Visitor Experience

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Potential Residual Effect(s)
1. Disruption of visitor services, facilities and access routes	Various locations along Highway 16, Pocahontas Cabins, Snaring and Celestine Roads	Visual and Visitor Experience SA	• Construction will be completed over one winter season (i.e., outside peak visitor season) • Areas with high probability of causing disruption (i.e., near visitor services and access routes) will be prioritized for construction and completed • Schedule planned outages at non-peak times.	• Disruption of visitor services, facilities and access routes during construction and operation
2. Concern for visitor and public safety	Entire Project	Project Footprint	• Proper safety barriers and signage will be installed • Restrict public access from the Project construction locations • Health and Safety representative to be on-site • Ensure regular maintenance on electrical facilities	• Concern for visitor and public safety during construction and operations
3. Disruption of recreational activities	Entire Project	Project Footprint	• Selection of structure type to reduce right-of-way width requirements • Selection of covered conductors to reduce right-of-way requirements, where applicable • Selection of bare conductor to reduce visibility of transmission line, where applicable • Structure placement to minimize the number of structures visible from major viewpoints • Colocation and reuse of existing infrastructure clearing to minimize amount of new right-of-way required • Public consultation on routing preference at Pocahontas Highway 16 crossing	• Construction and regular maintenance activities will create temporary, localized disturbances

[a] Detailed key mitigation measures are outlined in Axys and Walker, 1998 and ATCO Electric, 2011 and the Project EPP (Appendix 1).

5.8.3.2 Characterization of Potential Residual Effects

The method set out in Section 4 was adopted for the characterization of potential residual effects for the Visitor Experience. This qualitative assessment relied on the professional experience of the assessment team.

Disruption of Visitor Services, Facilities, and Access Routes During Construction and Operation

During the construction of the transmission line and substation, the number of vehicles and equipment within JNP will increase. The construction of the Project is scheduled to be completed outside the peak visitor season in winter from late Q3 2017 to May 2018. Equipment and materials will be brought into JNP by roadway and by the existing CN Railway. Use of the railway will help to reduce the number and frequency of vehicles within JNP. A visual screen of trees along most of the routing will reduce visual and noise disruption to park visitors. Some locations along the transmission line will require helicopter construction to limit the effects to the environment. The helicopter construction is not anticipated to greatly affect the visitor experience as the flights to move material and construct will be limited and will be short-term in duration. Substation construction will take place within the existing Palisades site and access will be via existing roads. Construction of the transmission line will require planned outages where the Project right-of-way overlaps with existing distribution line (i.e.*,* from the JNP east gate to Pocahontas cabins). During this planned outage, backup power generation is planned. Decommissioning of Palisades will require a momentary outage during energization of the new substation. All planned outages will be done at non-peak times and typically last less than 1 hour.

Regular maintenance of the energized electrical facilities will be required to ensure that the substation and transmission line are operating efficiently and safely. During maintenance operations the effects to Park users are anticipated to be minimal, although on occasion, maintenance activities may require temporary closure of certain areas of the Park. Maintenance activities will typically be restricted to the substation or transmission line and will be short-term in duration.

For the transmission line to operate in a safe and reliable manor, limited vegetation control along the right-of-way will be performed during the operational phase of the Project. Periodic removal of vegetation that has grown to a certain height will be required. Trees that have been identified as posing a hazard of falling and contacting the electrical facilities will also have to be removed. During these types of maintenance events, it can be anticipated that Park users within the immediate vicinity will have increased auditory disruption and increased vehicular traffic. With the implementation of mitigation measures noted in Table 5.8-1, the magnitude of potential disruption to visitor safety facilities and access routes will be minor (Table 5.8-2, point [a]).

Concern for Visitor and Public Safety During Construction and Operations

The newly constructed electrical facilities will carry latent safety concerns as referenced in Section 5.11.

Some sections of the transmission line are not accessible to large/heavy vehicular traffic year-round. Areas that are adjacent to existing roadways or access trails will have proper signage and safety measures in place during construction and maintenance.

The structure and conductor types were selected for the transmission line as a mitigation measure to minimize the amount of tree clearing required, thereby reducing the potential for a tree contact wildfire to occur Trees that have been identified as posing a hazard of falling on the transmission line will be removed which will also minimize the wildfire risk (Table 5.8-2, point [a]). Construction methods will be completed in a way that minimizes the risk of wildfire from construction activities (see Section 5.11).

Prior to construction all third-party facilities will be identified and marked along the transmission line route. Any works with potential for impacts with existing facilities will be discussed with the facility owner and proper mitigation measures will be in place prior to any works.

During the construction phase, appropriate signage for traffic control and Park user safety will be in place. ATCO Electric will also have a health and safety representative available at all times. Any potentially unsafe conditions will be identified and appropriate actions will be taken. In certain areas, temporary fencing will be employed to ensure that access is restricted to qualified personnel. All facilities will utilize construction methods to minimize the potential for release of hazardous materials and built to ensure that any future release of hazardous materials is contained. All electrical facilities will be built in accordance with the *Electrical Utilities Act* and the *Alberta Safety Codes Act* and will be deemed safe prior to energization and operation.

After construction and during the operations stage, the substation will be enclosed by a gated chain-link fence with appropriate signage warning about the dangers of an electrified substation. The transmission line and substation will be inspected regularly to ensure that no deficiencies are present that would affect the safety of the Park users. Maintenance activities may require temporary restriction from an area to ensure public and visitor safety. Due to the location of the electrical facilities and the protective and mitigative measures that will be taken (Table 5.8-1) the magnitude of the potential residual effect is considered minor (Table 5.8-2, point b).

Combined Residual Effects on Visitor Experience

Construction and regular maintenance activities will create temporary, localized disturbances during the construction of the transmission line and substation, areas of adjacent to the Project Footprint may have restricted access for safety reasons. Off-season construction is scheduled to reduce the potential for disruption of recreational activities. Sections of the transmission line located near recreational trails that have year round use and public access roads may have temporarily restricted access during construction of the transmission line. Once construction activities have been completed any new accesses will be returned to preconstruction status. Temporary access restrictions during maintenance may be required depending on the type and scale of maintenance. Disruptions to recreational activities are anticipated to be immediate to short-term in duration and with the implementation of mitigation measures identified in Table 5.8-1 the residual effect is expected to be negligible in magnitude (Table 5.8-2, point c)

Potential residual effects are anticipated to be minor in magnitude and are not expected to result in any long lasting multiplicative effects. During construction and maintenance of the electrical facilities, there is a potential for disruption of Park user related activities, however, there should not be any decrease in Park user safety. Any disruption effect will be temporary in nature.

The characterization of the potential residual effects of the construction and operation of the Project on Visitor Experience is summarized in Table 5.8-2.

Table 5.8-2. Residual Effects Characterization for Visitor Experience

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Disruption of visitor services, facilities, and access routes	**Context:** During the construction of the transmission line and substation, the number of equipment and vehicles within JNP will increase and electrical facilities will require ongoing maintenance to ensure safe and reliable operation.	
	Geographic Extent: Visual and Visitor Experience SA	The potential residual effect of construction and operation may extend beyond the proposed transmission line right-of-way, as the construction and maintenance activities may impact the Project Footprint
	Duration: Short-term	The potential residual effect persists for the entire construction phase of the Project, but reduces during operations once the construction is completed and ceases once the operational life of the Project is complete (i.e., the effect is limited to the construction phase or any 1 year during the life of the Project).

Table 5.8-2. Residual Effects Characterization for Visitor Experience

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Disruption of visitor services, facilities, and access routes (cont'd)	**Frequency:** Continuous to periodic	The potential residual effect of construction and operations will occur continuously throughout the construction and periodically during the operational life of the Project.
	Reversibility: Reversible	The potential residual effect of construction and operations are reversible to pre-construction conditions after the operational life of the Project.
	Magnitude: Minor	The potential residual effect of construction and operations will result in a detectable change to Visitor Experience. However, the change is anticipated to be limited to a minor modification from the existing (baseline) conditions.
b. Concern for Visitor and Public Safety	**Context:** Safety of the Park users around electrical facilities during and post construction	
	Geographic Extent: Project Footprint	The potential residual effect of construction and operation may extend beyond the proposed transmission line right-of-way, as the construction and maintenance activities may impact the Project Footprint
	Duration: Long-term	The potential residual effect is continuous for the entire construction and operational life of the Project, decreases once construction is completed and ceases once the operational life of the Project is complete.
	Frequency: Continuous	The potential residual effect of construction and operations will occur continuously throughout the construction and operational life of the Project.
	Reversibility: Reversible	The potential residual effect of construction and operations is reversible to pre-construction conditions after the operational life of the Project.
	Magnitude: Negligible	The potential residual effect of construction and operations are anticipated to have a negligible impact on Visitor and Public Safety.
c. Construction and regular maintenance activities will create temporary, localized disturbances	**Context:** Safety of the Park users around electrical facilities during and post construction	
	Geographic Extent: Project Footprint	The potential residual effect of construction and operation may extend beyond the proposed transmission line right-of-way, as the construction and maintenance activities may impact the Project Footprint
	Duration: Immediate to short-term	The disruption of recreational activities is anticipated to be between 2 days (i.e., immediate) but less than one year (i.e., short-term).
	Frequency: Occasional	The potential residual effect of construction and operations will occur continuously throughout the construction and operational life of the Project.
	Reversibility: Reversible	The potential residual effect of construction and operations occurs intermittently and sporadically over the assessment period.
	Magnitude: Minor	The potential residual effect of construction and operations will result in occasional disruptions to recreational activities. However, the change is anticipated to be limited to a minor modification from the existing (baseline) conditions.

5.8.3.3 Summary and Recommendations

Routing and structure type/placement as well as construction of the electrical facilities during off-peak season will be the major contributing factor to reducing the effects of the Project on Visitor Experience. ATCO Electric will work to ensure that all construction activities are completed with the intent of minimizing the effect to visitor experience in JNP.

ATCO Electric acknowledges that the potential effects listed herein are subject to change based on feedback received during ongoing consultation.

5.8.4 Cumulative Effects Assessment

The Project area contains many existing industrial, commercial, and recreational facilities that are tightly woven together within a narrow corridor. ATCO Electric's route selection criteria place a strong emphasis on integration with existing developments to minimize the impacts on the landscape. By co-locating a portion of the transmission line with the existing distribution line the total number of structures required within the Park is reduced. The distribution and transmission lines will share structures, which will minimize the amount of new right-of-way required as the existing distribution clearing can be reused. Where co-location with distribution infrastructure is not feasible, ATCO Electric has worked with other industries to utilize existing clearings and minimize the amount of new right-of-way. This also reduces the number of new clearings, minimizes new access, reduces the need for additional new infrastructure and in many cases provides a visual screen and an auditory barrier between the electrical facilities and the park users.

The Project-effects on Visitor Experience (described in Section 5.8.3.2) will act cumulatively with reasonable foreseeable developments (see Table 4.9-1) in that an incremental increase in effects to Visitor Experience will occur. No key mitigation measures beyond the Project-specific mitigation already proposed in Table 5.8-1 are recommended to address cumulative effects on Visitor Experience. It is anticipated that the companies involved in the construction and operations of the existing activities and reasonably foreseeable developments will implement mitigation similar to ATCO Electric's to reduce effects on Visitor Experience. During construction and maintenance activities, visitors may experience a short-term disruption to visitor services, facilities, and access routes and is considered reversible once the construction phase is complete. During the operations and maintenance phase, the effect on visitor experience is considered to be continuous and long-term at the substation and periodic and short-term along the transmission line. The cumulative effect on Visitor Experience is considered to be of minor magnitude are anticipated to be reduced once the construction phase of the Project is completed.

ATCO Electric is working with other stakeholders in the area and Parks Canada to coordinate any activities that may occur during the construction phase of the Project to minimize the cumulative effect on Visitor Experience.

5.8.5 References

5.8.5.1 Literature Cited

ATCO Electric Ltd. (ATCO Electric). 2011. Environmental Protection Plan for Jasper National Park. 323 pp.

Axys Environmental Consulting Ltd. and David Walker and Associates. 1998. Best Available Methods for Common Leaseholder Activities. Prepared for Line Leaseholder Working Group, Jasper National Park. 144 pp.

Municipality of Jasper and Parks Canada. 2011. Jasper Community Sustainability Plan. September 2011, Jasper, Alberta. 126 pp.

5.9 Heritage Resources

5.9.1 Historical Resources Impact Assessment

An HRIA was completed by Bison Historical Services Ltd. in 2016. Bison obtained a Research and Collection Permit from Parks Canada (JNP-2016-22519) which prescribed the necessary survey method and reporting conditions. The purpose of the 2016 HRIA was to revisit known existing historical resources and to identify any new historical resources within the Project Footprint, with the intent to prevent or mitigate impacts to historical resources.

5.9.1.1 Methods

The HRIA was initiated by a site file search of the Site Visit Records from PCA and Site Data Inventory Forms held by the Heritage Resource Branch of Alberta Culture and Tourism. These two site file searches were combined, incorporating all sites within 100 m of the proposed transmission line route. However, as a means to streamline the assessment and to focus the field investigation, only those sites within 25 m of the Project Footprint were included assessed in the field.

The HRIA was conducted in August 2016 by two Archaeologists. The team followed the Parks Canada standards for artefacts, photo and site data cataloguing and data entry.

The team conducted a pedestrian survey of the entire Project Footprint. Subsurface shovel tests were conducted in areas where existing Historical Resources were located immediately adjacent to the Project Footprint and in areas where the primary researcher identified as high potential based on location, landform and sediment type. 139 shovels tests were excavated to maximum depth of 1 m below the surface. Subsurface shovel tests were placed within the Project Footprint to observe the sediment profile and identify potential buried cultural deposits. Subsurface shovel tests were screened through one-quarter inch screens to ensure recovery of cultural material. Where buried cultural deposits were identified, further subsurface tests were excavated within the Project Footprint to determine horizontal extent of the deposit within the Project Footprint. Tests and excavation unites were backfilled on completion and original topsoil was separated and used to cap subsoil when backfilling.

In addition, ATCO Electric has been engaged with the identified Indigenous communities as per Parks Canada's direction. The engaged Indigenous communities received Project information and have had or will have the opportunity to complete field visits with ATCO Electric to further understand the potential impacts of the Project on Heritage Resources. Any information and identified sites of interests received from the Indigenous communities will be documented and managed appropriately to protect or mitigate these areas. ATCO Electric recognizes that once disturbed, many features cannot be replaced, recreated, or restored, and as such, it is important for heritage resources work to be completed in advance of Project development and ground disturbing activities (see Section 3.2.1).

Should an Indigenous community wish to see the HRIA report for the Project, they will be directed to Parks Canada to request this information.

Recent minor modifications to the proposed transmission line route developed after the 2016 HRIA field survey are scheduled to be surveyed in 2017 and a supplemental HRIA will be provided Parks Canada.

5.9.1.2 Results and Recommendations

A total of 45 sites were identified as being located more than 25 m outside of the Project Footprint and would not be impacted by the construction of the Project. No mitigative measures have been proposed for these sites, and no additional archaeological assessment is recommended with respect to the Project. 25 sites were recorded as being within 25 m the proposed transmission line route. During the 2016 HRIA, attempts were made to relocate and further assess these sites. Of the 25 sites within 25 m of the proposed transmission line route, 23 were previously recorded and two were newly recorded sites. These included 13 pre-contact sites, 11 historic sites, and 1 multi-component site with both a historic and Pre-contact component.

Of the 25 sites identified within 25 m of the proposed transmission line route, investigations failed to identify additional cultural material within the Project Footprint at 16 of these sites, these sites have either been destroyed or significantly disturbed by previous activities, or they are located outside of the proposed Footprint. Therefore, no further archaeological investigations are recommended at these 16 sites with regard to the Project.

Recommendations restricting proposed construction activities to the proposed right-of-way as well as erecting construction fencing around significant above ground archaeological features and structures have been put forward for seven of the 25 Heritage Resource sites. Recommendations for Heritage Resources in the areas of minor route modifications will be developed (if necessary) following the 2017 supplemental HRIA. In addition, an accidental finds protocol will be in place during all construction-related activities so as to address the discovery of unanticipated resources during construction. The primary objective of this Accidental Finds Protocol will be to minimize impacts to resources, and alert Parks Canada of the find.

Due to the sensitive nature of Heritage Resources, site-specific information for these resources is not included in this DIA. The complete HRIA was provided to Park Canada Terrestrial Archaeology for review and final acceptance and to ATCO Electric for construction planning purposes.

5.10 Socio-Economics

5.10.1 Existing Conditions and Regulatory Context

The latest municipal census of the Municipality of Jasper completed in June 2011 concluded that the population of town is 5,236; however, it should be noted that the town population experiences seasonal fluctuation as a result of high and low tourism seasons. During the high summer season, the population booms and the demographics of the town change to include both residents, and visitors from all over the world. The town is well equipped to handle the large influx of seasonal visitors. The town is a fully serviced community, has ample amenities and over 1,400 hotel rooms, over 100 home accommodations, and over 2000 seasonally available campsites to serve the needs of its residents and seasonal occupants (as assessed by Parks Canada, in 2013) (Stewart, 2016, pers. comm.).

As per Statistics Canada (2013a), the population of town residents aged 15 years and older totals 2,955. Of those 2,955, 2,580 have obtained a high school diploma, and 2,490 are laborers in the workforce. Of the identified laborers, 40 indicated being unemployed resulting in an unemployment rate 1.6 percent at the time of census. The town has numerous industries including primarily sales and service, trades related occupations and social services. Tourism is strong economic driver for the town and the JNP as demonstrated by significant employment in the sales and service industry.

The latest municipal census of the Town of Hinton completed in June 2011 concluded that the population of the town is 9,640 (Statistics Canada, 2013b). The town's population experiences seasonal fluctuation as a result of high and low tourism seasons. The town is well equipped to handle the large influx of seasonal visitors. The town is a fully serviced community, has ample amenities and 1,139 hotel rooms (Olsen, 2016, pers. comm.).

As per Statistics Canada (2013b), the population of town residents aged 15 years and older totals 7,760. Of those 7,760, 5,805 have obtained at a minimum a high school diploma, and 5,435 are laborers in the workforce. Of the identified laborers, 390 indicated being unemployed resulting in an unemployment rate 6.7 percent at the time of census. The town has numerous industries including trades and transport, as well as sales and service. Tourism is a strong economic driver for the town and is demonstrated by significant employment in the sales and service industry (1,235 employed).

5.10.1.1 Spatial Boundaries

The Project route was considered in relation to a Project Footprint SA (the Project Footprint, as defined in Section 4.3.1) and a Socio-Economic SA.

The Socio-economic SA extends beyond the Project Footprint to include municipal boundaries (e.g., hamlets, villages, towns, and cities), commercial accommodation or Japer National Park accommodation within 2 km of the Project transmission line centreline (e.g., campgrounds, Tekarra Lodge, Jasper Park Lodge, and Pocahontas Cabins), where it can be reasonably expected that direct effects from the Project would occur. The Socio-economic SA for the Project extends to include the municipal boundaries of Jasper and the Town of Hinton.

The primary criterion in defining the Socio-economic SA is whether direct effects, such as a physical, social or economic change, could result from an interaction between components of the Project and community residents, and/or economic, social or cultural resources of interest. The secondary criterion in defining the Socio-economic SA is whether the community (nearest population centre) is a service centre that can reasonably offer goods or services to the Project and /or will draw electrical service from the Project.

5.10.2 Socio-Economic Effects Assessment

This subsection presents the assessment of the potential effects of the Project on socio-economics. The potential effects are identified in consideration of the existing conditions information presented in Section 5.10.1, and the potential residual effects are characterized and assessed according to the methods presented in Section 4 of the DIA.

5.10.2.1 Identification of Potential Effects, Key Mitigation Measures, and Residual Effects

The potential effects associated with the construction and operation of the Project on Socio-economics were identified by the assessment team and are listed in Table 5.10-1. The key mitigation measures proposed in Table 5.10-1 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the *Best Available Methods for Common Leaseholders* (Axys and Walker, 1998). The potential residual effects listed in Table 5.10-1 were identified according to the methodology described in Section 4 and are the effects remaining after mitigation is implemented.

Table 5.10-1. Potential Effects, Mitigation Measures and Potential Residual Effects of Construction and Operations of the Project on Socio-Economics

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a]	Potential Residual Effect(s)
1. Access to Alberta Interconnected Electrical System	Entire Project	Socio-economic SA	• No mitigation measures developed since effect is considered positive	• No negative residual effect identified
2. Increase demand for accommodation and services	Entire Project	Socio-economic SA	• No mitigation measures developed since effect is considered positive	• No negative residual effect identified
3. Increased traffic volumes as a result of transporting workers, supplies and equipment	Entire Project	Socio-economic SA	• Construction to take place during off-season • All Project personnel will respect posted speed limits, signage and flagging and/or fences at all times. • Follow traffic safety regulations and road bans	• No negative residual effect identified
4. Disruption of Community life by temporary workers	Entire Project	Socio-economic SA	• Construction to take place during off-season • Adhere to time of day construction limitations	• No negative residual effect identified

[a] Mitigation measures were developed in accordance with Axys and Walker, 1998 and the Project EPP (Appendix 1).

The potential effects listed in the above table are detailed further in the section that follows. These potential effects do not result adverse potential residual effects to the socio-economics of the Municipality of Jasper and therefore, are not carried through for further assessment.

5.10.2.2 Access to the Alberta Interconnected Electrical System

The Project is anticipated to provide a long-lasting positive socio-economic effect to the Municipality of Jasper and surrounding areas. The power supply to the town and surrounding areas will now come from the AIES which will improve the dependability of existing electrical facilities. The proposed transmission facilities will be designed to meet or exceed the standards of the AIES. Features that are anticipated to improve the reliability of electrical facilities include: redundant transformers at the proposed Sheridan Substation and existing Watson Creek Substation, co-locating existing distribution lines and portions of the proposed transmission line to reduce the risk of equipment failure, and use of covered conductor technology on portions of the proposed transmission line to reduce the potential for strike induced outages. Incorporating selective vegetation removal during construction and operations will further reduce the potential for strike induced outages on the proposed transmission system. Interconnecting to the AIES also provides a cleaner energy source compared to the diesel and natural gas-fuel Palisades facility since the AIES is powered by a combined 18 percent of renewable sources (e.g., hydro, wind, and biomass). In addition, the proportion of renewable sources is slated to increase in future years as the province moves towards the replacement of coal generated power plants with renewable sources (Government of Alberta, 2016a, 2016b). Once connected to AIES, JNP to the AIES, electrical consumers have the potential to export surplus microgeneration back to the AIES. The advantage of being connected to the AIES from a consumer stand point is the ability export any excess power to the AIES, therefore reducing the need for other sources of generation as well as the potential to receive some form of compensation. No mitigation measures are required for this effect as it is anticipated to be positive.

5.10.2.3 Increase Demand for Accommodation and Services

During the construction stage of the Project, ATCO Electric's employees and contractors will utilize the towns and Park's various accommodations and facilities. Construction for the Project will occur outside the peak tourist season when the demand for accommodations and facilities from visitors to the Park and towns is reduced. ATCO Electric estimates a maximum of 150 workers during peak construction of the transmission line and substation. In addition, 25 workers are anticipated for the decommissioning of Palisades. These workers will require accommodation and use of facilities. Given the timing of the construction, and in consideration of the number of available lodging options (over 2,739 hotel rooms and over 100 home accommodations) and the extent of available services and facilities, the Park and towns are suitably equipped to serve the Project workforce without any shortage to temporary accommodations within the Socio-economic SA. No mitigation measures are required for this effect as it is anticipated to be positive.

5.10.2.4 Increased Traffic Volumes as a Result of Transporting Workers, Supplies and Equipment

During the construction stage of the Project there will be an increase in the number of vehicles and construction equipment present within the JNP and the Town of Hinton. Due to the location of the electrical facilities (paralleling existing alignments) and the construction timing (outside peak tourist season), Project-related traffic is not anticipated to impact the lifestyles, or business within the Socio-economic SA. With the implementation of mitigation measures identified in Table 5.10-1 and Project routing and scheduling this potential effect is minimized and no residual effect was identified.

5.10.2.5 Disruption the Community by Temporary Workers

During the construction stage of the Project there will be an increase in the number of vehicles, construction equipment and personnel present within the JNP. While ATCO Electric staff and contractors will be present in the community during the construction period, the time spent in the community will be limited to the off-tourist season and likely limited primarily to the use of lodging and standard services such as restaurants during that time. Due to the timing of construction, and the anticipated use of town services, ATCO Electric's temporary work force during construction is not anticipated to impact the lifestyle of the Community in the Socio-economic SA. With the implementation of mitigation measures identified in Table 5.10-1 and Project scheduling this potential effect is minimized and no residual effect was identified.

5.10.2.6 Summary

With the implementation of the key mitigation measures (Table 5.10-1), there are no anticipated residual effects are nominal on Socio-economics.

5.10.3 Cumulative Effects Assessment

The Socio-economic effect assessment for the Project did not identify any adverse potential residual effects and as a result an assessment of cumulative effects is not required (see Section 4, Assessment Methodology).

5.10.4 References

5.10.4.1 Personal Communications

Stewart, Amber. 2016. Integrated Land Use Planner, Jasper National Park of Canada. Personal Communication with ATCO Electric. July 8, 2016.

Olsen, Emily. 2016. Communications and Strategic Advisor, Town of Hinton. Personal Communication with ATCO Electric. November 18, 2016.

5.10.4.2 Literature Cited

Government of Alberta. 2016a. *Electricity Statistics*. http://www.energy.alberta.ca/Electricity/682.asp. Accessed November, 2016.

Government of Alberta. 2016b. *Climate Leadership Plan; Ending Coal Pollution.* http://www.alberta.ca/climate-coal-electricity.aspx. Accessed November, 2016.

Axys Environmental Consulting Ltd. and David Walker & Associates. 1998. *Best Available Methods for Common Leaseholder Activities.* Jasper, Alberta. 144 pp.

Statistics Canada. 2013a. *Jasper, SM, Alberta (Code 4815033) (table)*. National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/index.cfm?Lang=E (accessed July 21, 2016).

Statistics Canada. 2013b. *Hinton, T, Alberta (Code 4814019) (table).* National Household Survey (NHS) Profile. 2011 National Household Survey. Statistics Canada Catalogue no. 99-004-XWE. Ottawa. Released September 11, 2013. http://www12.statcan.gc.ca/nhs-enm/2011/dp-pd/prof/index.cfm?Lang=E (accessed November 19, 2016).

5.11 Accidents and Malfunctions

5.11.1 Accidents and Malfunctions Effects Assessment

This subsection presents the assessment of the potential effects of construction and operations of the Project related to accidents and malfunctions. The potential residual effects are characterized and assessed according to the methods presented in Section 4.

5.11.1.1 Identification of Potential Effects, Mitigation Measures, and Residual Effects

The potential effects of construction and operations of the Project related to accidents and malfunctions were identified by the assessment team, and are listed in Table 5.11-1 and includes the following:

- Spill of hazardous materials during construction and operations
- Fire during construction and operations
- Damage to foreign utilities during construction
- Transportation accidents
- Electrical shock

The key mitigation measures proposed in Table 5.11-1 were principally developed in accordance with ATCO Electric standards, industry and provincial regulatory guidelines including the Best Available Methods for Common Leaseholders (Axys, 1998).

The potential residual effects listed in Table 5.11-1 were identified according to the method described in Section 4, which considers the effects remaining after mitigation is implemented.

Table 5.11-1. Potential Effects, Mitigation Measures, and Potential Residual Effects of Construction and Operations of the Project Related to Accidents and Malfunctions

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Spill of hazardous materials during construction and operations	Transmission Line and Substation	Project Footprint to Vegetation SA; Aquatic SA, Wetlands and Hydrology SA; Wildlife and Wildlife Habitat SA	<u>Spill Prevention</u> • Environmental training for all Project personnel will include initial spill response training should a spill of any controlled substance occur. • Develop a response plan that is to be implemented immediately in the event of a sediment release or spill of a deleterious substance and keep an emergency spill kit of appropriate size on site. • Plan activities near water such that materials such as paint, primers, blasting abrasives, rust solvents, degreasers, grout, or other chemicals do not enter the watercourse. All equipment maintenance (i.e., oil changes, lubrication) during the construction period will be conducted at approved garage facilities in Jasper Town site, where possible. Where onsite servicing is essential, such servicing will be permitted at approved borrow pits, or other disturbed sites, as designated by Parks Canada on tarped areas to facilitate spill clean-up.	• Inadvertent spills could result in contamination.

Table 5.11-1. Potential Effects, Mitigation Measures, and Potential Residual Effects of Construction and Operations of the Project Related to Accidents and Malfunctions

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Spill of hazardous materials during construction and operations (cont'd)	See above	See above	• Where possible, refueling of equipment and vehicles will be conducted a minimum of 100 m away from the high watermark of waterbodies, unless otherwise authorized by Parks Canada. Event of a Spill • In the event of an accidental spill, implement the Spill Response Contingency Plan [Appendix A]. • Employees and Contractors shall immediately notify the Supervisor of any spills/releases and provide information about the spill. Ensure that a spill kit of appropriate size is on site. Ensure that operators and the Contractor Employee in Charge are trained to contain spills or leakage from equipment. • All spills within JNP will be reported as soon as possible to Parks Canada to be briefed on location, size, and contents of the spills, as well as the spill response measures conducted or proposed. • The contractor will be responsible for implementing soil replacement or other spill contingency and restoration measures required by Parks Canada.	• See above
2. Fire during construction and operations	Transmission Line and Substation	Project Footprint to Vegetation SA	Fire Prevention • Use appropriate coverings (e.g., conductor coverings) on the transmission line. • Maintenance activities will be restricted or suspended at the request of Parks Canada during periods of high or extreme fire hazard periods, and additional preventative precautions will be implemented as required. Parks Canada will notify ATCO Electric of pending high or extreme fire hazard ratings. • If the fire hazard is high, implement protection measures such as the use of fire resistant mats or wetting down the area prior to work commencing or having a water truck and or appropriate firefighting equipment on site.	• Despite vigilance, fires may adversely affect adjacent areas.

Table 5.11-1. Potential Effects, Mitigation Measures, and Potential Residual Effects of Construction and Operations of the Project Related to Accidents and Malfunctions

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
2. Fire during construction and operations (cont'd)	See above	See above	• Ensure that each vehicle carries the firefighting equipment required by the *Forest and Prairie Protection Act* and Regulations and the minimum fire extinguishers as outlined in Fire Contingency Plan (Appendix E). Each crew must carry a two-way radio or cell phone. • No lunch fires will be permitted at work sites. • All field crews during snow-free periods will be equipped with adequate equipment for responding to accidental fires. <u>In the event of a fire</u> • In the event of a fire the Fire Contingency Plan [Appendix E] will be followed. • ATCO Electric will obtain permission to burn slash piles from PCA as required. ATCO Electric will follow all conditions of burning permits. • If permission to burn has been obtained, attend to the fire and prevent the fire from spreading off the right-of-way. During snow-free conditions, extinguish burning embers before leaving the site and monitor burn sites to ensure that no smoldering debris remains. Burn only when the fire hazard is low. No new burning shall be conducted during high winds. • If burning during snow-free conditions, strip the site before piling slash to limit potential fire hazards and damage to soil. • Complete infrared scanning of slash piles in the spring to ensure that piles are fully extinguished.	• See above
3. Damage to foreign utilities during construction	Transmission Line and Substation	Project Footprint to Socio-economic SA	• All buried foreign lines approached by excavation activities will be clearly marked with flagging before activities commence. • Where buried foreign lines occur within 5 m of excavation activities, these facilities will be exposed by hand or with hydro vacuum techniques to verify their exact location before excavation commences. • Where the Project parallels one or more of the TMPL and the ATCO Pipelines natural gas pipeline, stake foreign lines at regular intervals to create a visual barrier. • Maintain required minimum setbacks from the TMPL and the ATCO Pipelines natural gas pipeline.	• Damage to foreign lines could lead to interruption of services or spills depending on the location and severity of the damage.

Table 5.11-1. Potential Effects, Mitigation Measures, and Potential Residual Effects of Construction and Operations of the Project Related to Accidents and Malfunctions

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
4. Transportation accidents	Access Roads	Project Footprint	• Project roads encountering high wildlife density areas with a high probability of vehicle/wildlife conflicts will be identified to Project personnel to reduce the probability of vehicle/wildlife interactions • Reduced speed limits for Project personnel will be implemented and enforced where practical. • ATCO Electric in consultation with Parks Canada will develop and Implement a traffic accommodation / control plan.	• Elevated risk of a transportation accident during construction that may cause injury to people.
5. Electrical shock	Transmission Line and Substation	Project Footprint	• Ground fences to reduce/eliminate induced current and risk of shock, where warranted. • Minimum clearance required between all transmission facilities and buildings will be in accordance with the *Safety Codes Act* and regulations.	• No residual effect identified.

[a] Detailed mitigation measures are outlined in the Project EPP (Appendix 1) and Axys and Walker, 1998.

The following potential effects related to accidents and malfunctions are eliminated through the implementation of mitigation measures.

Electrical Shock

Electrical shock may occur when workers or equipment come in contact with transmission lines. ATCO Electric maintains safety standards for construction and operations activities to reduce the risk of electrical shock. With the implementation of mitigation measures identified in Table 5.11-1 (Point 5), no potential residual effects were identified.

5.11.1.2 Characterization of Potential Residual Effects

The method set out in Section 4 was adopted for the characterization of potential residual effects for accidents and malfunctions. This qualitative assessment relied on professional experience of the assessment team.

Inadvertent Spills Could Result in Contamination

Construction, and to a lesser degree, operations of the Project may result in spills of hazardous material. Spills and leaks of fuel, or other hazardous materials, are most often caused by operator error or maintenance activities. The likely accident and malfunction scenario would involve the release of small quantities of fuel or hydrocarbons to a terrestrial environment as a result of equipment failure or operator error. A spill during the construction or operations is likely to be noted quickly and be of small volume and localized. Releases to terrestrial environments are not expected to result in a residual effect to soils due to the effectiveness of clean-up measures (see Table 5.11-1). Depending on the location and volume of the inadvertent spill, effects on VCs such as Vegetation, Aquatic Wildlife and Ecosystems and Wetlands and Hydrology could occur. In all cases, the magnitude of this effect would vary depending on the severity of the spill or release, the location of the event, and the sensitivity of the feature. For example, in the event of a spill such as a vehicle rollover in a stream with high quality fish habitat, the adverse residual effects could be of major magnitude with long lasting ramifications to the health of the stream. With the implementation of spill prevention and response measures, events such as this rarely occur and even more rarely occur instream or where other sensitive features exist (e.g., rare plant populations or habitat features important for wildlife species of concern). With the implementation of the proposed mitigation identified in Table 5.11-1, the potential residual effect is considered to be of minor to major magnitude and reversible, with clean-up occurring within an immediate duration.

Despite Vigilance, Fires May Adversely Affect Adjacent Areas

Fires during construction and operations of the Project have potential to result from other accidents or malfunctions, such as transportation accidents, damage to foreign utilities, or malfunctions at the substation. Project design considerations such as using covered conductor technology for the majority of the proposed transmission line will reduce fire risk and the risk of line contacts. With the implementation of mitigation measures (i.e., construction crews having the required firefighting equipment and training), scheduled winter construction and other proposed mitigation identified in Table 5.11-2 (Point b), no potential residual effect is considered to be of minor magnitude and reversible, with the fire being extinguished within an immediate duration.

Damage to Foreign Lines Could Lead to Interruption of Services or Spills Depending on the Location and Severity of the Damage.

Portions of the Project parallel the TELUS fibre optics cable, an ATCO Pipelines natural gas pipeline, and one or more of the TMPL.

The TELUS fibre optics line through JNP provides communication service for communities in BC in addition to the Municipality of Jasper. Damage to the TELUS fibre optics line would be inconvenient for services that rely on fibre optics communication, such as interact banking. The potential residual effect of a full loss of communication would likely be of major magnitude; however, reversible with repairs occurring within an immediate duration.

In the event of a rupture of the ATCO Pipelines natural gas pipeline, the risk of explosion and risk to human health would likely be of major magnitude. The ATCO Pipelines natural gas pipeline supplies gas to Palisades, as well as the Municipality of Jasper. If the natural gas pipeline is ruptured, electrical generation from Palisades would be affected. Depending on the time of year (e.g., during winter construction), a loss of electricity from Palisades can be of minor to major magnitude; however, reversible with repairs occurring within an immediate duration.

Potential contact with the TMPL may cause a leak or rupture of one of the pipelines. Depending on the size of the leak, the potential residual effect is considered to be of minor to major magnitude; however, reversible with repairs occurring within an immediate duration.

With the implementation of mitigation measures identified in Table 5.11-1, rupture to foreign lines is considered rare (Table 5.11-2, Point c).

5.11.1.3 Transportation Accidents

There is an elevated risk of a transportation accident, arising from increase traffic on major roads, and travel on winding mountain roads associated with construction of the Project. Transportation accidents may involve serious injury or death to humans and damage to property. Depending on the location and severity of the accident, the potential residual effect is considered to be of minor to major magnitude. With the implementation of mitigation measures identified in Table 5.11-1 (Point 4), transportation accidents are considered rare (Table 5.11-2, Point d).

The characterization of the potential residual effects of the construction and operations of the Project related to accidents and malfunctions is summarized in Table 5.11-2.

5.11.1.4 Combined Effects Resulting from Accidents and Malfunctions

An evaluation of the combined effects considers those residual effects that are likely to occur. Since the probability of an accident or malfunction is low, an evaluation of combined effects of the construction and operations of the Project arising from accidents and malfunctions is not warranted.

Table 5.11-2. Potential Residual Effects Characterization for Accidents and Malfunctions

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Inadvertent spills could result in contamination.	**Context:** Construction, and to a lesser degree, operations of the Project may result in spills of hazardous material on the Project Footprint. Larger spills could migrate into the SA and potentially contaminate adjacent lands.	
	Geographic Extent: Project Footprint to SA	The potential residual effect of inadvertent spills resulting in contamination may extend beyond the Project Footprint into the SA.
	Duration: Immediate	The potential residual effect of inadvertent spills resulting in contamination is limited to two days or less as clean-up activities would be addressed immediately.
	Frequency: Rare	The potential residual effect of inadvertent spills resulting in contamination in the Project Footprint and SA is considered uncommon or unpredictable over the assessment period.
	Reversibility: Reversible	The potential residual effect of inadvertent spills resulting in contamination is reversible due to immediate clean-up activities. Mitigation would reverse the potential residual effect to pre-construction or equivalent conditions.
	Magnitude: Minor to Major	The magnitude of the potential residual effect depends on the volume, location and contaminants released. In most cases the effect will result in some change but no measurable loss or exceedance of environmental or regulatory standards (i.e., minor). However, a rare spill event affecting sensitive VCs could result in a loss of VC value or function that exceeds environmental or regulatory standards (i.e., major).
b. Despite vigilance, fires may adversely affect adjacent areas.	**Context:** Fires during construction and operations of the Project have a higher potential to occur at the start of the Project in late summer. However, as the construction activities continue through the fall and winter months with cooler temperatures, the risk of fire and spread is reduced.	
	Geographic Extent: Project Footprint to SA	The potential residual effect of fire affecting adjacent areas may extend beyond the Project Footprint into the SA.
	Duration: Immediate	The potential residual effect of fire affecting adjacent areas is limited to two days or less as fire-fighting mitigation would be implemented immediately.
	Frequency: Rare	The potential residual effect of fire affecting adjacent areas in the Project Footprint and SA is considered uncommon or unpredictable over the assessment period considering the winter construction for the majority of the Project.
	Reversibility: Reversible	The potential residual effect of fire affecting adjacent areas is reversible due to immediate fire-fighting action. Mitigation would reverse the potential residual effect to pre-construction or equivalent conditions.

Table 5.11-2. Potential Residual Effects Characterization for Accidents and Malfunctions

Potential Residual Effect	Criteria Rating	Effects Characterization
b. Despite vigilance, fires may adversely affect adjacent areas. (cont'd)	**Magnitude:** Minor	The potential residual effect of fire affecting adjacent areas may result in some change during the effect but no measurable loss or exceedance of environmental or regulatory standards is anticipated.
c. Damage to foreign lines could lead to interruption of services or spills depending on the location and severity of the damage.	**Context:** The Project parallels existing utility lines, as well as oil and gas pipelines throughout various portions of the transmission line route.	
	Geographic Extent: Project Footprint to SA	The potential residual effect of damaging foreign lines may extend beyond the Project Footprint into the SA.
	Duration: Immediate to short-term	The potential residual effect of damaging foreign lines is likely limited to two days or less as mitigation would be implemented immediately. However, a potential spill related to an oil pipeline could last longer than two days and extend into the construction phase of the Project.
	Frequency: Rare	The potential residual effect of damaging foreign lines in the Project Footprint and SA is considered uncommon over the assessment period considering foreign lines will be identified prior to ground disturbance.
	Reversibility: Reversible	The potential residual effect of damaging foreign lines is reversible. Mitigation would reverse the potential residual effect to pre-construction or equivalent conditions.
	Magnitude: Minor to major	The potential residual effect of damaging foreign lines may result in some change during the effect depending on the foreign line damaged or ruptured. The magnitude could relate to no measurable loss or exceedance of regulatory standard or could result in measurable change depending on the situation.
d. Elevated risk of transportation accidents during construction.	**Context:** Access to the Project is via Highway 16 where traffic incidents may occur during periods on increased traffic volume or adverse weather conditions. Celestine Road is a winding isolated mountain road with short sight lines and exposed sections especially around Windy Point.	
	Geographic Extent: Project Footprint	The potential residual effect of transportation accidents is limited to the Project Footprint.
	Duration: Immediate	The potential residual effect of transportation accidents is likely limited to two days or less as mitigation would be implemented immediately.
	Frequency: Rare	The potential residual effect of transportation accidents in the Project Footprint is considered uncommon or unpredictable over the assessment period.
	Reversibility: Reversible to Irreversible	The potential residual effect of transportation accidents is reversible to irreversible depending on the severity of the accident.
	Magnitude: Minor to major	The potential residual effect of transportation accidents may result in some change during the effect depending on the severity of the accident. The magnitude could relate to no measurable loss or have measurable change depending on the situation.

5.11.1.5 Summary

There are no situations arising from accidents or malfunctions that cannot be technically or economically mitigated. Consequently, the potential residual effects of accidents and malfunctions having a major magnitude is considered rare.

5.11.2 References

Axys Environmental Consulting Ltd. and David Walker & Associates (Axys). 1998. *Best Available Methods for Common Leaseholder Activities.* Jasper, Alberta. 144 pp.

5.12 Effects of the Environment on the Project

ATCO Electric has been operating transmission systems and associated facilities throughout northern and central Alberta for many years and understands the range of environmental conditions that can cause potential effects to the Project. ATCO Electric considers engineering design and proposed mitigation measures to address these environmental conditions. For example, the Project has been designed to withstand ice and snow load and wind events occurring simultaneously.

The following subsections provide information on the potential effects of the environment on the Project including wildfire, high winds and heavy precipitation, as well as lightning and icing.

5.12.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The following environmental conditions were identified by the assessment team to have potential effects on the Project either during construction or operations, or both:

- Wildfire
- High winds and heavy precipitation
- Lightning and icing

Table 5.12-1 summarizes these potential environmental conditions and provides mitigation measures to reduce the severity of the potential effects on the Project.

Table 5.12-1. Potential Effects, Mitigation Measures, and Potential Residual Effects of the Environment on the Project

Potential Effect	Location	Geographic Extent	Key Mitigation Measures[a] [Project EPP Reference]	Potential Residual Effect(s)
1. Schedule delay, damage as a result of wildfire, or both.	Transmission Line and Substation	Project Footprint	• Fire suppression measures will be taken in accordance with ATCO Electric Safety Standards. • All fires or smoke observed must be reported to Parks Canada dispatch. • Implement the Fire Contingency Plan [Appendix E].	• Potential delay to construction schedule and potential damage to Project infrastructure as a result of wildfire.
2. Schedule delay, damage as a result of high winds and/or heavy precipitation, or both.	Transmission Line and Substation	Project Footprint	• Measures will be taken as outlined in ATCO Electric's Crisis Management and Emergency Preparedness Practice 201. • The Flood and Excessive Flow Contingency Plan [Appendix K].	• Potential delay to construction schedule and potential damage to Project infrastructure as a result of high winds, heavy precipitation, or both.
3. Damage as a result of lightning or icing.	Transmission Line and Substation	Project Footprint	• Measures will be taken as outlined in ATCO Electric's Crisis Management and Emergency Preparedness Practice. • An overhead shield wire will be in place to protect the transmission line during lightning strikes.	• Potential damage to Project infrastructure as a result of lightning or icing.

[a] Detailed mitigation measures are outlined in and the Project EPP (Appendix 1) and Axys and Walker, 1998.

5.12.2 Characterization of Potential Residual Effects

The method set out in Section 4 was adopted for the characterization of potential residual effects of the environment on the Project. This qualitative assessment relied on available research literature, comparisons to other Projects of similar type and magnitude, and the professional experience of the assessment team.

5.12.2.1 Potential Delay to Construction Schedule and Potential Damage to Project Infrastructure as a result of Wildfire

A wildfire causing a delay to construction activities for an entire Project is considered rare. Considering some portions of the transmission line are located in the isolated Devona area of JNP, wildfire may limit construction access along the Snaring and Celestine Roads. Construction activities and construction-related traffic would be suspended at potentially affected areas if conditions were considered to be unsafe by the Construction Manager or if requested by Parks Canada. The delay of construction activities generally is considered to be of minor magnitude (Table 5.12-2, Point a).

Wildfire that damages the transmission line anywhere along the Project Footprint could have immediate effects to the power supply to JNP. ATCO Electric would activate their mobile units to provide power while repair occurs on the transmission line. The potential residual effect of wildfire is considered to be of minor to moderate magnitude (Table 5.12-2, Point a).

5.12.2.2 Potential Delay to Construction Schedule and Potential Damage to Project Infrastructure as a Result of High Winds and/or Heavy Precipitation

High winds could result in the suspension of some construction activities such as topsoil handling, clearing, and welding. Heavy or persistent precipitation could also result in a delay of construction activities if topsoil salvage activities have not been completed or if wet soil conditions create safety or traffic-related problems. The potential residual effects related to delays in construction due to severe weather conditions or delays in operation due to damage to infrastructure are expected to be rare and of minor magnitude (Table 5.12-2, Point b).

5.12.2.3 Potential Damage to Project Infrastructure as a Result of Lightning or Icing

Lightning or icing could affect the power supply and damage aboveground equipment and buildings. Aboveground facilities will be grounded in accordance with provincial and national building codes to reduce the risk of damage due to lightning. In addition, the Project will be designed to withstand anticipated severe weather events that cause icing conditions. The potential residual effect related to infrastructure damage caused from lightning or icing is considered rare and of minor magnitude (Table 5.12-2, Point c).

Table 5.12-2 provides a summary of the characterization of potential residual effects of the environment on the Project.

5.12.2.4 Combined Effects of the Changes to the Project Caused by the Environment

An evaluation of the combined effects considers those residual effects that are likely to occur. Since the probability of environmental conditions affecting the construction or operations of the Project is low, an evaluation of combined effects of the changes to the Project caused by the environment is not warranted.

Table 5.12-2. Residual Effects Characterization for the Effects of the Environment on the Project

Potential Residual Effect	Criteria Rating	Effects Characterization
a. Potential delay to construction schedule and potential damage to Project infrastructure as a result of wildfire.	**Geographic Extent:** Project Footprint	The potential residual effect of schedule delays and damage due to wildfire is limited to the Project Footprint.
	Duration: Immediate to short-term	The potential residual effect of schedule delays and damage due to wildfire may last one or two days or may extend further into the construction or operations phase.
	Frequency: Rare	The potential residual effect of schedule delays and damage due to wildfire is uncommon and unpredictable.
	Reversibility: Reversible	The potential residual effect of schedule delays and damage due to wildfire are reversible to pre-event or equivalent conditions.
	Magnitude: Minor to moderate	The magnitude of potential construction delay or damage to the Project will result in some measurable change depending on the size of the wildfire.
b. Potential delay to construction schedule and potential damage to Project infrastructure as a result of high winds, heavy precipitation, or both.	**Geographic Extent:** Project Footprint	The potential residual effect of damage due to high winds or precipitation is limited to the Project Footprint.
	Duration: Immediate to short-term	The potential residual effect of damage due to high winds or precipitation may last one or two days or may extend further into the construction or operations phase.
	Frequency: Rare	The potential residual effect of damage due to high winds or precipitation is uncommon and unpredictable.
	Reversibility: Reversible	The potential residual effect of damage due to high winds or precipitation are reversible to pre-effect or equivalent conditions.
	Magnitude: Minor	The magnitude of potential construction delay or damage to the Project due high winds or precipitation will have some measurable change.
c. Potential damage to Project infrastructure as a result of lightning or icing.	**Geographic Extent:** Project Footprint	The potential residual effect of damage due lightning or icing is limited to the Project Footprint.
	Duration: Immediate	The potential residual effect of damage due lightning or icing may last one or two days or may extend further into the construction or operations phase.
	Frequency: Rare	The potential residual effect of damage due lightning or icing is uncommon and unpredictable.
	Reversibility: Reversible	The potential residual effect of damage due lightning or icing are reversible to pre-effect or equivalent conditions.
	Magnitude: Minor	The magnitude of potential damage due lightning or icing to the Project will result in some measurable change.

5.12.3 Summary

There are no situations arising from the effects of the environment on the Project that cannot be technically or economically mitigated. Consequently, the potential residual effects of the environment on the Project are considered to be of minor magnitude.

5.12.4 References

Axys Environmental Consulting Ltd. and David Walker & Associates. 1998. *Best Available Methods for Common Leaseholder Activities.* Jasper, Alberta. 144 pp.