



Basic Impact Analysis (BIA)

Repair and Replacement of Wildlife Exclusion Fencing Km 0 – Km 47

Banff National Park

November 2015



Parks
Canada

Parcs
Canada

Canada



1. PROJECT TITLE & LOCATION

Banff National Park – Wildlife Exclusion Fencing Realignment and Repairs – TCH km 0 - 47

Along both sides of the Trans-Canada Highway, spanning from kilometre 0 (Park Gate) to kilometre 47 (Castle Mountain Interchange).

2. PROPONENT INFORMATION

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3. PROJECT DATES

Planned commencement: 2015-09-30

Planned completion: 2018-09-30

4. INTERNAL PROJECT FILE

5. PROJECT DESCRIPTION

Project Objectives

Parks Canada Agency (PCA) is proposing to repair and replace wildlife exclusion fencing and associated structures along the Trans-Canada Highway (TCH) from kilometer (km) 0 to km 47 within Banff National Park (BNP). The existing fencing system is over 30 years old, in poor condition, is beyond its service life, and does not meet the current PCA standard set in Phase 3B Trans-Canada Twinning project (km 47 to km 82). The new fencing system will effectively follow the existing fence line with targeted alignment adjustments to allow for easier access for wildlife monitoring and maintenance. The new alignment also accommodates for the Legacy Trail and for less fencing within the forest and more within the open highway right-of-way. The main reason for installing the fencing outside of the forest is to limit the number of tree falls which regularly damage the existing fencing allowing large animals to access the highway. The Project will include new wildlife fencing components to current standards and other existing components would be recapitalized to current standards.

The first phase of this project will be the installation of Electrified Animal Mitigation Crossing Systems (EAMCS) and supply and stockpile of fencing materials. Clearing/brushing will proceed during fall/winter months to avoid the bird nesting window, and fencing construction will take place during the spring/summer/fall construction seasons. This project will (tentatively) begin in fall 2015 and end in fall 2018.

Project Rationale

Rehabilitation/improvements to the wildlife exclusion fencing system will result in fewer animal/vehicle interactions, thereby decreasing animal fatalities, property damage and risk to human life, as well as preserving and protecting the wildlife in BNP. An improvement to visitor experience will be achieved by

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mitigating the negative experiences created by wildlife collisions, and by providing opportunities for public education and showcasing of the wildlife preservation efforts of PCA.

Project Components

Preliminary design drawings for all project components are provided in Appendix 3. Descriptions of the location, footprints, and construction methods for each component are provided below.

Electrified Animal Mitigation Crossing Systems

Six EAMCS sites with wildlife monitoring systems (pole-mounted cameras and electrical equipment) will be installed on the existing roadway and shoulder:

- Compound Road, approximately 60m south of TCH Intersection (km 15.1);
- Castle Junction East, approximately 300m east of TCH intersection (km 47.0);
- Castle Junction West (Highway 93S) approximately 900m west of TCH intersection (km 47.0);
- Banff Avenue, approximately 620m south of TCH Intersection (km 13.1);
- Lake Minnewanka Road, approximately 350m north of TCH Intersection (km 13.1); and
- Sunshine Road, approximately 30m south of TCH Intersection (km 25.5).

The Compound Road, Castle Junction East and Castle Junction West EAMCS sites were approved under a separate process and are scheduled to commence construction near the end of September. The installation of the Banff Ave, Lake Minnewanka and Sunshine Road EMACS sites will be considered in future years after consultation with Banff Field Unit.

The dimensions of each EAMCS are approximately 10 m to 19 m wide (depending on road width), 4.7 m long, and 0.3 m deep. Installation will require removal of pavement, minor excavating, installation of electrical works (conduit and power poles if required) placement of granular materials and asphalt paving. Fence construction is required to tie-in to the EAMCS, which may also include installation of steel access gates for pedestrians. Required equipment will include but not be limited to an excavator, skid steer, compactors, crane and dump trucks. The limits of construction at each site will be approximately 400 m².

The existing Texas gates at each the EAMCS sites will remain in place until the EAMCS have been tested and determined to be effective.

Vermilion Lakes Area Slope Stabilization

The TCH embankment slope in the Vermilion Lakes area will be stabilized in select locations where sloughing has created gaps under the fence allowing animal access to the highway. Select locations (around km 20.8) will be excavated and rip rap will be placed. New wildlife exclusion fencing will then be installed near the top of the embankment, in nearly the same location as the current fencing.

Fence Replacement

Wildlife fencing from TCH km 0 to km 26 (East Gate to Sunshine interchange) will be replaced on both sides of the highway. Select sections from TCH km 26 to km 47 are targeted for repairs and realignment.

During old fence removal and for new fence installation, the area between the edge of pavement and 3 m behind the proposed fencing alignment (approximately 15 m in most areas) will be brushed and cleared of vegetation. The 3 m area behind the new fence alignment is to allow for installation and prevent future damage to the fence by falling trees/branches/debris. The new fencing will require a 3 m width centred on the alignment for construction equipment and trenching to install the buried chain-link apron. The buried apron is designed to prevent carnivores from digging under the fence and accessing the highway.





Vegetation will be cut using hand tools or heavy equipment and debris will be chipped and piled on site before transportation to gravel/works pits for storage. Minor drainage work such as culvert cleaning and ditch cleaning may be conducted while vegetation clearing is underway, if deemed necessary. Equipment for vegetation clearing will include hand-tools (saws), truck-mounted brush cutters and mowers, truck mounted tree-falling equipment, chippers, loaders and dump trucks. Depending on contractor traffic control plans, traffic may be slowed through the work zones and temporarily stopped during operations.

Removal of the existing fencing and installation of new fencing with buried apron will require an excavator with bucket and post-pounding attachments. Wire mesh will be stapled to the posts by hand. Trucks with cranes will be used to transport fencing construction materials to the site. Steel pedestrian and double-swing gate posts will be pounded into the ground by machine, then workers will move gates into place by hand or by crane (if required) and affix them to the fence by hand. Posts are to be pressure treated outside the Park with CSA 080-97 approved preservative; touch-ups are to be applied by hand at the staging areas.

Animal jumpouts and small mammal culverts (under the TCH roadway) will be installed at various locations between TCH km 0 and km 47. Small mammal culverts will be installed by “pipe pushing” or horizontally inserting pipes under the existing TCH roadway (trenchless) using horizontal drilling equipment. The locations of the jumpouts are shown on the Preliminary Design Drawings (Appendix 3). The small mammal culverts will be installed at approximately 1 km intervals.

Stockpiling and Staging Areas

Cascade Pit, 600 m east on Lake Minnewanka Scenic Drive (off Lake Minnewanka Road) will be used for stockpiling of fencing materials (treated wood posts, metal wire and mesh, chain link, hardware). Mannix Pit, 3 km northwest of Castle Junction, will be used for construction staging.

Post-Construction Restoration

Following construction, all disturbed areas will be re-contoured and seeded with an approved seed mix.

6. VALUED COMPONENTS LIKELY TO BE AFFECTED

Following the background review of environmental information, potential Valued Components (VCs) were identified for this project, including soil and landforms, water, flora, fauna, cultural resources and visitor experience. The potential VCs were assessed to determine if they are present near the Project Site and if they are subject to stakeholder or regulatory concern. Based on these criteria and the professional judgment of the study team, this information was used to determine the final VC selection for the purposes of the BIA for this project.

Project activities that may interact with VCs are identified by investigating the various components of the Project that have potential effect pathways to the receiving environment.

Soil and Landforms

The Project falls within the Montane Subregion of the Rocky Mountain Natural Region. The Montane Subregion spans the widest elevation range in Alberta, from a low of about 825 m above sea level (asl) in northern part of the Subregion valleys to a high of over 3,600 m asl (Mount Columbia) in the Alpine Subregion (Natural Regions Committee 2006).

The Ecological Land Classification of BNP was used to summarize soil, vegetation, wildlife habitat, and ecological management concerns within the ecosites that the Project would cross (Alberta Institute of Pedology 1983) (Appendix 4). The dominant soils present in the ecosites the Project crosses includes regosol, brunisol, and luvisol (Appendix 4).

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Water

The existing and proposed wildlife exclusion fence crosses or is adjacent to a number of named watercourses:

- Carrot Creek (TCH Km 2.45),
- Cascade River (TCH Km 10.3),
- Forty Mile Creek (TCH Km 15.5),
- Five Mile Creek (TCH Km 22.3),
- Bow River (TCH Km 23.0),
- Brewster Creek, near but does not intersect the fencing (near TCH Km 25.3),
- Wolverine Creek (TCH Km 29.5),
- Red Earth Creek (TCH Km 37.3), and
- Altrude Creek (TCH Km 46.7).

In addition, there is a sulphur spring (known as Cool Spring) that emerges from the ground immediately upslope from Vermilion Lake Road then flows under the road to 3rd Vermilion Lake (the western-most lake). The Vermilion Lakes area (Figure 1) is considered an Environmentally Sensitive Site; it is considered the most important wetland in BNP and provides habitat for a wide variety of species.

Current fencing over some watercourses is above the low water mark, which allows wildlife to access the highway in low flow conditions, a design flaw that will be eliminated with new fencing.

Many additional water bodies are in the vicinity of the Project but there is only one location (between TCH km 8.1 and km 8.25, shown on drawing W01) where the existing fence passes through permanent open water. This open water area became established after the installation of the original fence due to beaver damming and plugged culverts. The new fence will be re-aligned closer to the highway to avoid the open water areas. The original fencing will be removed during winter under frozen ground conditions to minimize effects on the aquatic environment.

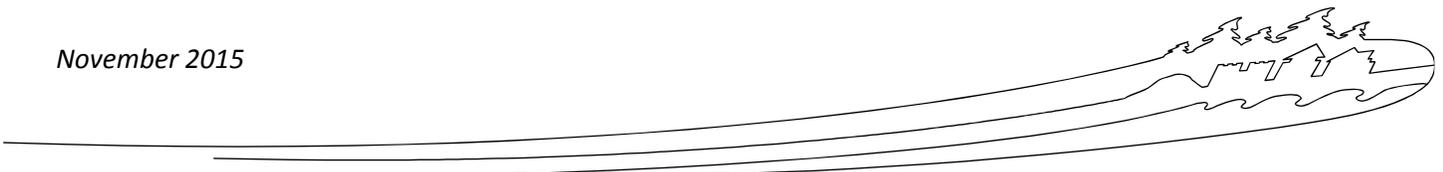




Figure 1. Vermilion Lakes Environmentally Sensitive Site (Courtesy of PCA).

Flora

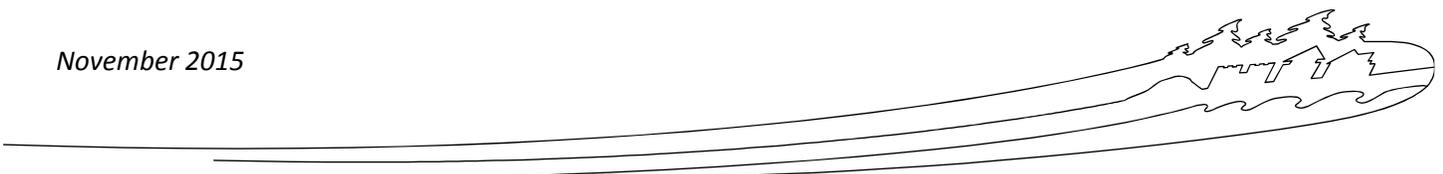
Proposed project activities will occur primarily within the cleared right-of-way of the TCH; however, some of the originally cleared areas have been re-growing for over 30 years. Some areas of the proposed alignment will require new clearing (i.e., in previously undisturbed areas). Historically occurring native vegetation communities within the right-of-way have been disturbed and cleared during construction of the TCH. The right-of-way is also routinely cleared of woody vegetation as part of ongoing highway maintenance activities. Natural vegetation communities located adjacent to the right-of-way consist primarily of coniferous forest. Native vegetation communities located in proximity to the Project Site, including a description of characteristic soil, dominant vegetation, and other associated wildlife and management considerations are presented in Appendix 4.

To determine the potential for rare plants within the Project footprint, a three-step process was used:

- Step 1: Compilation of a list of rare plants that have ranges that overlap the Project area;
- Step 2: Rare plant habitat assessment based on a field reconnaissance; and
- Step 3: Ground searches for rare plants in habitats considered to have high or moderate potential for rare plants.

Further details on these steps are provided below.

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A search of the Alberta Conservation Information Management System (ACIMS) database and Parks Canada Biotics Web Explorer was conducted to identify vegetation elements of concern within a 5 km buffer of the Project area (Government of Alberta 2014a; Parks Canada 2013). Vegetation Elements of Management Concern (VEMCs) are any plants that meet one or more of the following criteria:

- Have provincial and/or federal restricted activity dates or setback distances;
- Assessed as 'Threatened', 'Endangered', or 'Special Concern' by the Endangered Species Conservation Committee (ESCC; Government of Alberta 2014a);
- Listed as 'Threatened' or 'Endangered' under the Alberta *Wildlife Act* (AWA; Province of Alberta 2000);
- Assessed as 'Special Concern', 'Threatened', or 'Endangered' by the Committee on the Status of Endangered Species in Canada (COSEWIC; Government of Canada 2014);
- Listed as 'Special Concern', 'Threatened', or 'Endangered, or under the *Species at Risk Act* (SARA; Government of Canada 2002);
- Vascular plant species listed on the Alberta Conservation Information Management System (ACIMS) List of Tracked Elements in Alberta – Plants and Lichens (Government of Alberta 2015a); and
- Ecological communities listed on the ACIMS Community Tracking List Report (Government of Alberta 2015b).

A total of 99 species and communities were identified (Appendix 5) as elements of concern. Of these species, whitebark pine (*Pinus albicaulis*) and limber pine (*Pinus flexilis*) are currently listed as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC; Government of Canada 2014) and whitebark pine is listed as endangered under the *Species at Risk Act* (SARA; Government of Canada 2002). Whitebark pine typically exists at high elevations in upper subalpine habitats ranging from timberline, where it may occur as stunted krummholz, down to closed subalpine forest (COSEWIC, 2010). Limber pine is typically associated with exposed slopes (south and west facing) in montane areas (Alberta Conservation Association 2007). Based on the review of existing information with respect to adjacent vegetation communities (Alberta Institute of Pedology 1983) preferred habitat for these species is likely present in proximity to the Project; however, given the disturbed nature of the site, and routine clearing of woody vegetation within the TCH right-of-way, the potential for whitebark pine to occur within the disturbance footprint of the Project is considered unlikely. There is a marginally increased likelihood of encountering limber pine along the rocky slopes between the TCH and Vermilion Lake Road relative to other areas of the project.

Following the compilation of potential VEMC, the Project area was assessed for risk of encountering VEMC based on habitat attributes. The purpose of this habitat assessment was to stratify the Project area into zones of High, Moderate, Low and Nil risk of encountering VEMC. A site reconnaissance was conducted on May 7, 2015 to assist with this assessment.

Qualified specialists then conducted detailed ground surveys in areas considered to have Moderate and High risk for encountering VEMC. Surveys were conducted from June 19 to 22, 2015 in accordance with the detailed level of survey effort described in the Guidelines for Rare Vascular Plant Surveys, 2012 Update (Alberta Native Plant Council, 2012). Preliminary risk for encountering VEMC was then re-evaluated based on the results of the field survey. No Critical Priority Areas (i.e., presence of a SARA-listed species) were found. The following areas of Moderate and High Risk for encountering VEMC were confirmed along the Project:





Moderate Risk for Encountering VEMCs:

- Km 16.0 to km 17.0 – Presence of rich moist forest and wetland habitats with potential to support species of VEMC that are detectable during latter periods of the summer growing season (i.e., late July to late August).

High Risk for Encountering VEMCs:

- Km 17.9 to km 18.0 (North side only) – Detected occurrence of Hooker's cinquefoil (*Potentilla hookeriana*) within 5 m of the existing steel fence alignment;
- Km 19.3 to km 19.4 (North side only) – Detected occurrence of smooth cliff brake (*Pellaea glabella* ssp. *occidentalis*) within 5 m of the existing steel fence alignment;
- Km 20.3 to km 20.4 (North side only) – Detected occurrence of Hooker's cinquefoil within 5 m of the existing steel fence alignment; and
- Km 20.6 to km 20.8 (North side only) – Detected occurrence of smooth cliff brake within 5 m of the existing steel fence alignment.

Hooker's cinquefoil is a small herbaceous species of the rose family (i.e., Rosaceae) that inhabits dry, rocky slopes in the Rocky Mountain Region of Alberta (Kershaw et al., 2001) (Photos 1 and 2). Hooker's cinquefoil is considered to be vulnerable in Alberta (i.e., S3) and is tracked under the Alberta Conservation Information Management System (ACIMS) (Government of Alberta, 2015a; NatureServe, 2012).

Smooth cliff brake is small fern that inhabits the crevices and overhanging rock of predominantly calcareous cliffs and ledges (Kershaw et al., 2001) (Photo 3). Smooth cliff brake is considered to be imperiled in Alberta (i.e., S2) and is tracked under ACIMS (Government of Alberta, 2015a, NatureServe, 2012).



Photo 1 Close up of Hooker's cinquefoil plant near Km 17.9.



Photo 2 View of Hooker's cinquefoil habitat located near Km 17.9.





Photo 3 View of smooth cliff brake and habitat located near Km 20.6.

Fauna

Areas adjacent to the TCH and along the existing fence line provide habitat for a range of wildlife species, primarily for food and in some cases for security where dense shrub and tree cover exists. Wildlife using habitats adjacent to the roadway are generally disturbance-tolerant species. The wildlife crossing structures (underpasses, overpasses and culverts; 23 within the fencing project area) that occur along the TCH within BNP are used by a range of wildlife species (Table 1).

Table 1. Summary of wildlife crossing use for crossing structures in the project area (TCH Phases 1, 2 and 3a only) (1996-2014). (From Clevenger and Barrueto, 2014)

Species	No. Crossings
Bear spp.	56
Black Bear (<i>Ursus americanus</i>)	1,604
Grizzly Bear (<i>Ursus arctos</i>)	1,320
Cougar (<i>Puma concolor</i>)	1,624
Lynx (<i>Lynx canadensis</i>)	16
Coyote (<i>Canis latrans</i>)	8,435
Wolf (<i>Canis lupus</i>)	6,614
Wolverine (<i>Gulo gulo</i>)	9
Deer (<i>Odocoileus</i> spp.)	69,701
Elk (<i>Cervus elaphus</i>)	52,532
Moose (<i>Alces alces</i>)	336
Bighorn Sheep (<i>Ovis Canadensis</i>)	4,999
Grand total	147,246

Deer and elk comprise the majority (47% and 36%) of all detected animal crossings. Large carnivores made up 13.5% of the detections in the following descending order: coyotes, wolves, black bears, cougars and grizzly bears (Clevenger and Barrueto, 2014).

The Parks Canada Biotics Web Explorer (in addition to other internal PCA databases) was used to identify wildlife species present in BNP which are listed under SARA (Table 2) and described as being regularly





present in BNP with a confident distribution (PCA, 2013). There is the potential other SARA-listed species to be present in the Project area (e.g., Northern Long-eared Myotis); however, the available data are not sufficient to make a determination at this time.

Table 2: Regularly Present Wildlife Species in Banff National Park listed under SARA

Common Name	Scientific Name	SARA Schedule ¹	SARA Legal Status	Potential for Presence at Project
Banff Springs Snail	<i>Physella johnsoni</i>	Schedule 1	Endangered	Nil – outside of known range
Western Toad	<i>Anaxyrus boreas</i>	Schedule 1	Special Concern	Moderate – breeding, summer and winter habitat present
Common Nighthawk	<i>Chordeiles minor</i>	Schedule 1	Threatened	Moderate – habitat present
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Schedule 1	Threatened	Moderate – habitat present
Rusty Blackbird	<i>Euphagus carolinus</i>	Schedule 1	Special Concern	Unlikely – transient visitor to BNP
Little Brown Myotis	<i>Myotis lucifugus</i>	Schedule 1	Endangered	Moderate – generally found in low densities with patchy distribution
Woodland Caribou – Southern Mountain Population	<i>Rangifer tarandus</i>	Schedule 1	Threatened	Nil – population extirpated. Project is within mapped critical habitat.

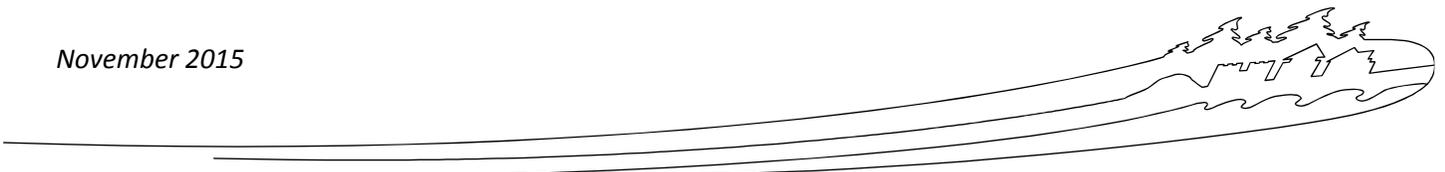
¹SARA - Species At Risk Act (Government of Canada 2002)

Banff Springs Snail are only located within the Banff Springs area and are not expected to occur at the Project.

The Western Toad is the most widespread amphibian in the Rocky Mountains and is found at all elevations and habitats within BNP below treeline. Western Toads use a wide variety of aquatic habitats for breeding. Wetlands along the fencing are potential breeding habitat for Western Toad. The forested areas along the fence provide potential summer foraging habitat and potential habitat for winter hibernation when toads hibernate underground, below the frost line to prevent freezing, and near water to prevent desiccation.

The Common Nighthawk regularly occurs in BNP, inhabits open and cleared areas, and breeds on flat, gravelly substrates. Suitable breeding habitat may occur along the fence.

The Olive-sided Flycatcher inhabits forests with open areas containing or surrounded by tall trees, often in association with water. Open areas may include human-made openings and thus the forested areas along the fence may offer suitable habitat for the Olive-sided Flycatcher.





The Rusty Blackbird regularly occurs in BNP; however, it is considered transient and is not known to breed within the Park, thereby limiting its potential occurrence within the Project area.

Little Brown Myotis tends to occur in the lower valleys of front ranges and is considered fairly common in the lower and middle Bow Valley and town sites; limited recent research has been conducted on current distributions. The lack of suitable hibernation locations at the Project (e.g., caves) will limit the potential occurrence during winter. However, the forest surrounding the Project areas is suitable summer habitat and individuals may be found foraging in forest openings and edges and over creeks and waterbodies, including in the vicinity of fence construction and staging areas.

The north end of the project area is about 20 km from the Banff Local Population Unit of the Central Group of Southern Mountain Woodland Caribou. The last known individuals of that unit were killed in a large avalanche in 2009. As a result, caribou are not likely to be found in the vicinity of any portions of the Project. There is a recovery planning process actively underway for caribou in BNP. The Project area from approximately TCH Km 8 onward is within mapped critical habitat (Critical Habitat - Type 2 Matrix Range¹).

Cultural Resources

BNP is part of a UNESCO World Heritage Site and home to seven National Historic Sites. The cultural history sequence of BNP is recorded by its varied cultural resource assemblage. BNP's earliest inhabitants relied on the region's rich ecological resources for survival. Prehistoric artifact assemblages are often located near water and within elevated terrain suitable for hunting or travel and consist primarily of campsite lithic assemblages. Some of these sites exhibit extended use into the post-contact period. Historic period sites within BNP can be characterised by three stages of advancement – the exploratory, the development, and the conservation/reclamation. Although each phase resulted from markedly different driving forces, each instigated unique, and permanent changes within the region.

Cultural resources within Federal Lands are protected under PCA's Cultural Resource Management Policy (CRMP; PCA 2013). Under this policy, PCA is required to manage and protect resources that comprise a part of Canada's heritage. Heritage resources encompass a wide array of culturally modified materials and may be identified and recovered from both surface and subsurface contexts. Any ground disturbing activities have the potential to permanently damage these materials; therefore, PCA requires terrestrial archaeological assessments to be completed prior to development to ensure heritage resource protection.

The CRMP applies to protected heritage places and cultural resources under PCA administration. Cultural resources are defined as: human work, an object, or a place that is determined, on the basis of its heritage value, to be directly associated with an important aspect or aspects of human history and culture (PCA 2013). The heritage value of a cultural resource is "embodied in tangible and/or intangible character-defining elements". It is PCA's objective that cultural resources are conserved and that their heritage value is "shared for the understanding, appreciation and enjoyment of present and future generations" (PCA 2013). Cultural resources may include a wide range of entities, including, but not limited to, cultural landscapes and landscape features, archaeological sites, structures, engineering works, artifacts and associated records.

According to internal PCA archaeological datasets, approximately 65 previously identified and recorded cultural resource sites are located within 100 m of the proposed Project footprint. These sites date to both

¹ Type 2 Matrix Range consists of areas surrounding annual ranges where predator/prey dynamics influence predator/prey dynamics in the subpopulation's annual range. Type 2 matrix range also may include areas of trace occurrences of caribou and dispersal zones between subpopulations and between Local Population Units.





the pre-contact and post-contact periods and range in significance (i.e., low, moderate and high), levels of disturbance (e.g., intact, partially disturbed, destroyed) and recommended mitigative measures (e.g., none, testing, periodic monitoring, archival research).

A review of the proposed development was undertaken through consultation with PCA Archaeologist Gwyn Langemann. In addition to visiting the proposed Project locations, Ms. Langemann prepared annotated plans that highlighted proposed components of the Project in potential conflict with previously identified cultural resource sites. Areas were identified as High, Moderate, or Negligible archaeological concern. This information was provided to the Project team and McElhanney incorporated this data in the Preliminary Design Plans for the Project.

Visitor Experience

The Project area is located in an intensively used area for transportation, recreation and natural and cultural appreciation. The existing wildlife exclusion fence is highly visible to all Park visitors using the TCH and directly adjacent roads, rest stops, lookouts and trails (e.g., the Legacy Trail).

7. EFFECTS ANALYSIS

The following are the environmental effects potentially resulting from this project, without the application of mitigation measures. Please see the Effects Identification Matrix in Appendix 1 for further identification of Project effects.

Air Quality

1. The use vehicles and machinery and the transport of materials and equipment will result in emissions and dust mobilization into the air.
2. The removal of vegetation will expose soils and surficial materials that when disturbed, may become airborne and have the potential to reduce air quality proximate to the Project; depending on the wind direction, changes in air quality (e.g., dust, fumes) may negatively affect Park visitors using trails (e.g., the Legacy Trail).

Soil and Landforms

1. There is potential for adverse effects to soil through use of machinery, as a result of accidental spills, leaks, or poorly maintained vehicles and equipment.
2. Soils will be disturbed during fence installation.

Water

1. There is a potential for adverse effects to water bodies (including the Vermilion Lakes Environmentally Sensitive Site) if debris or deleterious substances enter surface waters during fence repair or replacement.
2. The Cool Spring at Vermilion Lakes is unlikely to be affected by fence replacement; in this area, the fencing will remain in its current location near the top of the embankment along the TCH, with no works near the Cool Spring.
3. Water quality may be affected by spills or leaks from vehicles or equipment if not managed or maintained properly.
4. No effects to hydrology are anticipated as bridges are already in place for all watercourses, water bodies, and wetlands interacting with the TCH.





5. Negative effects to fish and fish habitat are related to the potential for sediment, construction materials, or accidentals spills or leaks to affect water quality for any watercourses, water bodies, or wetlands that interact with the TCH and associated wildlife exclusion fencing. Negative effects are not anticipated with application of mitigation measures.

Flora

1. Clearing for access and installation will result in a temporary loss of vegetation. After restoration and naturally over time, disturbed areas will return to a similar vegetation composition as before construction.
2. Most of the vegetation that is to be cleared is close to the roadway and is already subject to high levels of disturbance through routine vegetation management.
3. Approximately 2.5 km of the 94 km fencing length have High or Moderate risk of encountering VEMC, based on (a) suitable habitat with a known VEMC within 5 km or (b) observed occurrences (see below). Special management practices will be implemented in these areas.
4. Hooker's cinquefoil (designated as vulnerable in Alberta; not listed under SARA) was found in the area of the existing fence and may occur within the proposed construction footprint. With mitigation, impact can be avoided.
5. Smooth cliff brake (designated as imperilled in Alberta; not listed under SARA) was found in the area of the existing fence; however, as it inhabits crevices and overhanging rock faces, impacts are not expected.
6. Vegetation in the immediate vicinity of the Project may be affected by dust and debris resulting from clearing activities.
7. Surrounding vegetation could be affected by an accidental spill of a harmful substance.
8. Introduced invasive non-native plants could establish after vegetation clearing.

Fauna

1. Vegetation clearing will result in temporary loss of habitat; after restoration and naturally over time, disturbed areas will return to a similar vegetation composition as before construction.
2. Short-term effects to wildlife are expected during the construction periods. Operation of machinery, equipment, human presence, and noise may result in temporary avoidance of habitat surrounding the TCH, including wildlife crossing structures. Monitoring data indicates that use of wildlife crossing structures by some species (most notably cougar, deer, elk and moose) is higher in early morning and evening and lower during daytime hours (Clevenger and Barrueto, 2014) and thus may be less affected when fence replacement work is underway. Black bears grizzly bears were found to be generally most active during daylight hours.
3. Once fence replacement is complete and vegetation is restored, wildlife use of crossing structures is expected to be unchanged since the replaced fence will be in a similar location and have the same physical characteristics as the original fence.
4. There is potential for loss of bird nests, which are protected under *the Migratory Birds Convention Act* (MBCA), if vegetation clearing occurs during the general bird nesting period (April 17 – August 31).





5. Western Toads may potentially breed in water bodies and wetlands in the vicinity of the Project sites. They may also breed in temporary pools and tire ruts within the work areas. Since there will be no work directly within wetlands, impacts to breeding habitat will generally be avoided. If pools and water-filled tire ruts are present in areas directly impacted by construction activities, pre-work Western Toad surveys will be required.
6. Since Common Nighthawk nest on the ground in open areas, cleared portions of the Project work areas may provide suitable nesting habitat, although they are unlikely to initiate nesting either close to the highway or when work is underway. Common Nighthawk that are present in or adjacent to work areas when clearing or construction activities commence may be displaced, potentially affecting breeding and/or foraging.
7. Direct effects on Olive-sided Flycatcher nesting will be avoided by clearing vegetation in winter. Olive-sided Flycatchers that are adjacent to work areas when construction activities commence may be displaced, potentially affecting breeding and/or foraging. However, the new fence alignment will result in a net decrease in the amount of land on the highway side of the fence, which is subject to potentially permanent disturbance. Net habitat is therefore expected to be stable to increasing over the long term.
8. Suitable hibernacula for Little Brown Myotis are not likely to occur within the Project Area. Winter tree clearing will avoid direct effects on roosting individuals. Little Brown Myotis that are adjacent to work areas when construction activities commence may be displaced, potentially affecting foraging. However, the new fence alignment will result in a net decrease in the amount of land on the highway side of the fence, which is subject to potentially permanent disturbance. Net habitat is therefore expected to be stable to increasing over the long term.
9. The north end of the Project area is near the previous range of Woodland Caribou and most of the Project area is located within mapped critical habitat. Woodland Caribou would not be impacted in the short term and even a recovered population would be minimally or not impacted. This is based on the small area of vegetative clearing, the close proximity to heavily disturbed areas which caribou would tend to avoid, and the lack of any historical caribou activity in the lower Bow Valley. The new fence will remain within the previously disturbed highway footprint and the new alignment will result in a net decrease in habitat alienated on the highway side of the fence. During fence removal and new fence construction, openings in the fence could be created, thus allowing wildlife to access the highway.
10. Local wildlife may be affected by an accidental spill of a harmful substance on-site.
11. Garbage and waste generated by the construction activities could attract local wildlife.

Cultural Resources

1. Numerous previously recorded cultural resource sites are located within, or in immediate proximity of the Project footprint. Proposed ground disturbances will result from: (a) the installation of fence posts; (b) trenching for the placement of the chain link apron; (c) installation of posts for gates, (d) construction of animal jumpouts; (e) drilling of small mammal culverts and (f) re-alignment of portions of the existing wildlife fencing.
2. Approximately 65 previously recorded cultural resource sites are located within 100 m of the proposed fencing corridor; over 20 sites are located in within the Project work areas.

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These areas of 'Archaeological Concern' are outlined on the Preliminary Design Plans as exhibiting Negligible, Moderate or High risk, as determined through consultation with PCA Archaeologist, Gwyn Langemann.

3. Negative impacts to identified cultural resources are not anticipated, with the mitigation measures outlined in the Section 8.

Visitor Experience

1. The temporary presence of construction equipment, vehicles, and personnel along the TCH during fence repair and replacement will detract from the views of the Park for those travelling the TCH, adjacent roads and the trails.
2. Once construction is complete, the new fence will have a similar level of visibility to visitors travelling the TCH and adjacent roads and trails.
3. For visitors travelling the TCH, the fence will no longer be visible in the Vermilion Lakes area (approximately km 20.3 – km 21.1) as the fencing will be installed at the base of embankment, affording motorists an unobstructed view in this area.
4. Use of the Banff Legacy Trail and all other trails by Park visitors will not be affected by construction activities.
5. The new fencing will improve exclusion of wildlife, thus increasing visitor safety and the negative effects of encountering the results of or experiencing wildlife-vehicle collisions.

8. MITIGATION MEASURES

Mitigation measures can be applied by adhering to operational protocols or through Project design alterations adopted by the Project to reduce potential adverse effects. All work will be conducted in accordance with "Parks Canada National Best Management Practices: Roadway, Highway, Parkway and Related Infrastructure" (2015).

Project Specific Mitigations

1. The Contractor is required to prepare an Environmental Protection Plan (EPP) and will include:
 - a. An access plan including access routes, type of equipment used for various construction phases, and lay down areas in order to prevent/minimize disturbance to vegetation and soils. Any new laydown areas will require approval from the assigned PCA Environmental Surveillance Officer (ESO) and Departmental Representative.
 - b. Details on how the work limits will be marked and what procedures will be employed to ensure trespass outside these limits does not occur and to ensure that the environment is not impacted or damaged by workers or construction equipment beyond the work limits.
 - c. A Spill Response Plan will be prepared by the Contractor and will detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products, to the satisfaction of the Departmental Representative and the ESO and in accordance with all applicable federal and provincial legislation. The Plan will include a list of products and materials to be used or brought to the work site that are considered or defined as hazardous or toxic to the environment. Such products may include, but are not limited to fuels, lubricants, cement





and/or resin based grouts, and asphalt cement. The Material Safety Data Sheets (MSDS) for all chemicals used will be made available on-site.

- d. An emergency response plan that outlines procedures to follow in the case of an emergency (e.g., wildlife encounter, equipment malfunction/failure, fire).
 - e. A fire prevention plan which describes the fire prevention equipment (e.g., fire extinguishers) and procedures on-site in the event of a fire. Should a fire occur, Banff dispatch and the Fire Duty Officer must be notified immediately.
2. It is expected that all staff and contactors will understand and comply with all National Park regulations within the Park. All staff employed at the construction site will be required to attend an environmental briefing regarding their individual and collective responsibilities to ensure avoidable adverse environmental effects do not arise from their activities and personal choices. This information will be available on-site and provided to any new workers and/or subcontractors such that subsequent environmental briefings can be presented by arrangement with the ESO through the Departmental Representative.
 3. It is the responsibility of the Project Manager and Contractor to ensure that all Project works are conducted in accordance with all applicable regulations and approvals including the SARA and *Canada National Parks Act*.
 4. The ESO assigned by PCA will provide periodic and unscheduled site visits to ensure that Project operations are conducted in accordance with all identified environmental protection measures (including, but not limited to those within this document, applicable legislation and construction Best Management Practices). The ESO maintains the right to halt any work that does not comply with all Project Approvals, Permits or Authorizations. The Contractor is responsible for undertaking environmental monitoring and follow up reporting of rehabilitation works such that criteria in PCA Approvals and the EPP are being adhered to.
 5. It is the responsibility of the Project Manager to provide PCA staff with advanced notifications of Project activities and direct that this information be included in local media, if required.
 6. All site staff are required to wear the appropriate Personal Protective Equipment (PPE) and be trained to standards that comply with both the *Alberta Occupational Health and Safety Act* and *Worker's Compensation Board*.
 7. Firearms and pets are prohibited on-site.
 8. Fishing within watercourses in proximity to the pit by Project crew is prohibited.
 9. Park campgrounds will not be used for staff accommodation.
 10. The Contractor assumes any risk to public safety as a result of Project activities.
 11. Dust generated by Project activities will be controlled as necessary by covering and/or dust control for on-site work by methods approved by the Departmental Representative.
 12. The Contractor will ensure that works are completely contained such that deleterious substances (e.g., cement-based products, blast media, epoxies, wash water) will not be released into the environment.
 13. Prior to use on-site, equipment will be inspected for fluid leaks of any kind. Any detected leaks from equipment on-site will be addressed immediately and absorbent pads will be used under





equipment with chronic leaks. Inspections should be done daily and recorded. Equipment stored overnight will be stored on tarps with appropriate containment if required.

14. All stationary operating equipment with fuel tanks or hydraulic systems (e.g., pumps), or stores of liquid hazardous materials (e.g., fuel) will be located within an impervious secondary containment area capable of holding 110% of the contents of the largest container within the area.
15. The Contractor will have a spill response and cleanup plan prepared as part of the EPP. Appropriately sized and stocked spill kits will be on site capable of dealing with 110% of the largest potential spill. All staff must be aware of their location(s) on site and must be trained on spill response procedures.
16. In the event of any fluid spills or leaks exceeding 5 litres or any spill quantity to water, PCA Dispatch and the ESO will be notified immediately. Any absorbent materials used in the cleanup or soils contaminated by the spill will be disposed of in the appropriate facilities and transported in accordance with the Transportation of Dangerous Goods Regulations.
17. All refueling will take place on hardened, impermeable surfaces at least 100 m from all watercourses. All staff will be trained on proper fueling procedures.
18. Prior to accessing the site, all construction equipment will be pressure washed or steam cleaned to prevent the transport of invasive plant parts, including seeds, to the work site where there is disturbed soil that may be easily invaded. In particular, tire treads, wheel wells and bumper areas will be clear of dirt and plant debris from former work sites.

Air Quality

1. Vehicles will not be left idling when not in use to reduce vehicular emissions.
2. Carpooling to site will be used whenever possible to reduce vehicular traffic and emissions.
3. Dust generated by Project activities will be controlled as necessary by covering and/or dust control for on-site work by methods approved by the Departmental Representative.
4. To reduce noise and air emissions, construction equipment will be turned off when not in use and should be maintained in order that they operate at optimal performance.

Soils and Landforms

1. All sediment control measures shall be implemented by the Contractor prior to commencement of the work in the vicinity of any watercourse, water body, or wetland.
2. Slopes will be covered by stripped soil and chip compost material and seeded, if required. Environmental concerns related to these activities largely focus on erosion prevention and sediment control. The Contractor is to present a plan for placement, spreading, and stabilization of reclamation materials that controls erosion and prevents sedimentation, to the satisfaction of the Departmental Representative and ESO.
3. Equipment and materials laydown areas will be restricted to existing cleared surfaces further reducing the Project Site and reducing the potential for soil disturbance and erosion.

Water

1. Where fencing passes over temporary watercourses, fencing will be below the low water mark to ensure wildlife cannot access the highway in drier conditions.





2. Effective sediment and erosion control measures will be installed before starting work near watercourses, water bodies, or wetlands. Sediment and erosion control measures will shall be inspected regularly during the course of construction and repairs shall be made as necessary.
3. The site will be secured against erosion during any periods of construction inactivity or shutdown.
4. Generally work within a 30 m buffer of water bodies or wetlands will have the close oversight of the ESO and the Departmental Representative.
5. Machinery, equipment, and construction personnel will not enter any watercourse, water body, or wetland associated with the Project. All work is to occur above the high water mark and in a manner that minimizes disturbances to the banks of the watercourse.
6. Machinery is to arrive to site in a clean condition and is to be maintained free of fluid leaks.
7. Machinery is to be washed, refueled, and serviced at least 100 m away from any watercourse, water body, or wetland associated with the Project.
8. Fuel is to be stored at least 100 m away from any watercourse, water body, or wetland associated with the Project.
9. A Spill Response Plan will be prepared as part of the EPP and shall detail the containment and storage, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products, to the satisfaction of the Departmental Representative and the ESO and in accordance with all applicable federal and provincial legislation. The EPP shall include a list of products and materials to be used or brought to the construction site that are considered or defined as hazardous or toxic to the environment.
10. In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and cleanup.

Flora

1. Approximately 2.0 km of the 94 km fencing length have Moderate risk of encountering VEMC, based on suitable habitat. In this zone, the construction work zone will be limited to 3 m or less to minimize potential impacts to VEMC.
2. The locations of Hooker's cinquefoil will be flagged by the Departmental Representative and construction practices will be modified (e.g., to the buried apron) such that impacts will be avoided.
3. All soils, seeds, and any debris attached to construction equipment to be used on the Project Site will be removed (e.g., by power washing) outside BNP before delivery to the work site.
4. Clearing limits will be flagged to ensure vegetation outside the clearing limits is not disturbed.
5. Mature Douglas-fir (*Pseudotsuga menziesii*) trees will be preserved wherever feasible. The Departmental Representative will identify trees for preservation.
6. Care will be taken to ensure that trees do not fall into any watercourse, water body, or wetland or outside the clearing limits as marked by coloured flagging. Trees inadvertently felled into a watercourse, water body, or wetland or outside the clearing limits shall be removed in a manner (e.g., winch) that does not damage the substrate or any standing trees left outside the clearing limits.





7. Existing trails, roads, and hard surfaces will be used wherever possible to avoid disturbance to all vegetation, but especially riparian and wet soil vegetation surrounding watercourses, water bodies, or wetlands.
8. A fire prevention plan as part of the EPP. The fire prevention plan shall comply with applicable PCA fire prevention policies.
9. Disturbed areas (i.e. former fence alignment) will be restored by replacing any excavated topsoil, re-contouring and seeding with an approved seed mix for BNP.
10. To minimize the establishment and spread of invasive plants, a post-construction monitoring and control program will be developed jointly by HES and the BNP Field Unit.

Fauna

1. No vegetation removal will occur within the breeding bird period (April 17–August 31). The breeding bird window coincides with the bat and Western Toad breeding period.
2. Birds may be breeding within or adjacent to work areas (e.g., ground-nesting birds, like Common Nighthawk). If an active nest is found, work will be halted and the Banff Field Unit will be contacted for advice.
3. New fencing will be erected prior to removing the old fencing. A closed fencing system will be maintained during and after work shifts to prevent wildlife from breaching the fence and entering the highway.
4. Construction personnel will avoid use of crossing structures other than that necessary for replacing the fence.
5. Equipment and supplies used for fence replacement should not be stored near crossing structures.
6. Prior to work commencing near crossing structures, the ESO will be notified regarding the amount of time required at each crossing structure.
7. No night-time work will be permitted during fence construction.
8. Pre-work Western Toad surveys will be conducted by the Department Representative or the ESO if temporary pools or water-filled ruts will be directly affected by construction.
9. PCA will be notified immediately in the event of human-wildlife interactions, or activity or encounters with bears, mountain goats, lynx, wolves, bighorn sheep, cougars, wolverines, any species at risk, dens and nests. The following should be reported to the BNP field unit: a) immediate reports of (i) aggressive encounters involving any species, (ii) sightings of large carnivores or (iii) observations of carcasses; b) reports within 48 hours of other species or features of particular management interest. Immediate reports should go to Banff Dispatch (403-762-1473). SARA-listed species could potentially be observed on or near the Project location. Should this occur, operations in the immediate vicinity of the species should be halted and should recommence only when the species has left the immediate area. PCA Resource Conservation staff shall be notified immediately via Banff Dispatch.
10. All efforts to prevent wildlife from obtaining food, garbage or other domestic wastes will be made by the Contractor and contract staff while undertaking work in National Parks. Such wildlife attractants will not be stored at the work site overnight. Lunches, coolers and food products,





including waste food products, will be securely stored away from access by animals. Daily removal from the Park and off-site disposal of food scraps, food wrappers, pop cans, domestic waste, and other potential wildlife attractants is mandatory. Existing PCA waste receptacles will not be used for disposal of such wastes without prior arrangement with PCA. Incidents involving wildlife accessing garbage or attractants will be reported immediately to PCA.

11. Feeding, harassment or destruction of any wildlife is strictly prohibited. Wildlife encountered at or near Project locations will be allowed to passively disperse without undue harassment. Nuisance wildlife will be immediately reported to the PCA personnel and any incidents involving wildlife getting into garbage or attractants should be immediately reported.

Cultural Resources

1. For work in areas assessed as High risk to archaeology, the fence apron will be installed on the surface, with no trenching, thus avoiding ground excavation.
2. Work in areas assessed as Moderate and Negligible risk to archaeology will proceed according to normal practices with no special restrictions.
3. All cultural resources within BNP are protected under the *National Parks Act* and Regulations and are the property of PCA. All cultural resources found on the work site shall be reported to the ESO or the Departmental Representative immediately. The contractor and workers shall protect any articles found and request direction from the ESO or the Departmental Representative before work proceeds.

Visitor Experience

1. A traffic accommodation strategy or management plan shall be incorporated into the EPP to address contractor and public safety around the site.
2. Carpooling to the worksite shall be used whenever possible to reduce traffic volume.
3. Vehicles shall not be left idling when not in use to reduce vehicular emissions.
4. Work will be permitted from Monday to Saturday only. Work during nighttime hours will only be permitted if prior written approval is granted by the Departmental Representative.
5. No work will be permitted on Civic Holidays or long weekends unless prior written approval is granted by the Departmental Representative.
6. Road closures during peak traffic times will be avoided.
7. BNP Field Unit will be notified 1 month in advance of construction, with details on construction work areas and timing to enable communication to park visitors, local residents and stakeholders.





9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

9 a) Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:

No

Yes

9 b) Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

No

Yes

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

It is anticipated that should all mitigation measures discussed in this BIA be followed, there should be no significant adverse residual environmental effects as a result of the proposed project activities.

11. SURVEILLANCE

Surveillance is not required

Surveillance is required

Site inspection by PCA environmental staff in order to review appropriate use of mitigation will be sufficient given work activities and low risk.

12. FOLLOW-UP MONITORING

Follow-up monitoring is:

not required

legally required (e.g. under the *Species at Risk Act* or *Fisheries Act*)

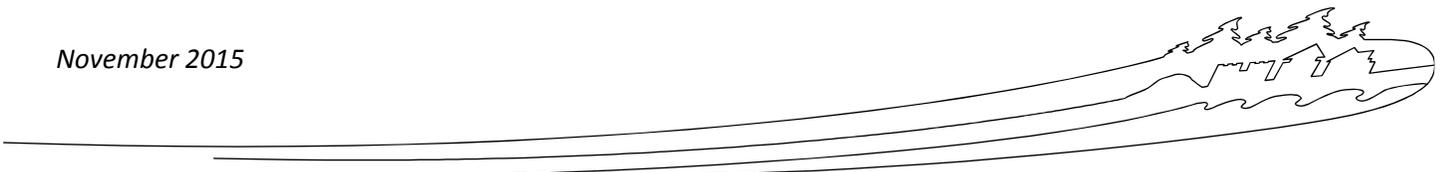
required in accordance with the *Parks Canada Cultural Resource Management Policy*

13. SARA NOTIFICATION

Notification is:

not required

required under the *Species at Risk Act*



**17. EXPERTS CONSULTED**

Include Parks Canada experts. Add as many entries as necessary for the project.

Department/Agency/Institution: Parks Canada Agency	Date of Request: 2015-02-27
Expert's Name: Tony Clevenger	Title: Consultant
Contact Information: apclevenger@gmail.com	
Expertise Requested: Tony reviewed the BIA to evaluate consistency with sound science and existing practice within the park.	
Response: Summarize the expert's response to the request (append correspondence as required and add to attachment list in Section 21).	
Dr. Clevenger had four primary comments on the BIA: <ul style="list-style-type: none"> - Noted that consultation with PC staff should be undertaken prior to construction to confirm presence of species of management concern; - Where the fence passes over creeks and waterbodies, ensure no gap between bottom of fence and water level during drier conditions; - Including language that expressly limits the amount of human activity (and storage of material) in proximity to crossing structures; and - Improve justification for recommended wildlife surveys. 	
The current version of the BIA has incorporates the last three concerns.	

Department/Agency/Institution: Parks Canada Agency	Date of Request: 2015-05-15
Expert's Name: Trevor Kinley	Title: Environmental Assessment Scientist
Contact Information: Highway Services Centre, Radium Hot Springs Trevor.Kinley@pc.gc.ca	
Expertise Requested: Local knowledge of Banff National Park wildlife, terrestrial, and cultural data	
Response: Incorporated into document.	

Department/Agency/Institution: Archaeology and History Branch, Heritage Conservation and Commemoration Directorate, Parks Canada	Date of Request: 2015-06-25
Expert's Name: E. Gwyn Langemann,	Title: Archaeologist
Expertise Requested: Historical Cultural Resources data available for Project area	
Response: Incorporated into document	

November 2015





15. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

- not likely to cause significant adverse environmental effects.
- likely to cause significant adverse environmental effects.

FOR SARA REQUIREMENTS:

- There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

OR, the SARA-Compliant Authorization Decision Tool ([Appendix 2](#)) was used and determined:

- There is no contravention of SARA prohibitions
- Project activities contravene a SARA prohibition and CAN be authorized under SARA
- Project activities contravene a SARA prohibition and CANNOT be authorized

16. RECOMMENDATION AND APPROVAL

<p>Prepared by: EIA Author: Jeff Matheson (M.Sc., R.P.Bio., P.Biol) Senior Biologist EIA Reviewers: Jason Jones (Ph.D., R.P.Bio., P.Biol.) Senior Ecologist Nigel Cavanagh (M.Sc., R.P.Bio., P.Biol.) Senior Fisheries Biologist</p>	<p>Date: 2015-11-26</p>
<p>Recommended by: Functional manager of the project (name):</p>	<p>Date:</p>
<p>Approved by: Name & position: (<i>Field Unit Superintendent, Director of a Waterway</i>):</p>	<p>Date:</p>
<p>Signature:</p>	





17. REFERENCE LIST

- Alberta Conservation Association. 2007. Status of the Limber Pine (*Pinus flexilis*) in Alberta. Prepared for: Alberta Sustainable Resource Development (SRD) and the Alberta Conservation Association (ACA). Alberta Wildlife Status Report No. 62. Publication No. T/140.
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18. ATTACHMENTS

Appendix 1 – Environmental Impact Analysis Tools: Effects Identification Matrix

Appendix 2 – SARA-Compliant Authorization Decision Tool

Appendix 3 – Preliminary Design Drawings

Appendix 4 – Summary of Ecosite Characteristics Present Along the TCH from Km 0 – Km 47

Appendix 5 – Vegetation Element Occurrences iithin 5 km of the TCH from Km 0 – Km 47

19. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

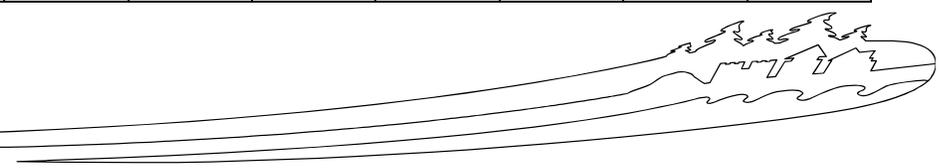
- Project registered in [tracking system](#)
- Not yet registered (*CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system **by the end of April** to enable reporting.*)





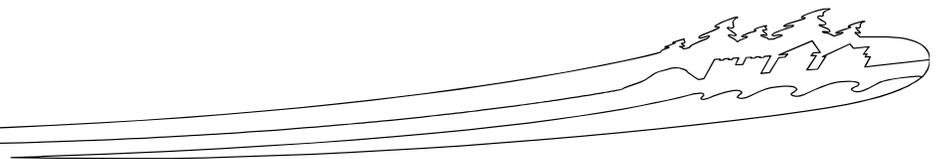
Appendix 1 - Environmental Impact Analysis Tools: Effects Identification Matrix

A. Direct Effects									
			Valued components potentially directly affected by the proposed project						
			Natural Resources				Cultural Resources		
			Air	Soil & landforms	Water (surface)	Flora (including SAR)	Fauna (including SAR)	Archaeological Sites	
Phase	Examples of Associated Activities								
Project Components	Preparation / Construction / Operation / Decommissioning	Supply and storage of materials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Burning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Clearing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Demolition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Disposal of waste	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Blasting/ Drilling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Dredging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Drainage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Excavation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Grading	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Backfilling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
		Use of machinery	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Transport of materials/ equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Building of fire breaks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of Chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Set up of temporary facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		





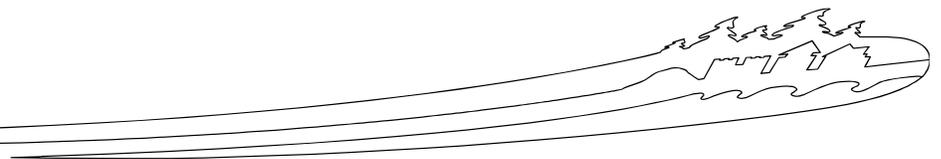
A. Direct effects continued									
			Valued components potentially affected by the proposed project						
			Natural Resources				Cultural Resources		
			Air	Soil & landforms	Water (surface)	Flora (including SAR)	Fauna (including SAR)	Archaeological Sites	
Phase	Examples of Associated Activities								
Project Components	Preparation / Construction / Operation / Decommissioning	Waste disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Wastewater disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use/Removal of temporary facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of Chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Active fire stage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Prescribed burn cleanup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Planting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Culling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Vehicle Traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





B. Indirect Effects (all phases)							
		Impacts as a result of changes to the environment					
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:			With respect to visitor experience	
		Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes	Access & services	Recreation & accommod'n opportunities	Safety
Phase	Natural resource components affected by the project						
Preparation /construction operation/implementation/decommissioning	Could impacts to <u>air</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>soils and landforms</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>water</u> (e.g. surface, ground water and water crossings) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>flora</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

November 2015





B. Indirect Effects (all phases)				
		Impacts as a result of changes to the environment		
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:	
		Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes
Phase	Natural resource components affected by the project			
All phases: Preparation /construction operation/implementation/decommissioning	Could impacts to <u>air</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>soils and landforms</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>water</u> (e.g., surface, ground water and water crossings) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>flora</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No indirect effects are anticipated.





Appendix 2: SARA-Compliant Authorization Decision Tool

- **This tool is for use when the BIA has determined that project activities will lead to residual adverse effects to THR, EN, or EX species at risk** (i.e. even after mitigation measures are applied, there are effects to individuals, residences or critical habitat of THR, EN or EX species at risk).
- This tool provides a structured process to determine if a SARA authorization is required, if it can be issued, and how to issue it.
- **Guidance for each question is provided within the form and should be deleted from the final version.**
- Consultation with a representative of the [Species Conservation and Management \(SCM\)](#) team is encouraged to help ensure consistent application of this tool.

Part A – Does a SARA authorization need to be considered for this activity?
1. Will the activity lead to residual adverse effects that contravene a SARA prohibition for a listed endangered (En), threatened (Th) or extirpated (Ex) species at risk, its residence or its critical habitat? (Clearly indicate if the activity will affect one/or more listed species).
SARA prohibitions: s.32 - Cannot: kill, harm, harass, capture, or take individuals; possess, collect, buy, sell or trade individuals or parts of individuals; s.33 – Cannot damage or destroy residences; s.58 – Cannot destroy any part of critical habitat; s.80 - Cannot carry out an activity that is prohibited under a protection order.
<input type="checkbox"/> Yes. Residual adverse effects of the activity will contravene a SARA prohibition. Document how activities will contravene a SARA prohibition. Then continue to Question 2.
2. Is the activity authorized under S. 83 of SARA?
<input type="checkbox"/> Yes. A SARA authorization is NOT required. The activity is authorized in a recovery strategy or action plan; OR <input type="checkbox"/> Yes. A SARA authorization is NOT required. The activity is required for public safety, health or national security AND authorized by or under another Act of Parliament. <u>Document below:</u> <ul style="list-style-type: none">• The specific section of the published recovery strategy or action plan that makes reference to section 83 of SARA OR <ul style="list-style-type: none">• Why the activity is needed for public safety, health or national security and reference the Act of Parliament under which the activity is authorized (<i>you MUST consult a member of the SCM team if you plan to use the section 83 exception</i>). If all activities that would contravene a SARA prohibition are already authorized under SARA s.83, check the first box in Part D and submit for approval.
<input type="checkbox"/> No. A SARA authorization is required. Continue to Part B.





Part B – Is the activity eligible for authorization under SARA?

****Complete ONLY if you have answered NO to Question 2, above****

3. Does the activity fall into one of the following three categories?

Select the appropriate box (check only one) and **continue to Question 4** OR, If the proposed activity DOES NOT fit in any of the three categories below the activity CANNOT be authorized, and you can check the second box in **Part D** and **submit for approval**.

- The activity is scientific research related to the conservation of the species and conducted by qualified persons; **OR**
- The activity benefits the species or is required to enhance its chance of survival in the wild ; **OR**
- Affecting the species is incidental to the activity (i.e. the purpose of the activity is not to engage in an activity that is prohibited under SARA (e.g., kill, harm, harass...an individual; destroy a residence or critical habitat). For example, fishing for a listed species cannot be permitted, but accidental by-catch *may* be.

4. Alternatives that would reduce the impact(s) on the species have been considered and the best solution adopted

Document below and **continue to Question 5**. *This question is an additional requirement to the questions in the BIA template.*

- Identify and explain all reasonable alternatives considered to reduce the impact(s) on the species (alternatives to the project and alternative means of carrying out the project, including a “no action” alternative).
- This explanation must demonstrate that the best solution has been adopted.

5. All feasible measures must be taken to minimize the impact of the activity

Ensure that the mitigations identified in Section 8 of the BIA template to address effects to species at risk are as comprehensive as possible, and continue to **Question 6**.

6. Will the activity jeopardize the survival or recovery of the species?

Document here your analysis of whether the activity will jeopardize survival or recovery of the species. The analysis must consider and refer to relevant SARA recovery documents (e.g. COSEWIC status reports, recovery strategies, action plans), and/or Parks Canada Detailed Assessments for the species, if available. In particular, refer to the population and distribution objectives, the threats to the species, and the identification of critical habitat (including the location, amount - if available, biophysical attributes, and the activities likely to destroy).

NOTE: *If the BIA determines there are no alternatives or mitigation measures that can prevent destruction of critical habitat or non-compliance with a protection order, you **MUST** consult a member of the [SCM team](#) for further advice.*

- Yes. The activity CANNOT be authorized.**

Check analysis with the [SCM team](#). Then check the second box in Part D and submit for approval. **ENSURE THIS CONCLUSION IS TAKEN INTO CONSIDERATION IN SECTION 10 OF THE BIA TEMPLATE (SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS) AND DOCUMENTED IN THE BIA TEMPLATE, SECTION 15 – DECISION.**

- No. The activity CAN be authorized.** Complete explanation and continue to **Part C**.





Clearly document how you considered potential jeopardy to the survival or recovery of the species. Check analysis with the [SCM team](#).

Part C - Prepare the SARA authorization and posting explanation

7. Prepare the authorization

The authorization will be issued using the EIA process and SARA s.74

Issue the SARA authorization using the [template on the intranet](#) and complete Question 8 to prepare the posting for the [SAR Public Registry](#).

8. Provide description for posting

SARA requires that an explanation of why a SARA authorization is issued be posted in the SARA Public Registry in both official languages within 30 days of the authorization being issued. Prepare the explanation, using the information you entered in the BIA and previous sections of this Appendix. Your regional SCM representative will have the explanation translated and will publish it on the SARA registry.

Regional or Local Number:

Provide the authorization number issued by Parks Canada (in this instance, the file number of the EIA)

Purpose – *select the answer indicated in Section 3 of this Appendix:*

- Affecting the species is incidental to the activity; OR
- The activity is necessary or beneficial to the species, OR
- The activity is scientific research related to the conservation of the species and conducted by qualified persons

Description of the Activity

Provide a one-paragraph summary of the activity and how it will affect the listed species (using the information in sections 5 & 10 of the BIA template)

- Start Date of Authorization: XXX End Date of Authorization: XXX
- Issuing Authority: Parks Canada Agency
- Authority Used: *(see section 7 of this Appendix)*
- Location of Activity *(province, territory or ocean):* XXX
- Affected Species: *Limit your list to potentially affected species that are listed under SARA as Extirpated, Endangered or Threatened*

Pre-Conditions - *limit your explanation to species for which the authorization will be issued:*

Provide a half-page summary of proposed mitigation measures and the significance of residual effects (from the BIA) and provide summary of sections 4, 5 and 6 of this Appendix.

Contact Person(s)

Provide name and coordinates of a PCA contact.





Part D – SARA Authorization Decision

Select the appropriate answer and continue to Part E.

- This activity does not require a SARA authorization, as indicated in Questions 1 and 2.
- This activity requires a SARA authorization but CANNOT be authorized because it does not fit into one of the three required categories (see response to Question 3) OR it does not meet one of the SARA pre-conditions (see responses to Questions 4-6).

This activity meets the SARA authorization requirements; an authorization may be issued (see response to Questions 3-6). The residual adverse effects (effects remaining after mitigations have been applied) MAY contravene the following SARA prohibition:

- s.32 - Cannot: kill, harm, harass, capture, or take individuals; possess, collect, buy, sell or trade individuals or parts of individuals;
- s.33 – Cannot damage or destroy residences;
- s.58 – Cannot destroy any part of critical habitat;
- s.80 - Cannot carry out an activity that is prohibited under a protection order

Part E – SARA Authorization Recommendation and Approval

Prepared by (add additional blocks as required):

Name & Position of Author(s), Collaborator(s), Reviewer(s):

Date: YYYY-MM-DD

Recommended by:

Name & Position:

Date: YYYY-MM-DD

Decision Approval

Name & Position (*FUS/Director of a Waterway, or Delegate*):

Signature:

Date: YYYY-MM-DD





McElhanney

for / pour



Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord Région

WILDLIFE FENCING REALIGNMENT AND REPAIRS

TRANS CANADA HIGHWAY BANFF NATIONAL PARK, AB

PRELIMINARY DESIGN

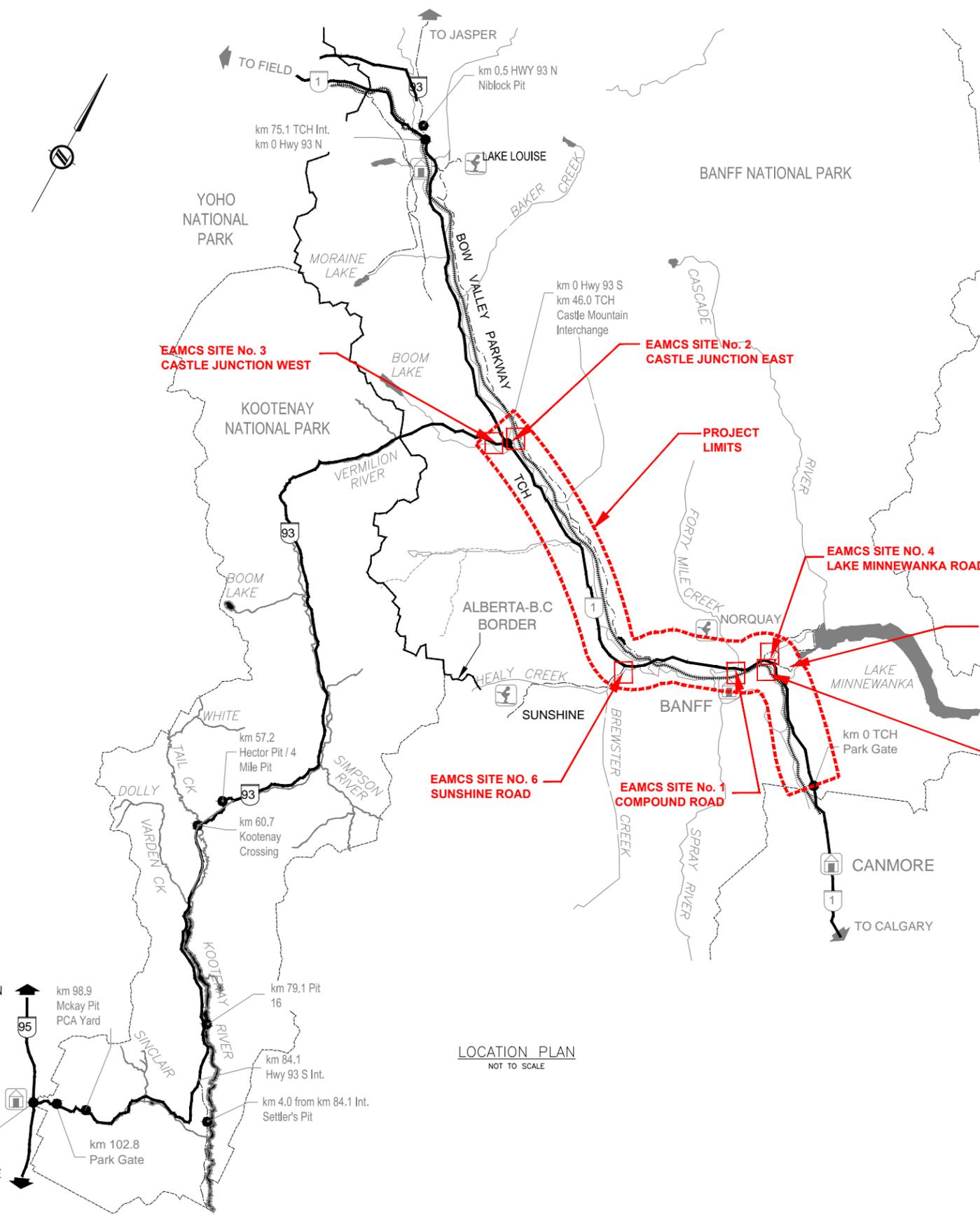
PROJECT No. 201524

NOVEMBER 20, 2015

C01

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LEGEND

EXISTING	PROPOSED
WOOD POST FENCE ALIGNMENT	—————
STEEL POST FENCE ALIGNMENT	—————
EXCAVATION AND RIP RAP PLACEMENT	—————
OPTIONAL CPR FENCING ALIGNMENT	—————
WILDERNESS ZONE BOUNDARY	—————
LEGACY TRAIL BICYCLE PATH	—————
RETAINING WALL	—————
DOUBLE SWING GATE	⊗
PEDESTRIAN GATE	□
JUMPOUT IN WOOD FENCE	▽
ELECTRIFIED WILDLIFE MITIGATION SYSTEM	○
TEXAS GATE	■
ARCHAEOLOGICAL CONCERNS - NEGLIGIBLE PROJECT RISK	▨
ARCHAEOLOGICAL CONCERNS - MODERATE PROJECT RISK	▩
ARCHAEOLOGICAL CONCERNS - HIGH PROJECT RISK	▧
VEMC* POTENTIAL - NEGLIGIBLE PROJECT RISK	▭
VEMC* POTENTIAL - LOW PROJECT RISK	▭
VEMC* POTENTIAL - MODERATE PROJECT RISK	▭
VEMC* POTENTIAL - HIGH PROJECT RISK	▭

NOTES:

- *VEMC = VEGETATION ELEMENTS OF MANAGEMENT CONCERN
- THE ARCHAEOLOGICAL SITES IN THESE DRAWINGS ARE SHOWN AS OFFSET FROM THE PROPOSED AND EXISTING FENCING. ACTUAL LOCATIONS OF IDENTIFIED ARCHAEOLOGICAL SITES SHOULD BE INTERPRETED AS UNDER THE EXISTING AND PROPOSED FENCING.

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A	B	C
A	A	A
C	B	C

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Eng. Stamp / Scellé de l'ingénieur

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Parks Canada Agency Western and Northern Region / L'Agence Parcs Canada Ouest et Nord Région

Consultant's Name / Nom de l'expert-conseil
McElhanney

Project title/Titre du projet
TRANS CANADA HIGHWAY WILDLIFE FENCING REALIGNMENT AND REPAIRS
BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin
LOCATION PLAN AND DRAWING INDEX

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

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Project No./No. du projet	Asset No./No. du-bien	Sheet No./No. de la feuille
201524		C02
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

DRAWING INDEX

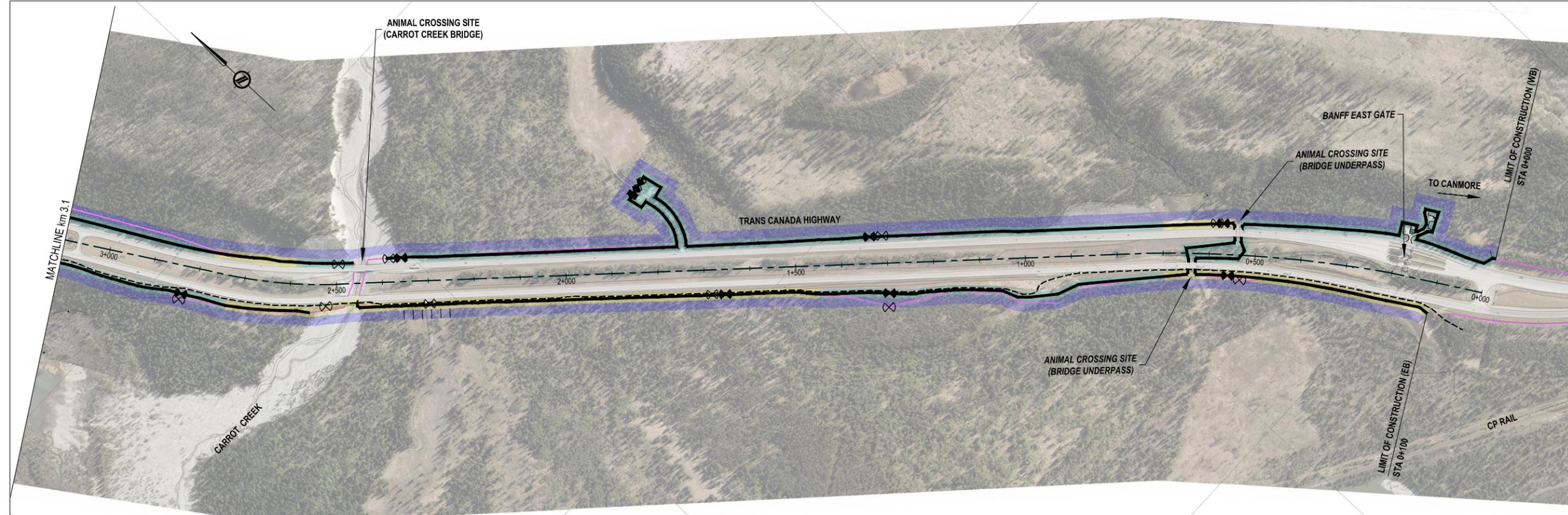
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C02	LOCATION PLAN AND DRAWING INDEX
F01 - F08	FENCING ARRANGEMENT PLAN
D01	WILDLIFE FENCE DETAILS
D02	BRACE SYSTEM DETAILS
D03	WILDLIFE FENCE POST DETAILS
D04	WILDLIFE FENCE PEDESTRIAN GATE DETAILS
D05	WILDLIFE JUMPOUT DETAILS
EM01	EAMCS SITE No. 1 - COMPOUND ROAD
EM02	EAMCS SITE No. 2 - CASTLE JUNCTION EAST
EM03	EAMCS SITE No. 3 - CASTLE JUNCTION WEST
EM04	EAMCS SITE No. 4 - LAKE MINNEWANKA ROAD
EM05	EAMCS SITE No. 5 - BANFF AVENUE
EM06	EAMCS SITE No. 6 - SUNSHINE ROAD
W01	FENCE ALIGNMENT DETAIL - km 8.14 (NORTH)
W02	WILDLIFE FENCE ALIGNMENT DETAIL - km 8.07 (SOUTH)
W03	WILDLIFE FENCE ALIGNMENT DETAIL - km 16.6 (NORTH)

LOCATION PLAN
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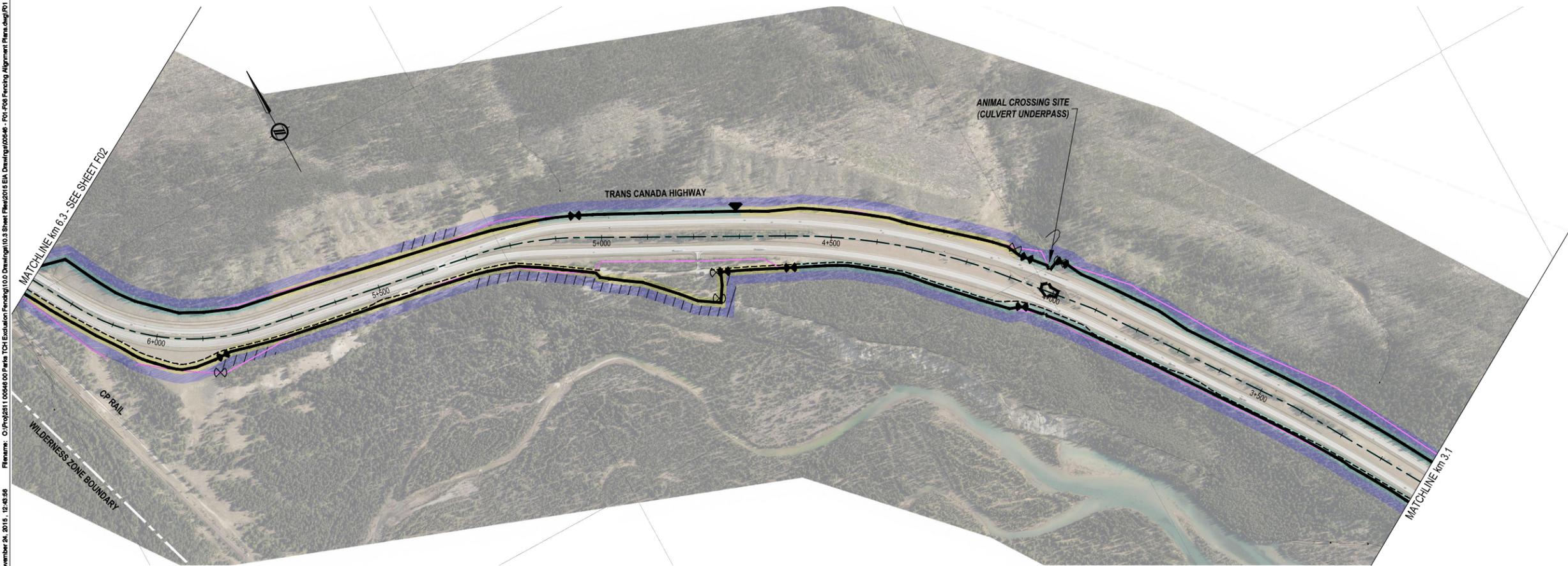
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FENCING ALIGNMENT km 0.0 TO km 3.1
SCALE 1:5000



FENCING ALIGNMENT km 3.1 TO km 6.3
SCALE 1:5000

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Western and Northern Region

L'Agence Parcs Canada
Ouest et Nord Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**FENCING ARRANGEMENT PLAN
TRANS CANADA HIGHWAY
km 0.0 TO km 6.3**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
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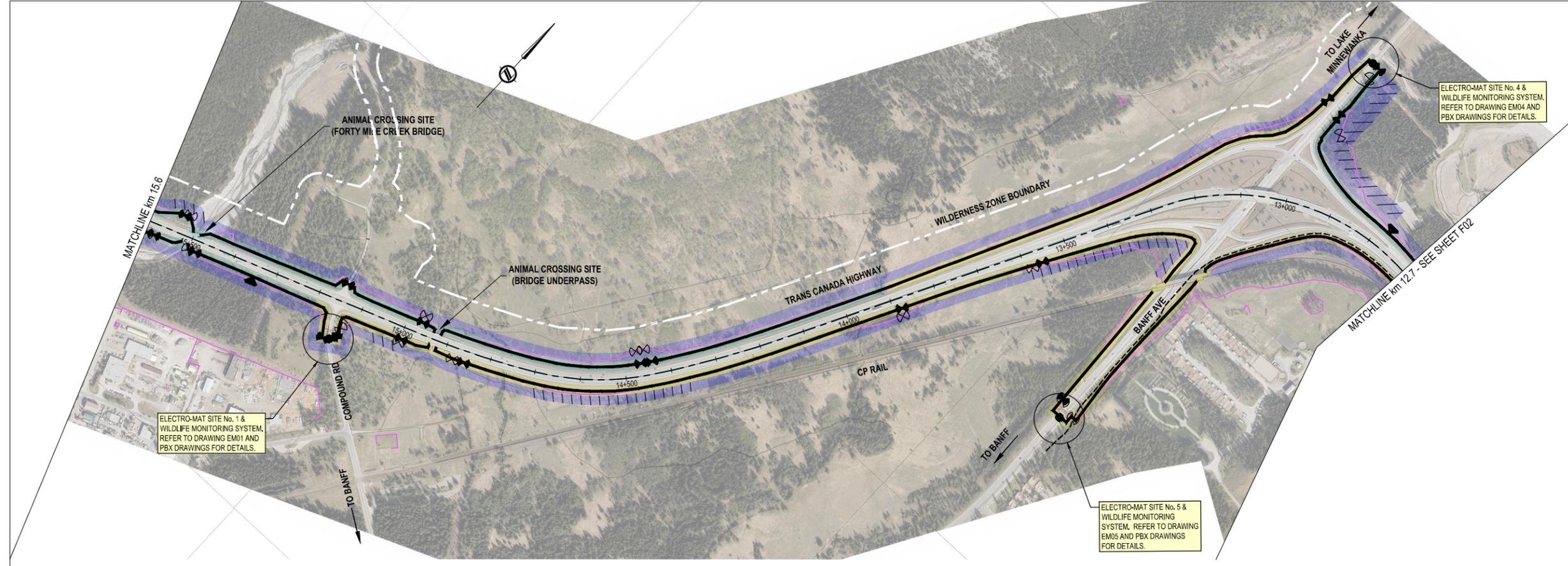
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201524		F01
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

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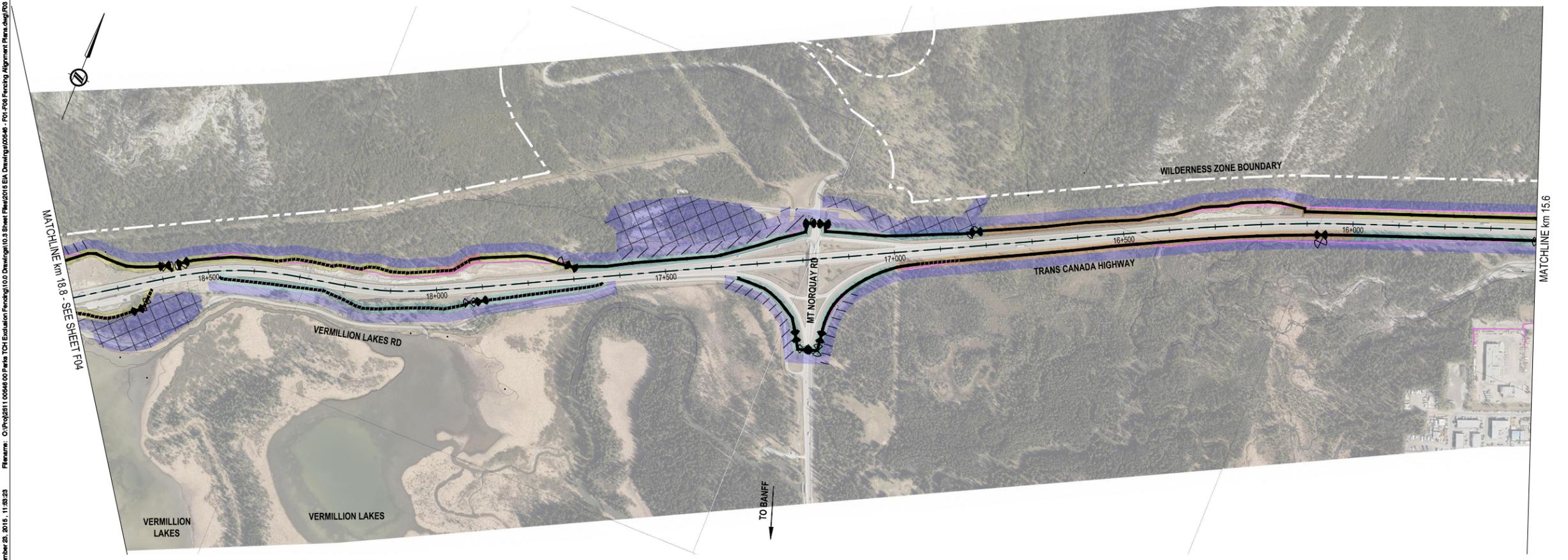
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November 25, 2015 - 11:58:23
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 Plot: F03 Fencing Alignment Plans.dwg\F03



FENCING ALIGNMENT km 12.7 TO km 15.6
SCALE 1:5000



FENCING ALIGNMENT km 15.6 TO km 18.8
SCALE 1:5000

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Client / client
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 Agence Western and Northern Region
 L'Agence Parcs Canada /
 Ouest et Nord Région

Consultant's Name /
 Nom de l'expert-conseil

Project title / titre du projet
**TRANS CANADA HIGHWAY
 WILDLIFE FENCING
 REALIGNMENT AND REPAIRS**
 BANFF NATIONAL PARK, AB

Drawing title / titre du dessin
**FENCING ARRANGEMENT PLAN
 TRANS CANADA HIGHWAY
 km 12.7 TO km 18.8**

Surveyed by / Arpenté par	Drawn by / Dessiné par	Date/Date
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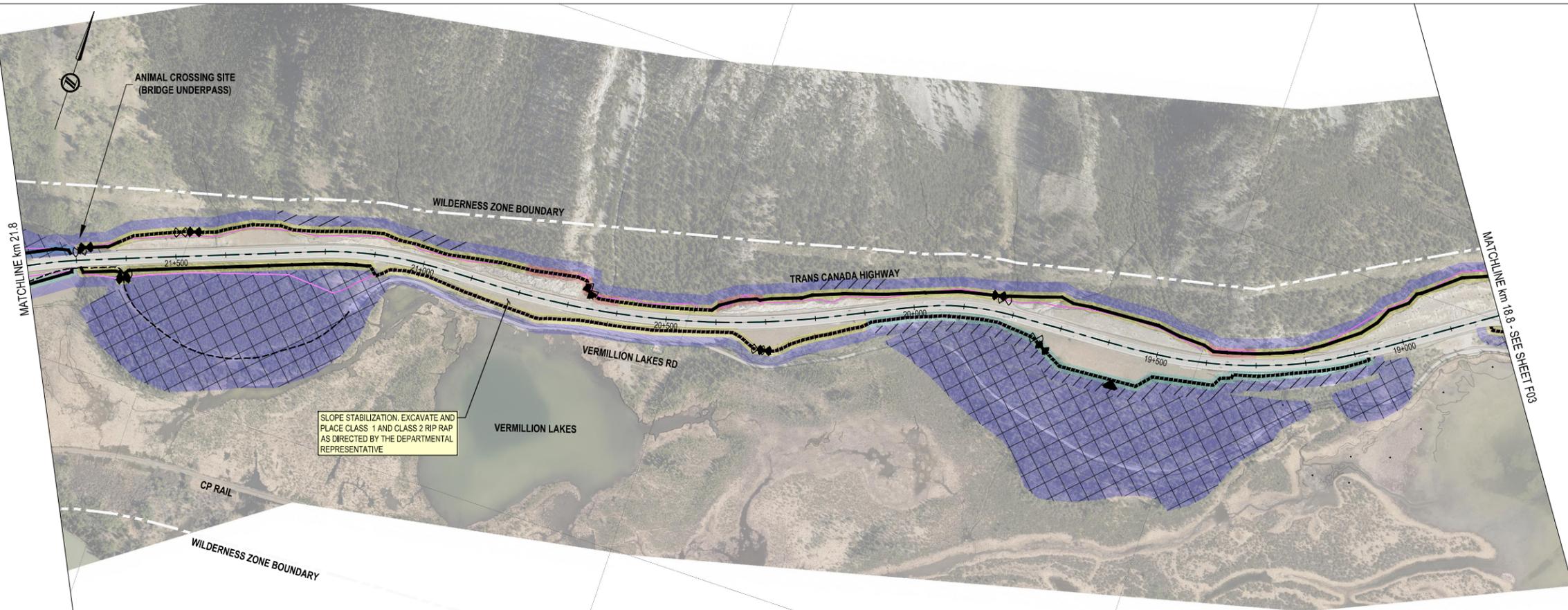
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Drawing Reference No. / No. de référence du dessin		
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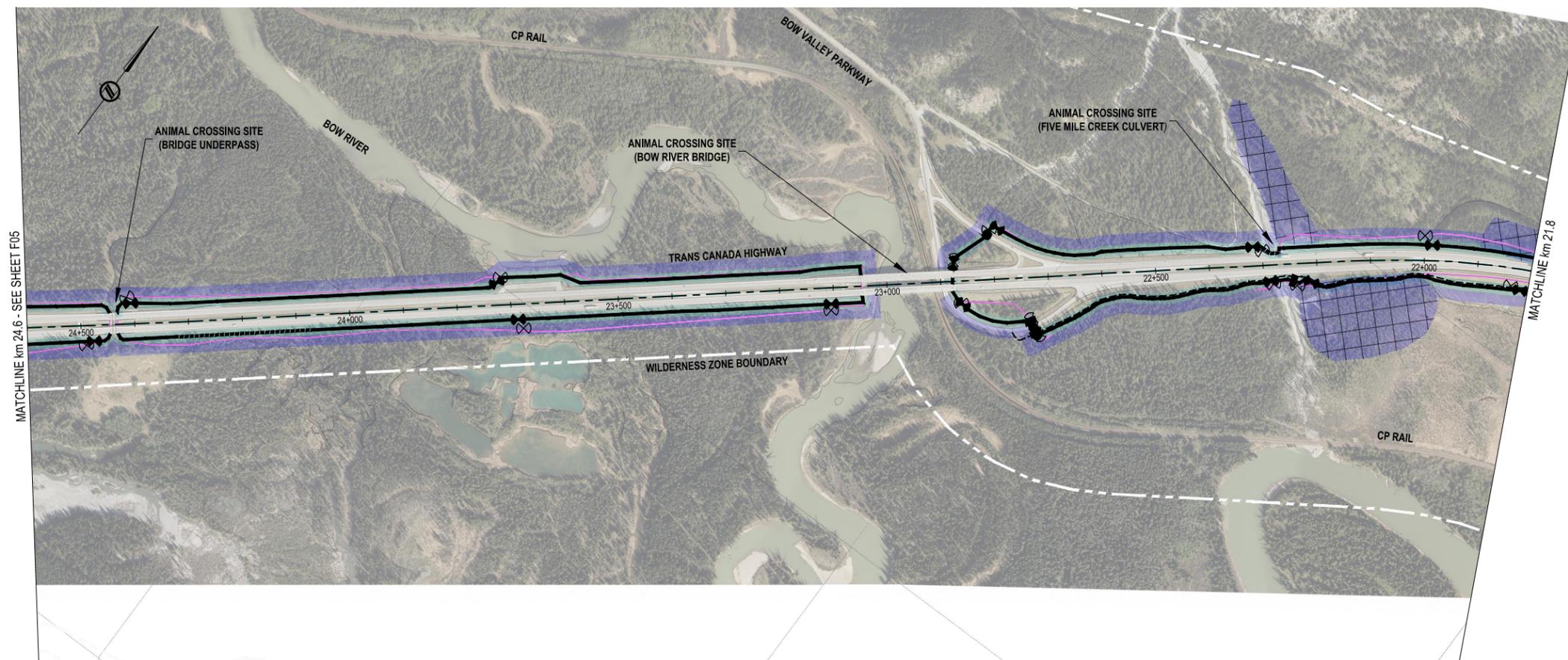
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FENCING ALIGNMENT km 18.8 TO km 21.8
SCALE 1:5000



FENCING ALIGNMENT km 21.8 TO km 24.6
SCALE 1:5000

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Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name /
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**FENCING ARRANGEMENT PLAN
TRANS CANADA HIGHWAY
km 18.8 TO km 24.6**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client

Approved by/Approuvé par

Parks Canada Responsible Officer/Responsable des Projets Parcs Canada

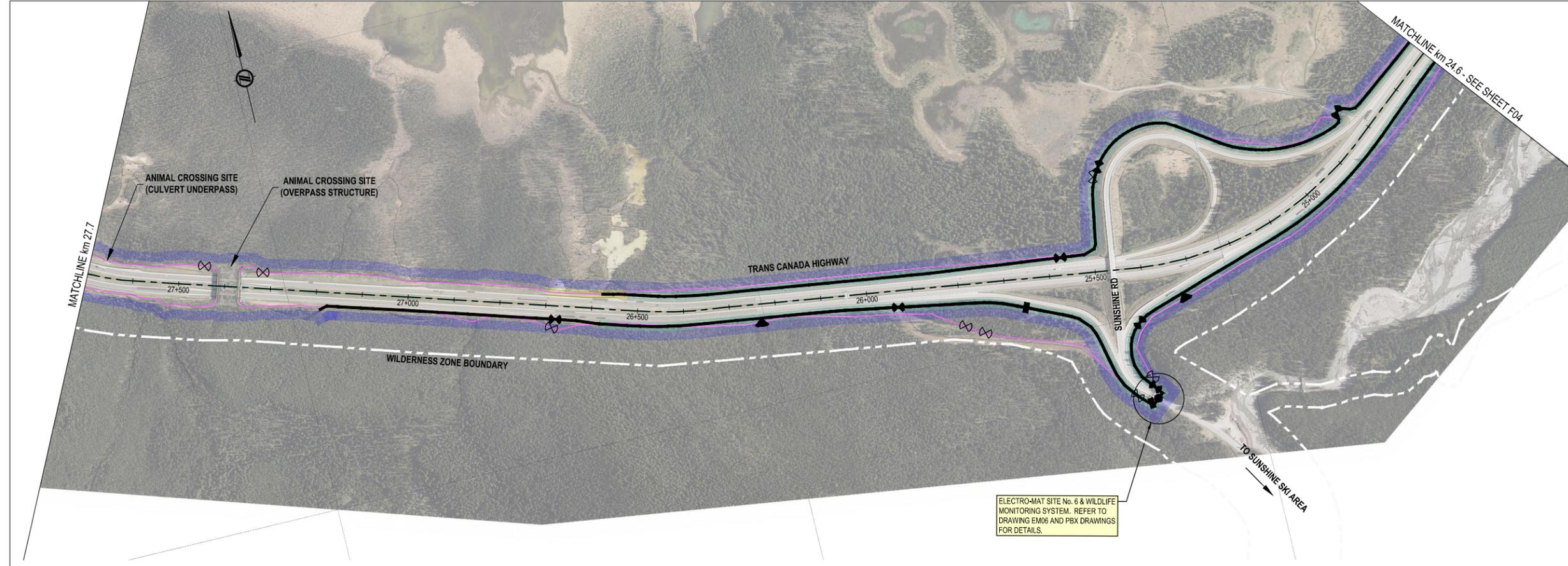
Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Project No./No. du projet	Asset No./No. de bien	Sheet No./No. de la feuille
201524		F04
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

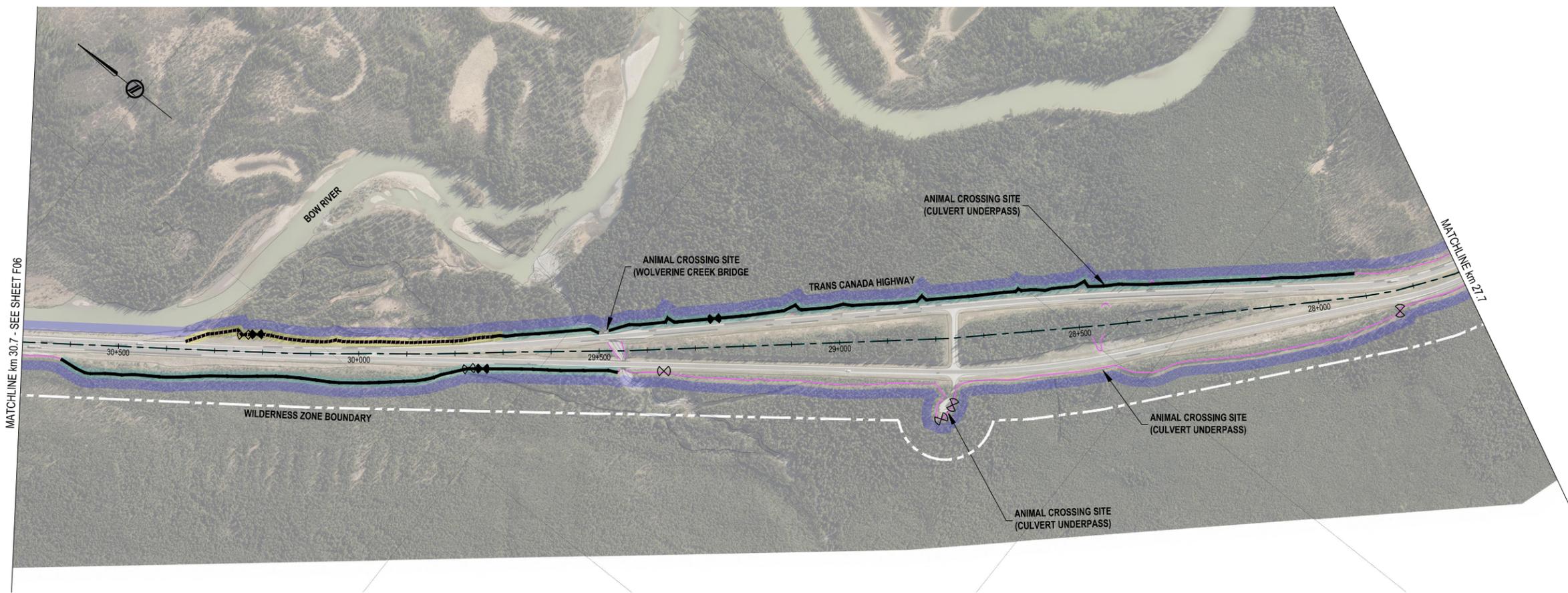
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 Plotted:

NOT FOR CONSTRUCTION

HALF SIZE



FENCING ALIGNMENT km 24.6 TO km 27.7
SCALE 1:5000



FENCING ALIGNMENT km 27.7 TO km 30.7
SCALE 1:5000

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B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF
No.	Date/Date	Description/Description	Drawn by Dessiné par	Approved Approuvé

Revision / Revision	
A	detail number numéro de détail
B	source drawing no. de dessin no.
C	detail on drawing no. détail sur dessin no.

Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**FENCING ARRANGEMENT PLAN
TRANS CANADA HIGHWAY
km 24.6 TO km 30.7**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client	Approved by/Approuvé par	
Project No./No. du projet	Asset No./No. de bien	Sheet No./ No. de la feuille
201524		F05
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

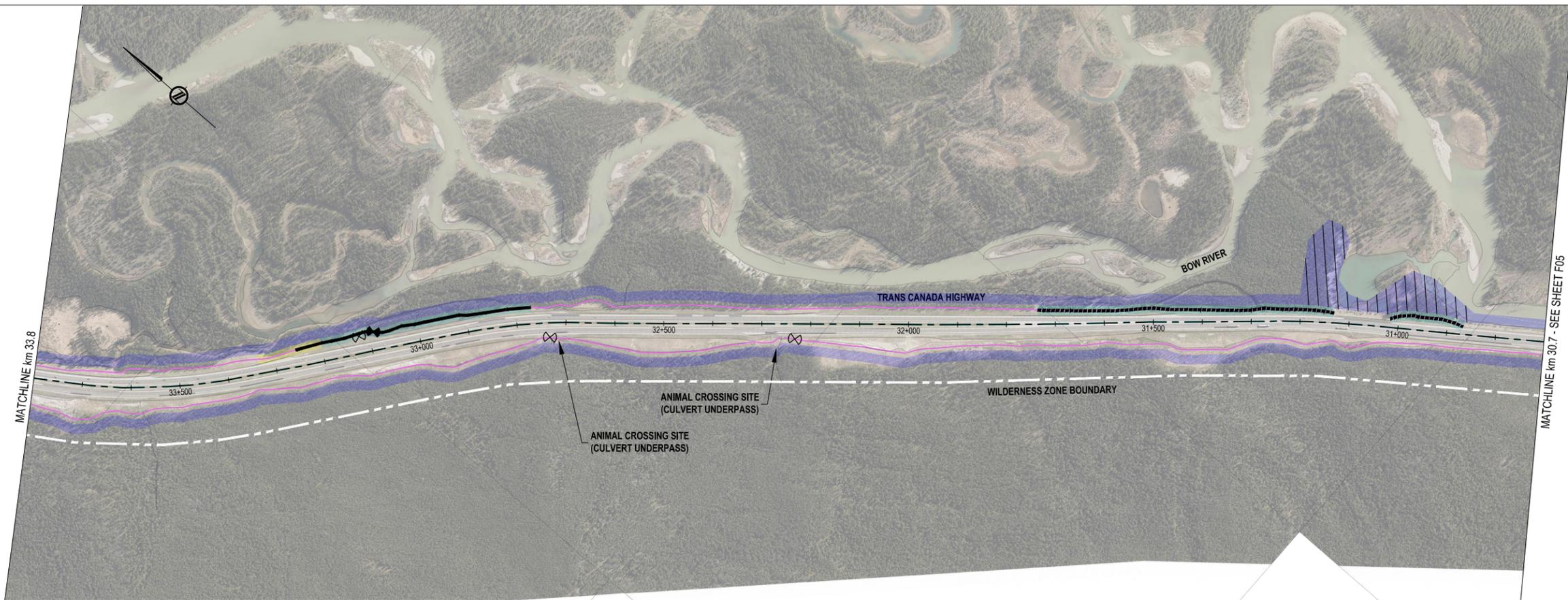
November 21, 2015 - 08:00:28
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NOT FOR CONSTRUCTION

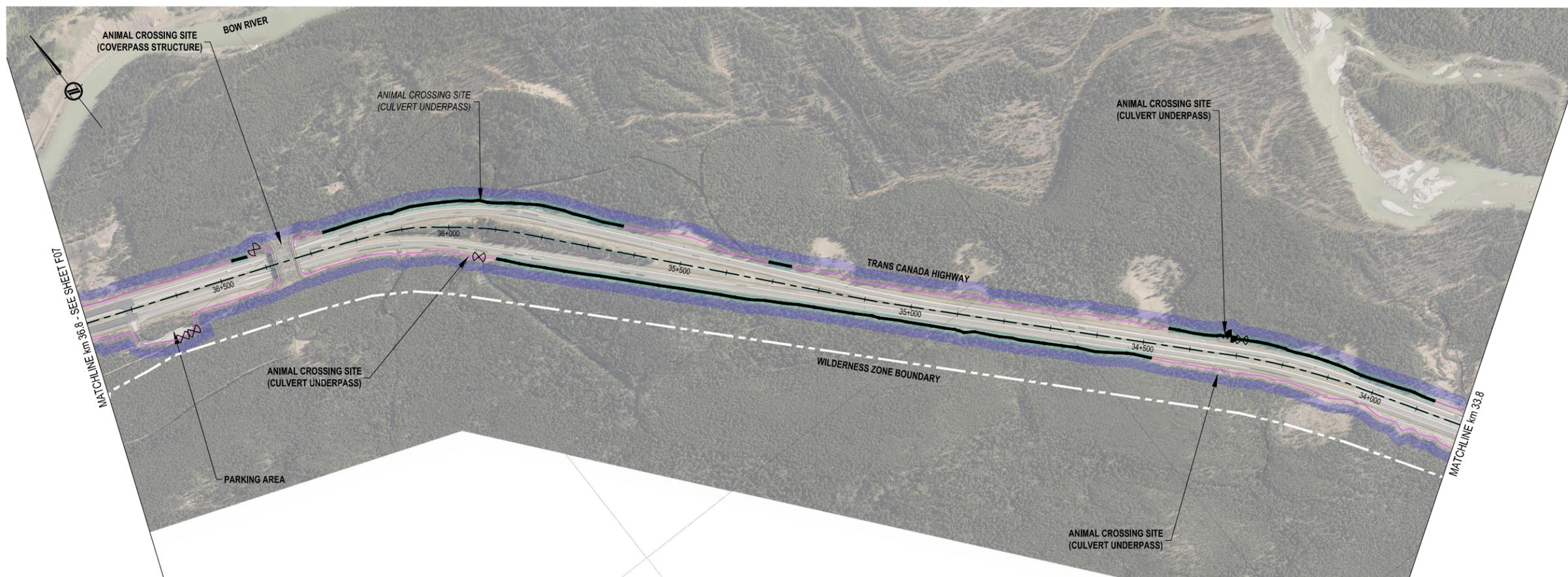
HALF SIZE

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FENCING ALIGNMENT km 30.7 TO km 33.8
SCALE 1:5000



FENCING ALIGNMENT km 33.8 TO km 36.8
SCALE 1:5000

No.	Date/Date	Description/Description	Drawn by/Dessiné par	Approved/Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Révision	
A	detail number / numéro de détail
B	source drawing no. / de dessin no.
C	detail on drawing no. / détail sur dessin no.

Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**FENCING ARRANGEMENT PLAN
TRANS CANADA HIGHWAY
km 30.7 TO km 36.8**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client	Approved by/Approuvé par	
Project No./No. du projet	Asset No./No. de bien	Sheet No./No. de la feuille
201524		F06
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

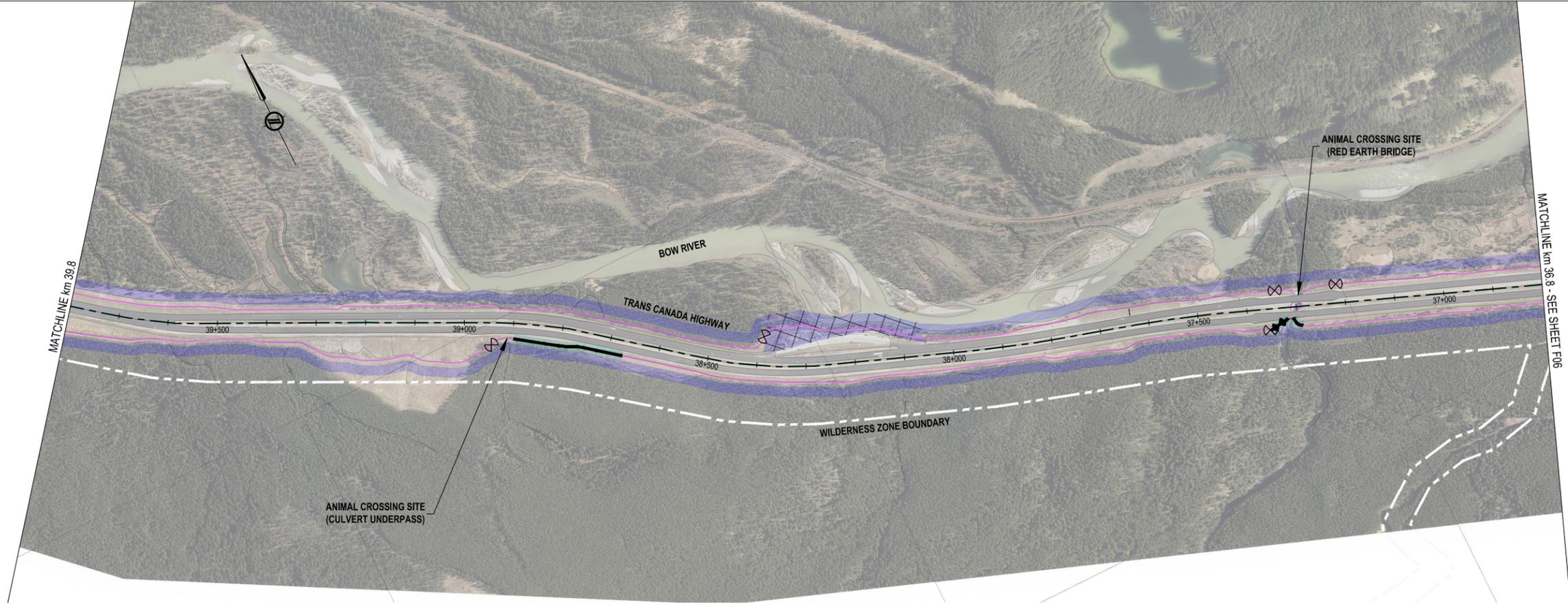
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NOT FOR CONSTRUCTION

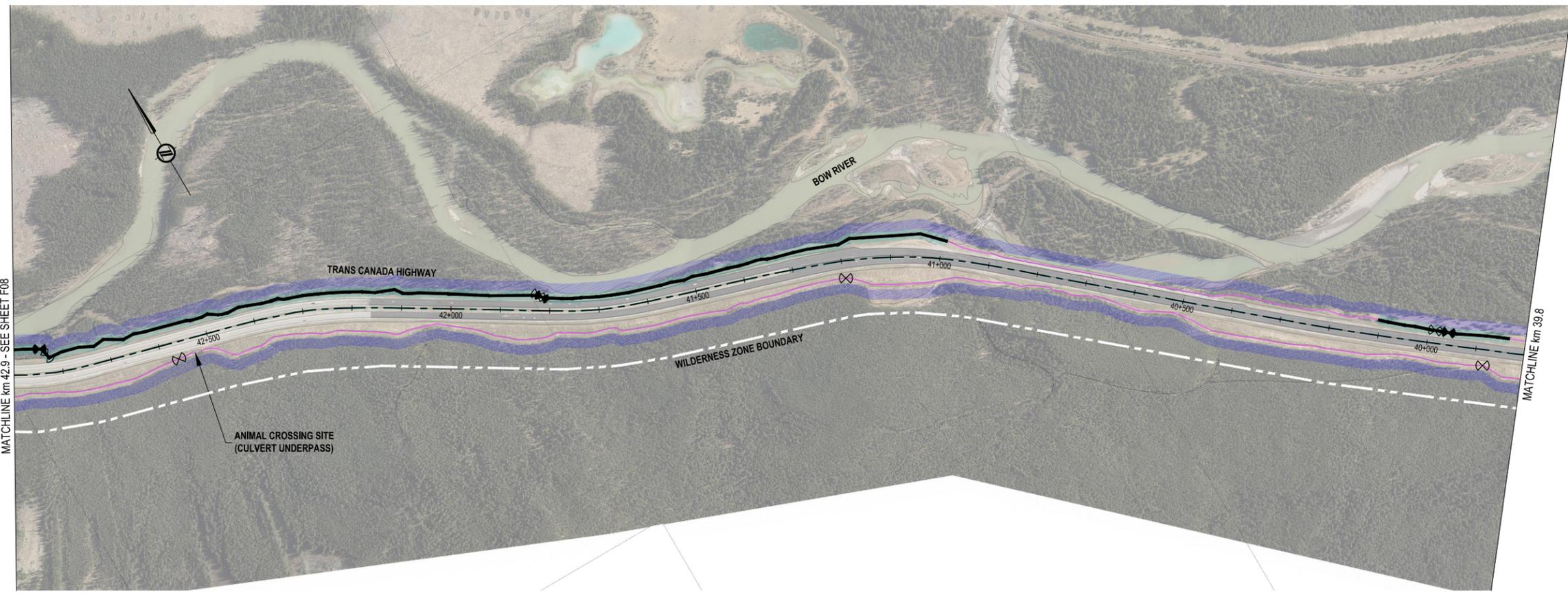
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FENCING ALIGNMENT km 36.8 TO km 39.8
SCALE 1:5000



FENCING ALIGNMENT km 39.8 TO km 42.9
SCALE 1:5000

No.	Date/Date	Description/Description	Drawn by/Dessiné par	Approved/Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Révision	
A	detail number / numéro de détail
B	source drawing no. / de dessin no.
C	detail on drawing no. / détail sur dessin no.

Consultant's Stamp /
Sceau de l'expert-conseil

Eng. Stamp /
Sceau de l'ingénieur

Client/Client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name /
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**FENCING ARRANGEMENT PLAN
TRANS CANADA HIGHWAY
km 36.8 TO km 42.9**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client

Approved by/Approuvé par

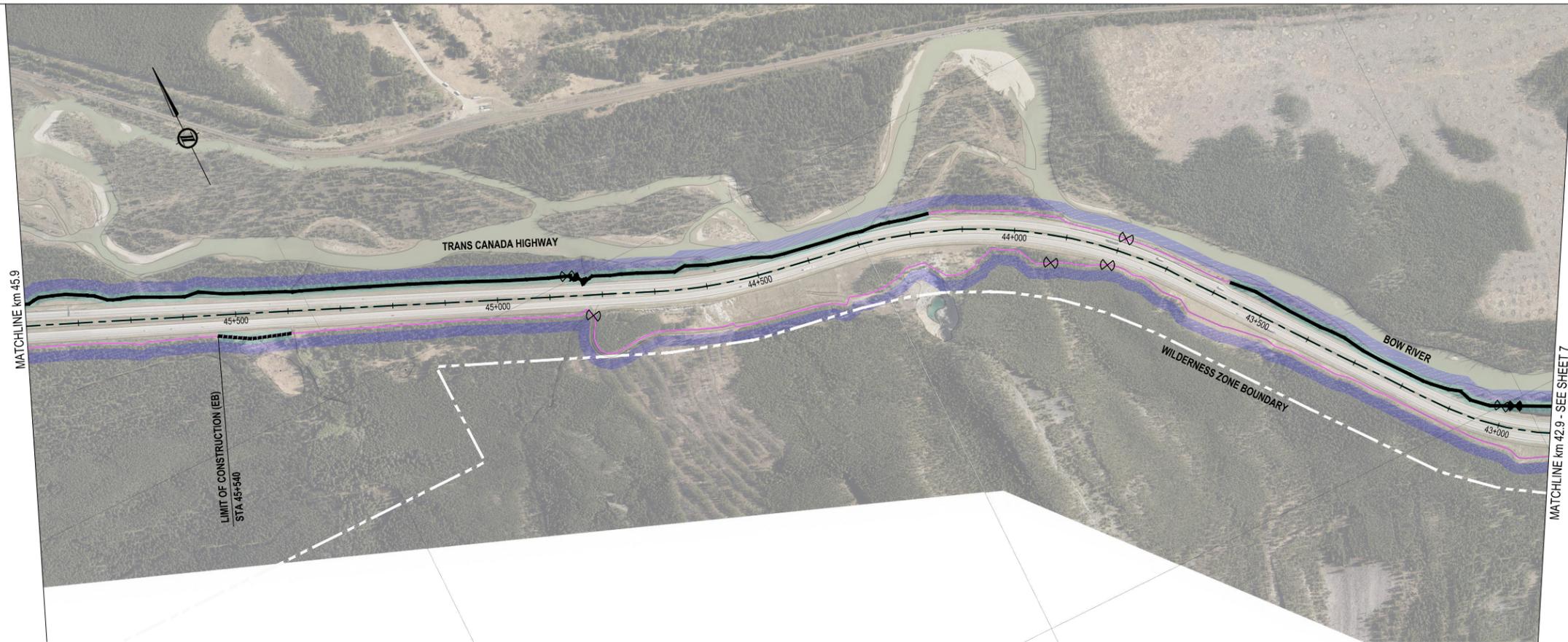
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201524		F07
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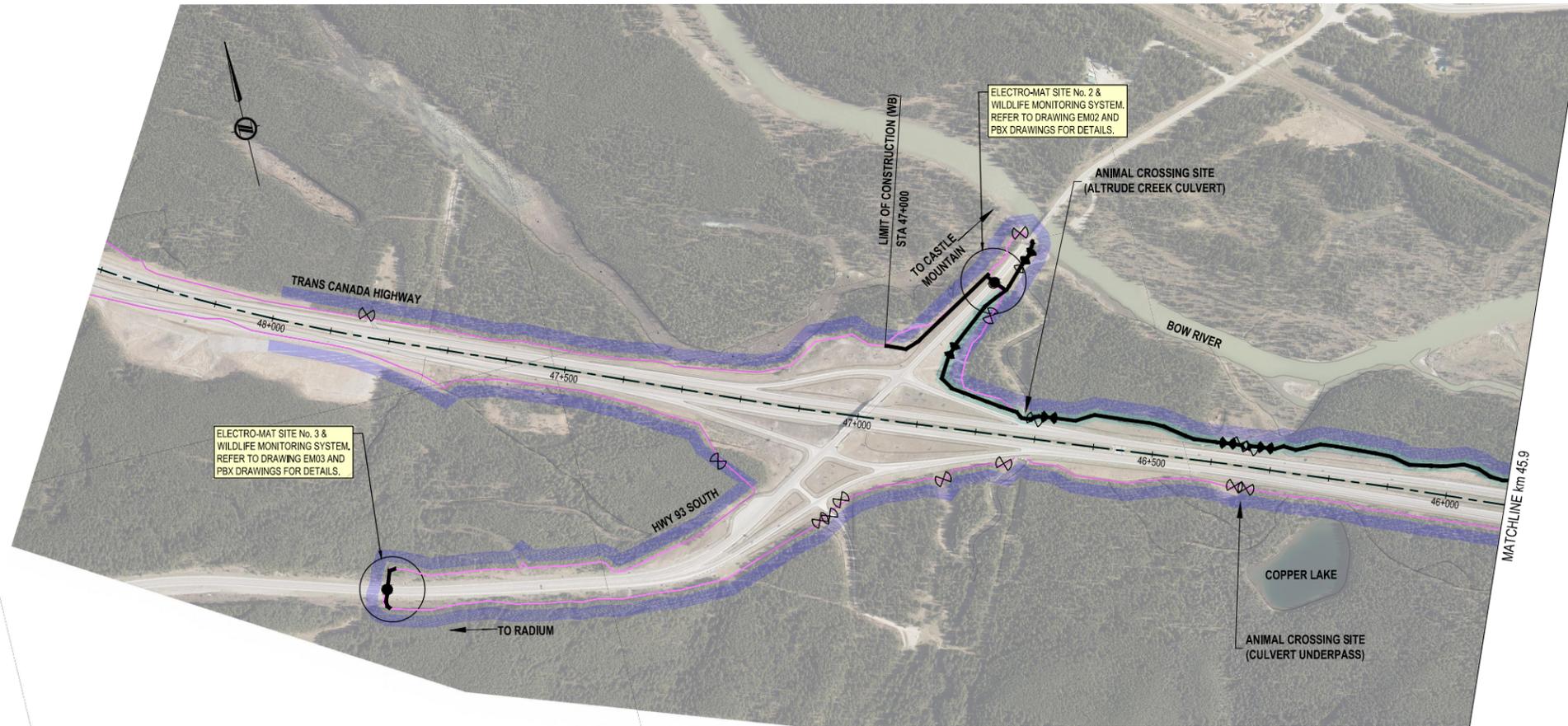
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HALF SIZE

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FENCING ALIGNMENT km 42.9 TO km 45.9
SCALE 1:5000



FENCING ALIGNMENT km 45.9 TO km 47.0
SCALE 1:5000

NOT FOR CONSTRUCTION

HALF SIZE

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No.	Date/Date	Description/Description	Drawn by Dessiné par	Approved Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Revision	
A	A detail number numéro de détail
B	B source drawing no. de dessin no.
C	C detail on drawing no. détail sur dessin no.

Consultant's Stamp Sceau de l'expert-conseil	Eng. Stamp Sceau de l'ingénieur
---	------------------------------------

Client/client	Parks Canada Agence Western and Northern Region	L'Agence Parcs Canada Ouest et Nord Région
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Consultant's Name
Nom de l'expert-conseil



Project title/Titre du projet
**TRANS CANADA HIGHWAY
 WILDLIFE FENCING
 REALIGNMENT AND REPAIRS**
 BANFF NATIONAL PARK, AB

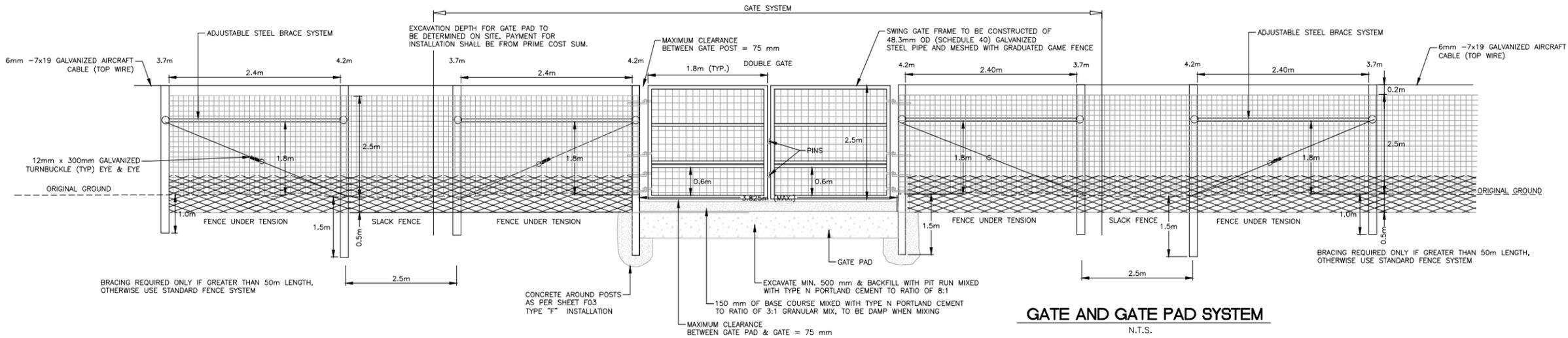
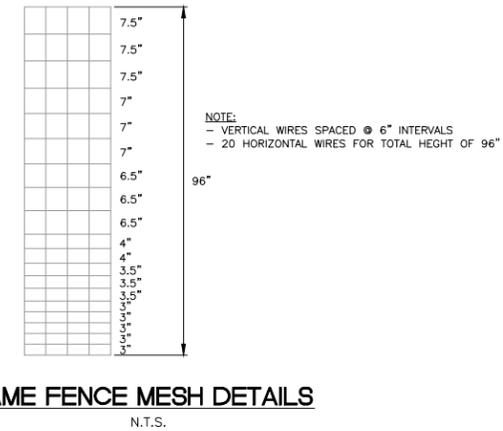
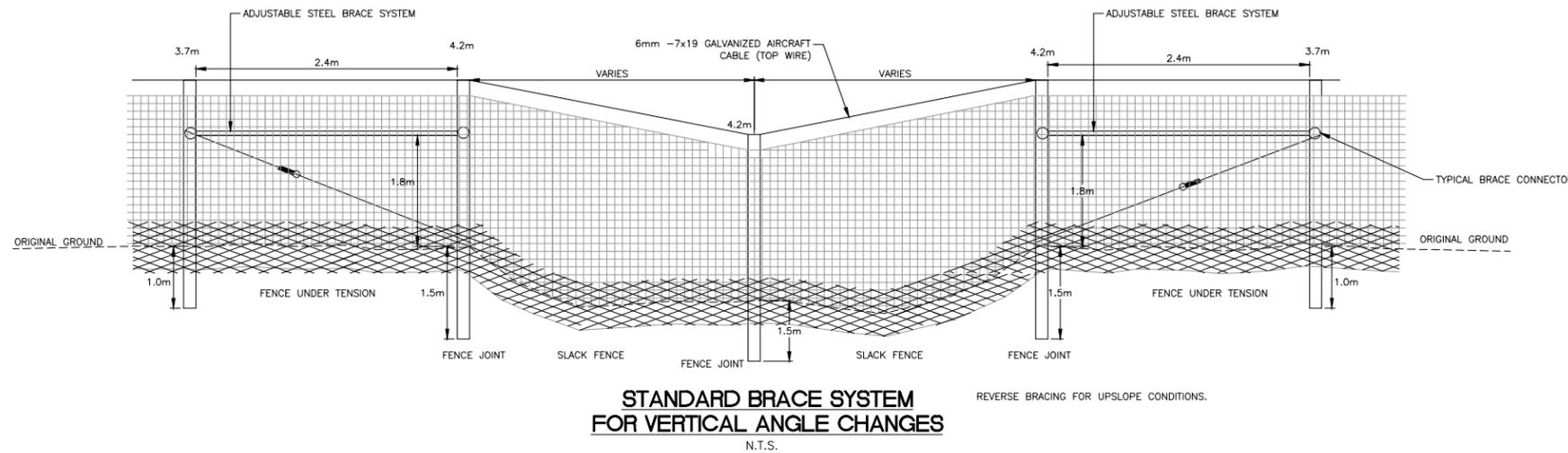
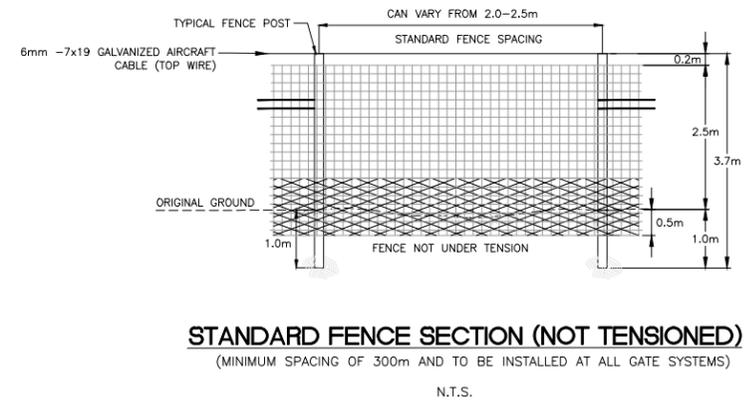
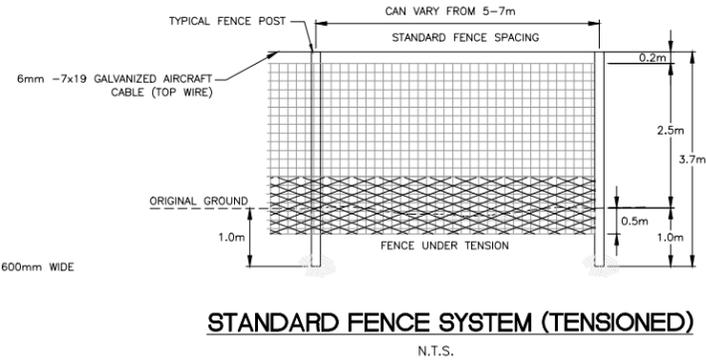
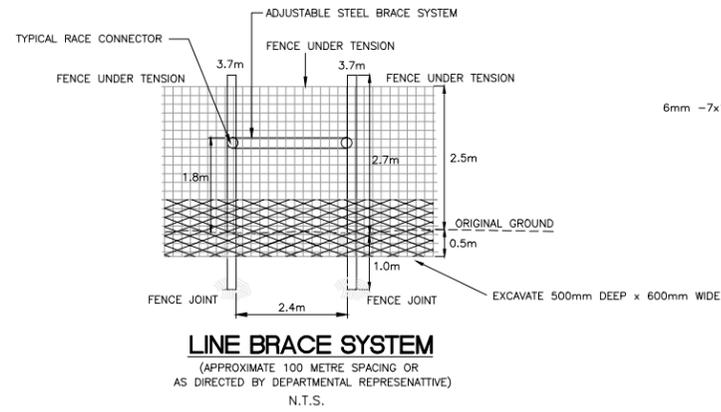
Drawing title/Titre du dessin
**FENCING ARRANGEMENT PLAN
 TRANS CANADA HIGHWAY
 km 42.9 TO km 47.0**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client	Approved by/Approuvé par
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Project No./No. du projet	Asset No./No. de l'actif	Sheet No./ No. de la feuille
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Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

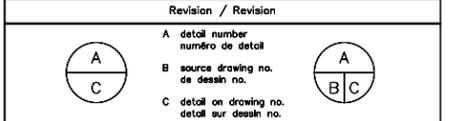


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A	15/07/31	PRELIMINARY DESIGN	AK	SF
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No.	Date/Date	Description/Description	Drawn by Dessiné par	Approved Approuvé
Revision / Revision				
		A detail number numéro de détail		
		B source drawing no. de dessin no.		
		C detail on drawing no. détail sur dessin no.		



Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**WILDLIFE FENCE
DETAILS**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-07-31
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client

Approved by/Approuvé par

Parks Canada Responsible Officer/Responsable Projets Parcs Canada

Project No./No. du projet	Asset No./No. de la feuille	Sheet No./No. de la feuille
201524		D01
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

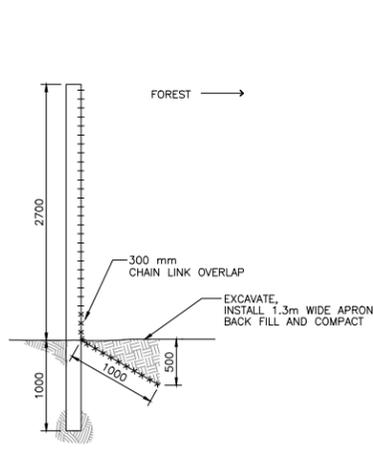
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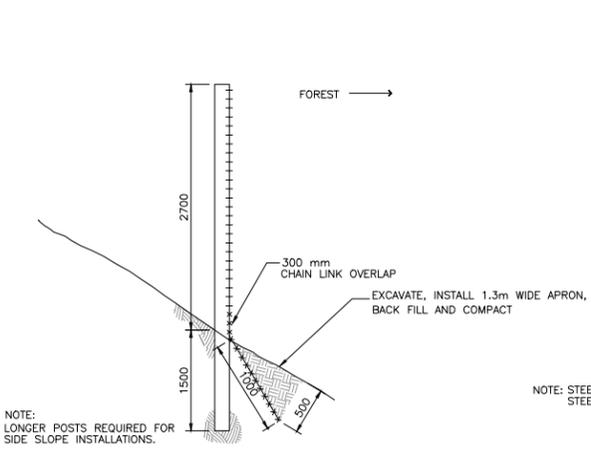
HALF SIZE

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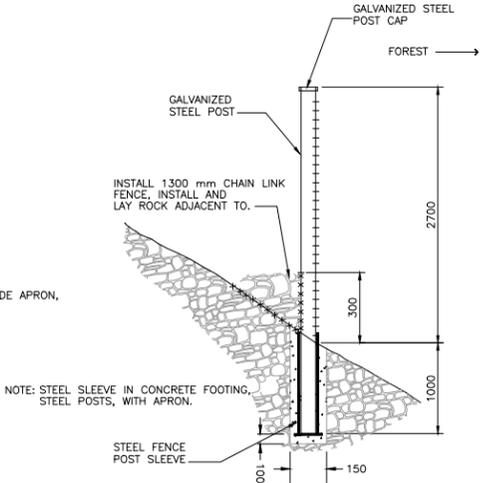
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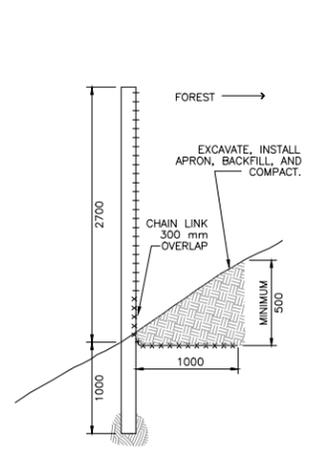
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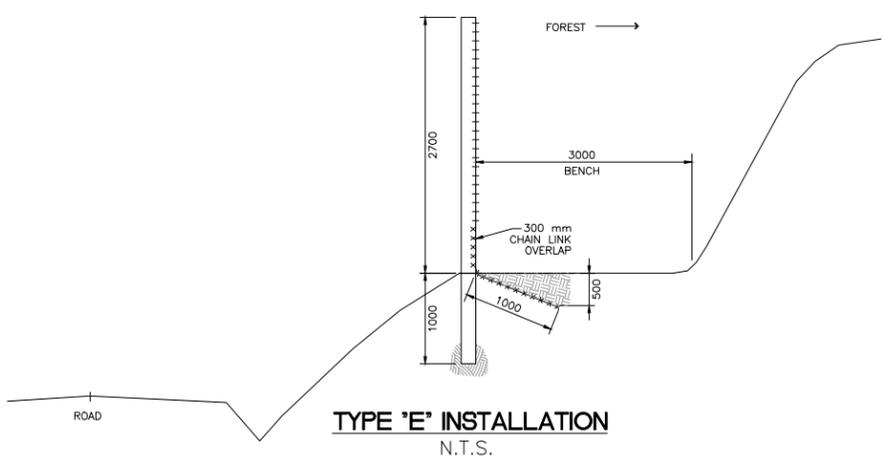
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N.T.S.



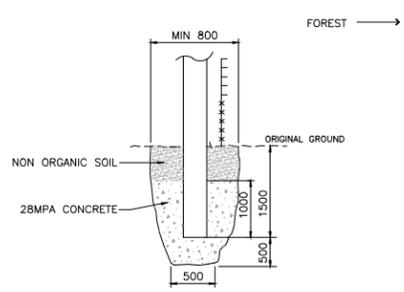
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ROCK RUBBLE SIDESLOPE
N.T.S.



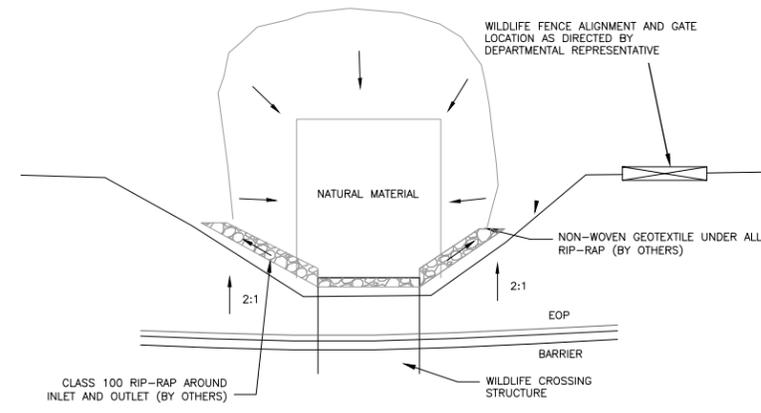
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BACKSLOPES 2:1 AND FLATTER
N.T.S.



TYPE "E" INSTALLATION
N.T.S.



TYPE "F" INSTALLATION
WOOD POST FOUNDATION IN HIGH
WATER TABLE AND NON ORGANIC SOILS
N.T.S.



TYPICAL WILDLIFE FENCE LAYOUT
AT CROSSING STRUCTURE
N.T.S.

No.	Date/Date	Description/Description	Drawn by/Dessiné par	Approved/Approuvé
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Revision	
A	detail number / numéro de détail
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C	detail on drawing no. / détail sur dessin no.

Consultant's Stamp / Sceau de l'expert-conseil	Eng. Stamp / Sceau de l'ingénieur
---	--------------------------------------

Client/client	Parks Canada Agency Western and Northern Region	L'Agence Parcs Canada Ouest et Nord Région
---------------	--	---

Consultant's Name /
Nom de l'expert-conseil

Project title/Titre du projet
**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin
**WILDLIFE FENCE
POST DETAILS**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-07-31
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada		
Client Acceptance/Acceptation du client	Approved by/Approuvé par	
Parks Canada Responsible Officer/Agent Responsable Parcs Canada		
Project No./No. du projet	Asset No./No. du bien	Sheet No./ No. de la feuille
201524		D03
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

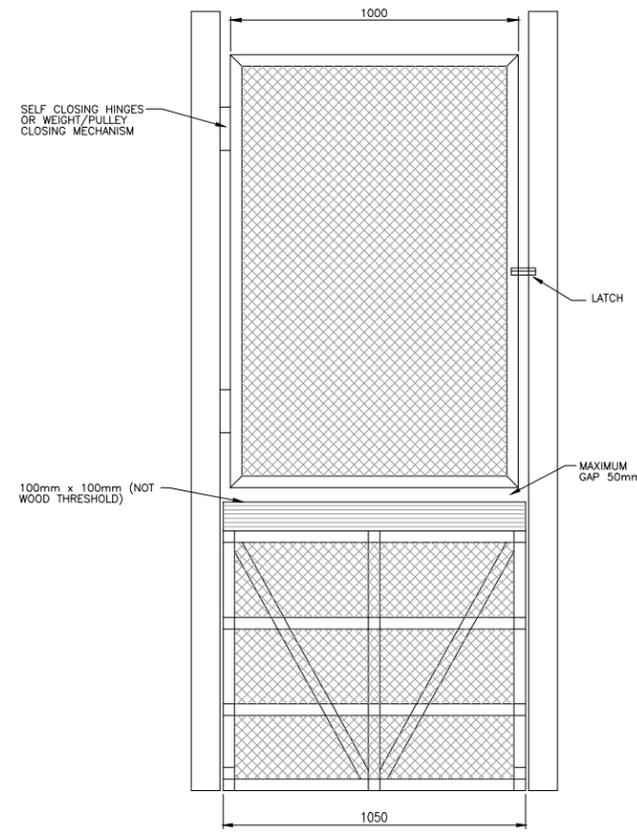
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NOT FOR CONSTRUCTION

HALF SIZE

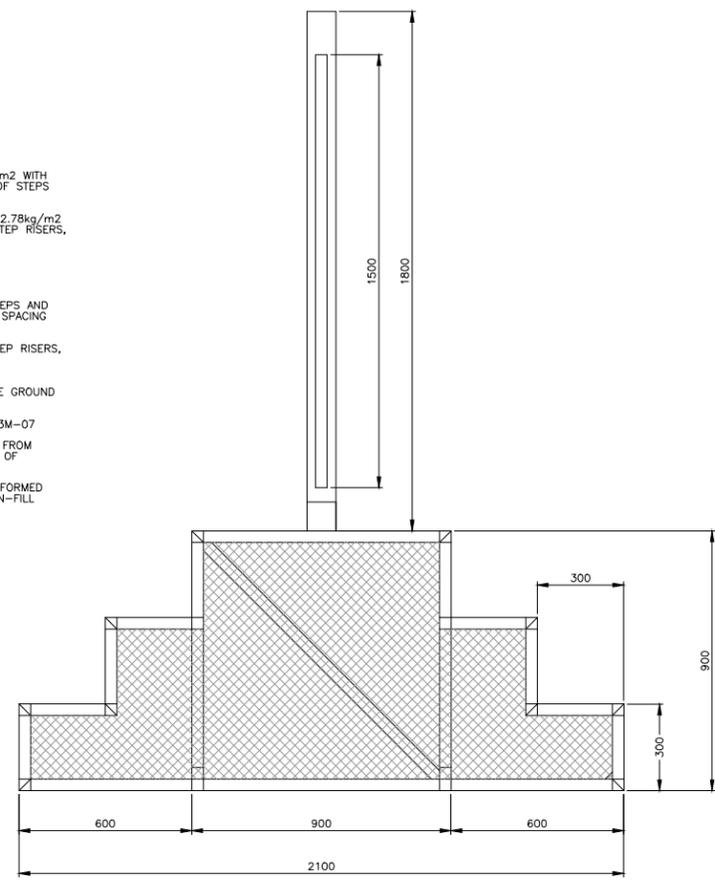
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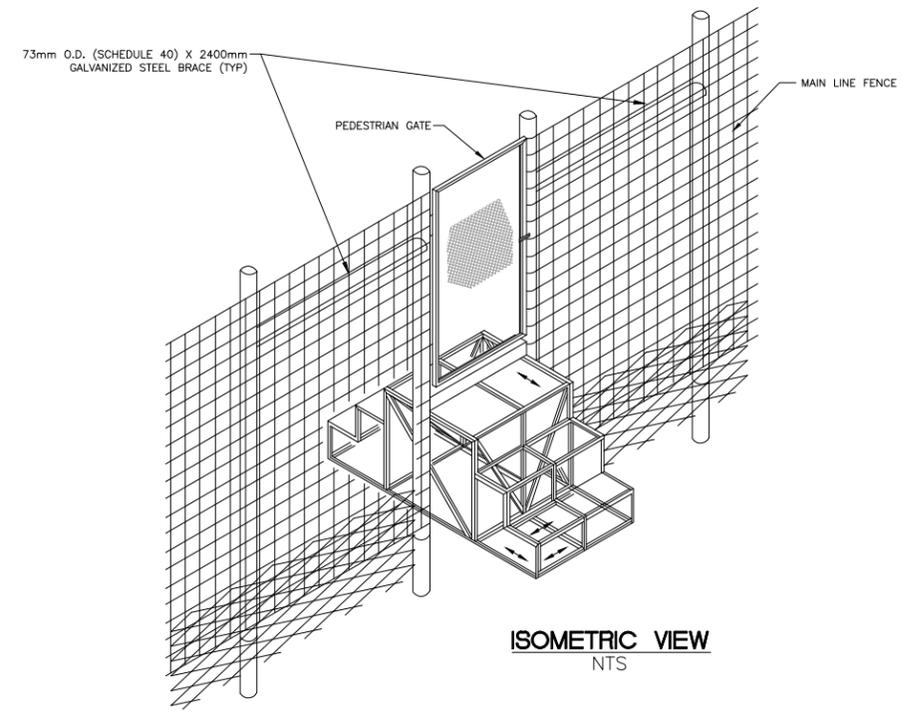


ELEVATION VIEW
NTS

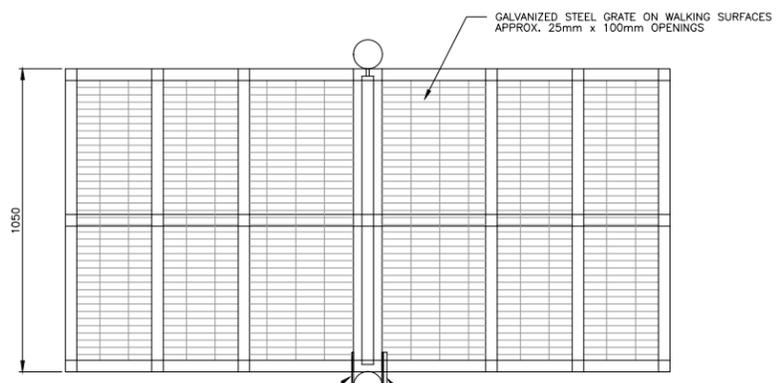
1. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE NOTED.
2. ALL MEMBERS ARE 38x38x3.81 HSS.
3. EXPANDED METAL STRUCTURAL GRATING CARBON STEEL 14.65kg/m² WITH OPENING SIZE OF 25mm x 100mm IS TO BE USED FOR TOP OF STEPS AND DECK (WALKING SURFACES).
4. EXPANDED METAL FLATTENED CARBON STEEL STYLE 38 - #13, 2.78kg/m² WITH OPENING SIZE OF 27mm x 70mm IS TO BE USED FOR STEP RISERS, SIDES AND GATE.
5. LONG OPENING SIZE TO BE IN DIRECTION OF LONGEST SPAN.
6. ALL HSS JOINTS TO BE CONTINUOUS 4mm BUTT WELD.
7. ALL CONTACT POINTS OF EXPANDED METAL WITH FRAMES ON STEPS AND DECK (WALKING SURFACE) TO BE SPOT WELDED WITH MAXIMUM SPACING OF 75mm.
8. ALL CONTACT POINTS OF EXPANDED METAL WITH FRAMES ON STEP RISERS, SIDES AND GATE ARE TO BE SPOT WELDED WITH A MAXIMUM SPACING OF 150mm.
9. ALL EXPANDED METAL EDGES PROJECTING BEYOND FRAME TO BE GROUND FLUSH BEFORE WELDING.
10. ALL ELEMENTS TO BE GALVANIZED ACCORDING TO ASTM A53/A53M-07
11. ALL REFERENCES TO EXPANDED METAL SPECIFICATION OBTAINED FROM INDUSTRIAL WIRE AND IRON WORKS LTD. CATALOGUE. MATERIALS OF EQUAL QUALITY AND DIMENSION ACCEPTABLE.
12. GATES SHALL BE FABRICATED OF GALVANIZED PIPE, TUBING OR FORMED SHEET METAL SECTIONS PROPERLY JOINED, BRACED AND WITH IN-FILL AS SPECIFIED IN THE CONTRACT DRAWINGS.



SIDE VIEW
NTS



ISOMETRIC VIEW
NTS



PLAN VIEW
NTS

No.	Date/Date	Description/Description	Drawn by Dessiné par	Approved Approuvé
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Revision	
A	detail number numéro de détail
B	source drawing no. de dessin no.
C	detail on drawing no. détail sur dessin no.

Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**WILDLIFE FENCE
PEDESTRIAN GATE DETAILS**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-07-31
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client	Approved by/Approuvé par

Parks Canada Responsible Officer/Agent Responsable Parcs Canada

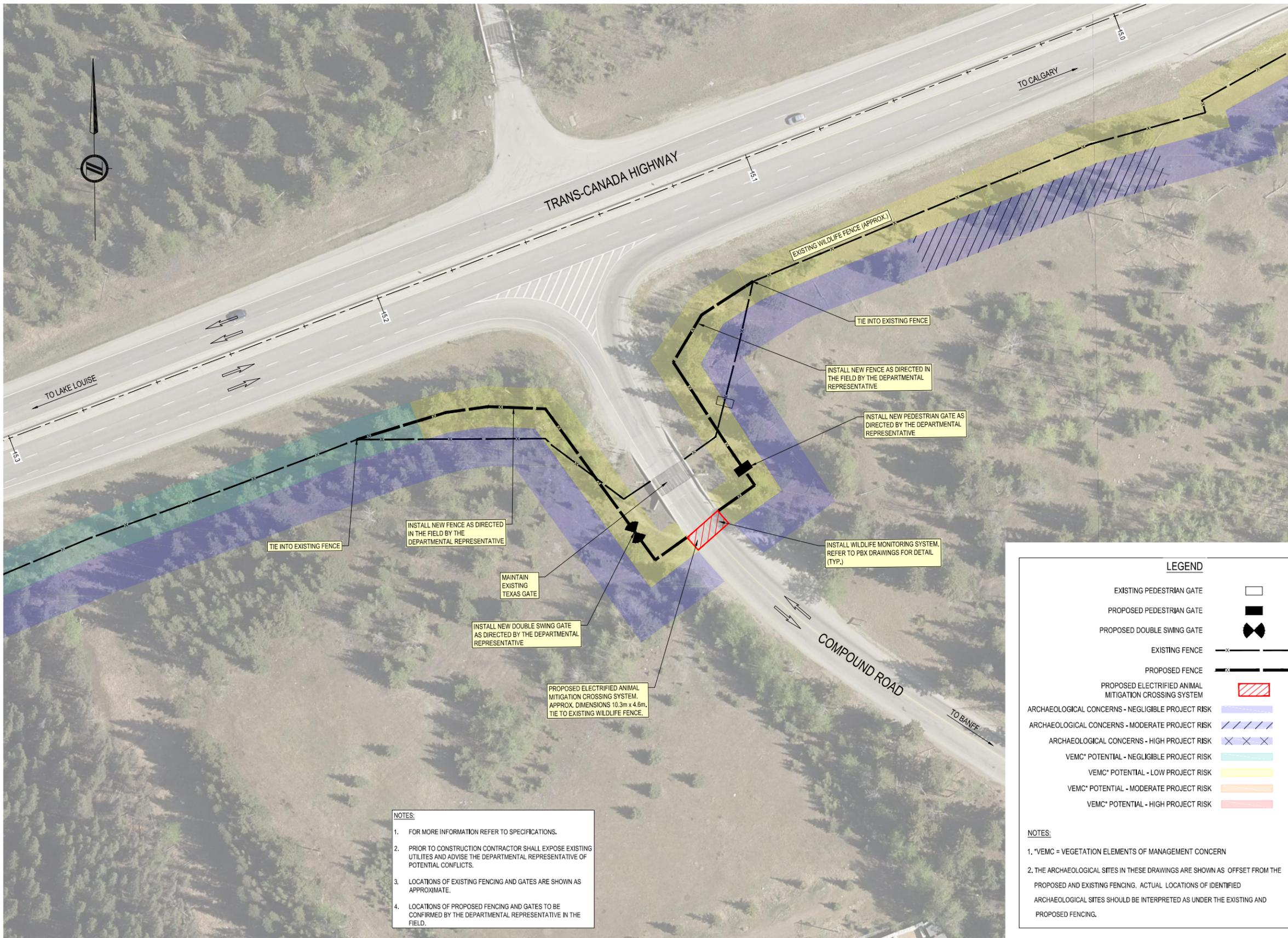
Project No./No. du projet	Asset No./No. du bien	Sheet No./ No. de la feuille
201524		D04
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

November 24, 2015, 12:53:14
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 Plotted: A1 841 x 564 mm

NOT FOR CONSTRUCTION

HALF SIZE

November 20, 2015, 10:28:23 Filename: C:\Project\100546-00 Parks TCH Evolution\Fencing\100_Drawing\103_Sheet_Plan\2015 EIA_Drawing\00546 - EAMCS EAMCS Sites.dwg/E101 Plotted: A1 841 x 594 mm



NOTES:

- FOR MORE INFORMATION REFER TO SPECIFICATIONS.
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- LOCATIONS OF PROPOSED FENCING AND GATES TO BE CONFIRMED BY THE DEPARTMENTAL REPRESENTATIVE IN THE FIELD.

LEGEND

- EXISTING PEDESTRIAN GATE
- PROPOSED PEDESTRIAN GATE
- PROPOSED DOUBLE SWING GATE
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED ELECTRIFIED ANIMAL MITIGATION CROSSING SYSTEM
- ARCHAEOLOGICAL CONCERNS - NEGLIGIBLE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - MODERATE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - HIGH PROJECT RISK
- VEMC* POTENTIAL - NEGLIGIBLE PROJECT RISK
- VEMC* POTENTIAL - LOW PROJECT RISK
- VEMC* POTENTIAL - MODERATE PROJECT RISK
- VEMC* POTENTIAL - HIGH PROJECT RISK

NOTES:

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EAMCS SITE No. 1 - COMPOUND ROAD
SCALE 1:500

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HALF SIZE

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B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Révision

A	detail number / numéro de détail	A
B	source drawing no. / de dessin no.	B/C
C	detail on drawing no. / détail sur dessin no.	

Consultant's Stamp /
Sceau de l'expert-conseil

Eng. Stamp /
Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name /
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

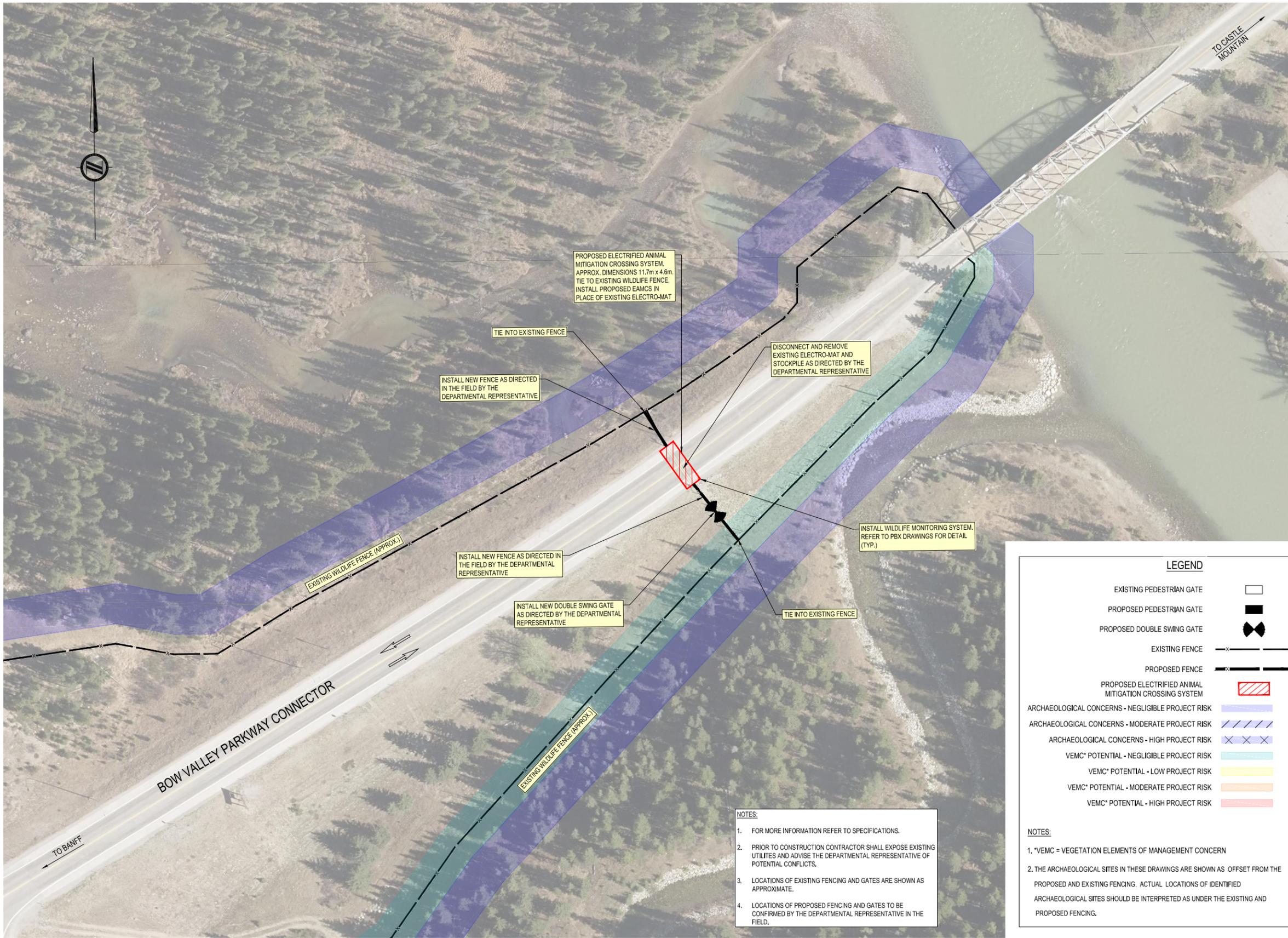
**EAMCS SITE No. 1
COMPOUND ROAD**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client	Approved by/Approuvé par	
Project No./No. du projet	Asset No./No. du bien	Sheet No./ No. de la feuille
201524		EM01
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

November 20, 2015 - 10:28:17 Filename: C:\Project\10064600 Parks TCH Evolution\Fwdng\100 Drawings\10.3 Sheet Plans\016 EA Drawings\0546 - EAMCS EAMCS Sites.dwg/E102



- NOTES:**
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LEGEND

- EXISTING PEDESTRIAN GATE
- PROPOSED PEDESTRIAN GATE
- PROPOSED DOUBLE SWING GATE
- EXISTING FENCE
- PROPOSED FENCE
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- ARCHAEOLOGICAL CONCERNS - NEGLIGIBLE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - MODERATE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - HIGH PROJECT RISK
- VEMC* POTENTIAL - NEGLIGIBLE PROJECT RISK
- VEMC* POTENTIAL - LOW PROJECT RISK
- VEMC* POTENTIAL - MODERATE PROJECT RISK
- VEMC* POTENTIAL - HIGH PROJECT RISK

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EAMCS SITE No. 2 - CASTLE JUNCTION EAST
SCALE 1:500

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No.	Date/Date	Description/Description	Drawn by/Dessiné par	Approved/Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Révision

A	detail number / numéro de détail	A
B	source drawing no. / de dessin no.	B/C
C	detail on drawing no. / détail sur dessin no.	

Consultant's Stamp /
Sceau de l'expert-conseil

Eng. Stamp /
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Client/client

Parks Canada Agency Western and Northern Region

L'Agence Parcs Canada Ouest et Nord Région

Consultant's Name /
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

TRANS CANADA HIGHWAY WILDLIFE FENCING REALIGNMENT AND REPAIRS

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

EAMCS SITE No. 2 CASTLE JUNCTION EAST

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client

Approved by/Approuvé par

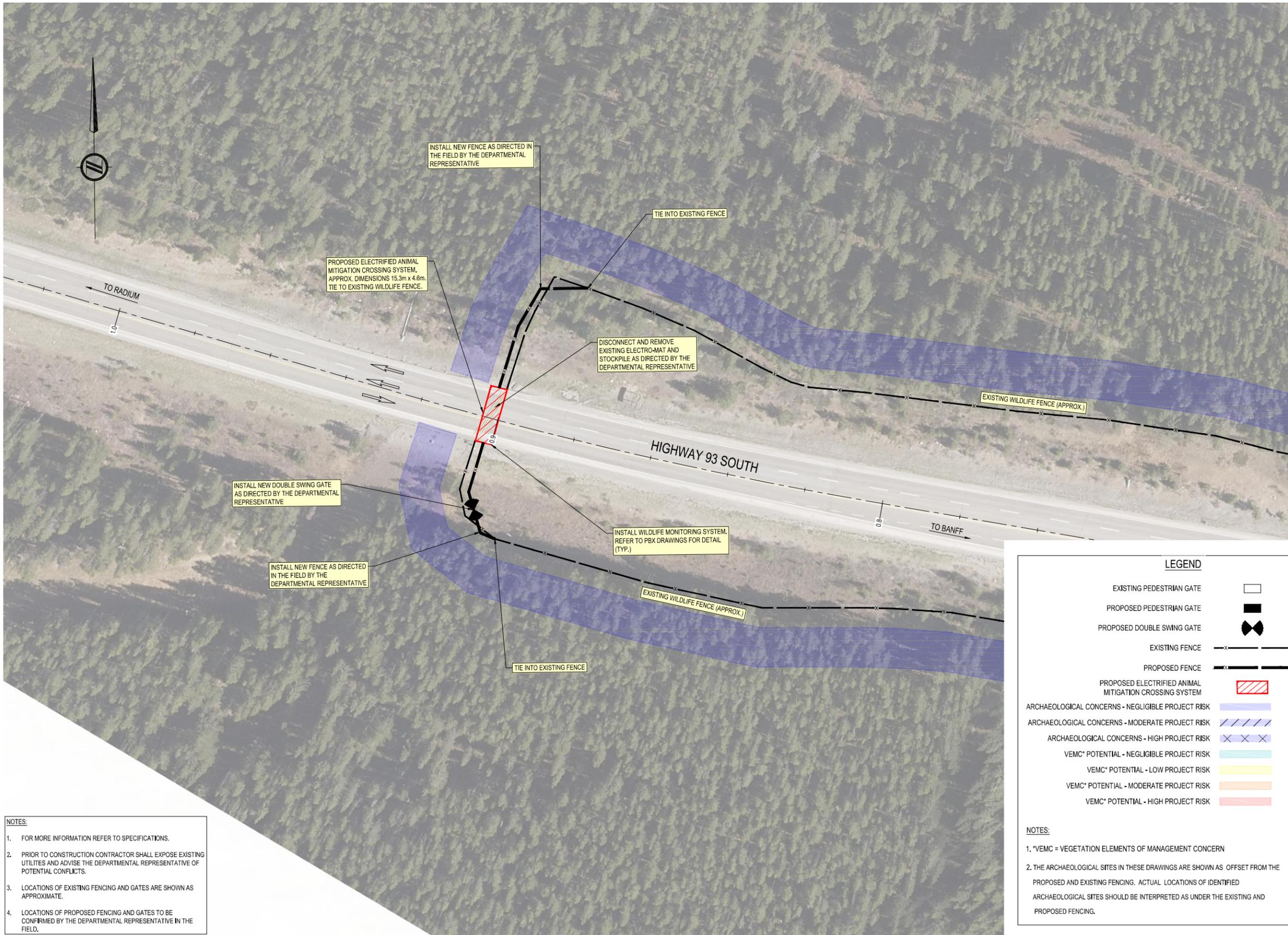
Parks Canada Responsible Officer/Agent Responsable Parcs Canada

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Project No./No. du projet	Asset No./No. de bien	Sheet No./No. de la feuille
201524		EM02
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

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B	15/11/20	PRELIMINARY DESIGN	AK	SF
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Revision / Révision	
A	detail number / numéro de détail
B	source drawing no. / de dessin no.
C	detail on drawing no. / détail sur dessin no.

Consultant's Stamp /
Sceau de l'expert-conseil

Eng. Stamp /
Sceau de l'ingénieur

Client/client

Parks Canada
Agency
Western and
Northern Region

L'Agence Parcs
Canada
Ouest et Nord
Région

Consultant's Name /
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**EAMCS SITE No. 3
CASTLE JUNCTION WEST**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Client Acceptance/Acceptation du client		Approved by/Approuvé par
Parks Canada Responsable Officier/Agent Responsable Parcs Canada		Parks Canada Project Manager/Administrateur de Projets Parcs Canada
Project No./No. du projet	Asset No./No. du bien	Sheet No./ No. de la feuille
201524		EM03
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

LEGEND

- EXISTING PEDESTRIAN GATE
- PROPOSED PEDESTRIAN GATE
- PROPOSED DOUBLE SWING GATE
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED ELECTRIFIED ANIMAL MITIGATION CROSSING SYSTEM
- ARCHAEOLOGICAL CONCERNS - NEGLIGIBLE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - MODERATE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - HIGH PROJECT RISK
- VEMC* POTENTIAL - NEGLIGIBLE PROJECT RISK
- VEMC* POTENTIAL - LOW PROJECT RISK
- VEMC* POTENTIAL - MODERATE PROJECT RISK
- VEMC* POTENTIAL - HIGH PROJECT RISK

NOTES:

1. *VEMC = VEGETATION ELEMENTS OF MANAGEMENT CONCERN

2. THE ARCHAEOLOGICAL SITES IN THESE DRAWINGS ARE SHOWN AS OFFSET FROM THE PROPOSED AND EXISTING FENCING. ACTUAL LOCATIONS OF IDENTIFIED ARCHAEOLOGICAL SITES SHOULD BE INTERPRETED AS UNDER THE EXISTING AND PROPOSED FENCING.

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EAMCS SITE No. 3 - CASTLE JUNCTION WEST
SCALE 1:500

NOT FOR CONSTRUCTION

HALF SIZE

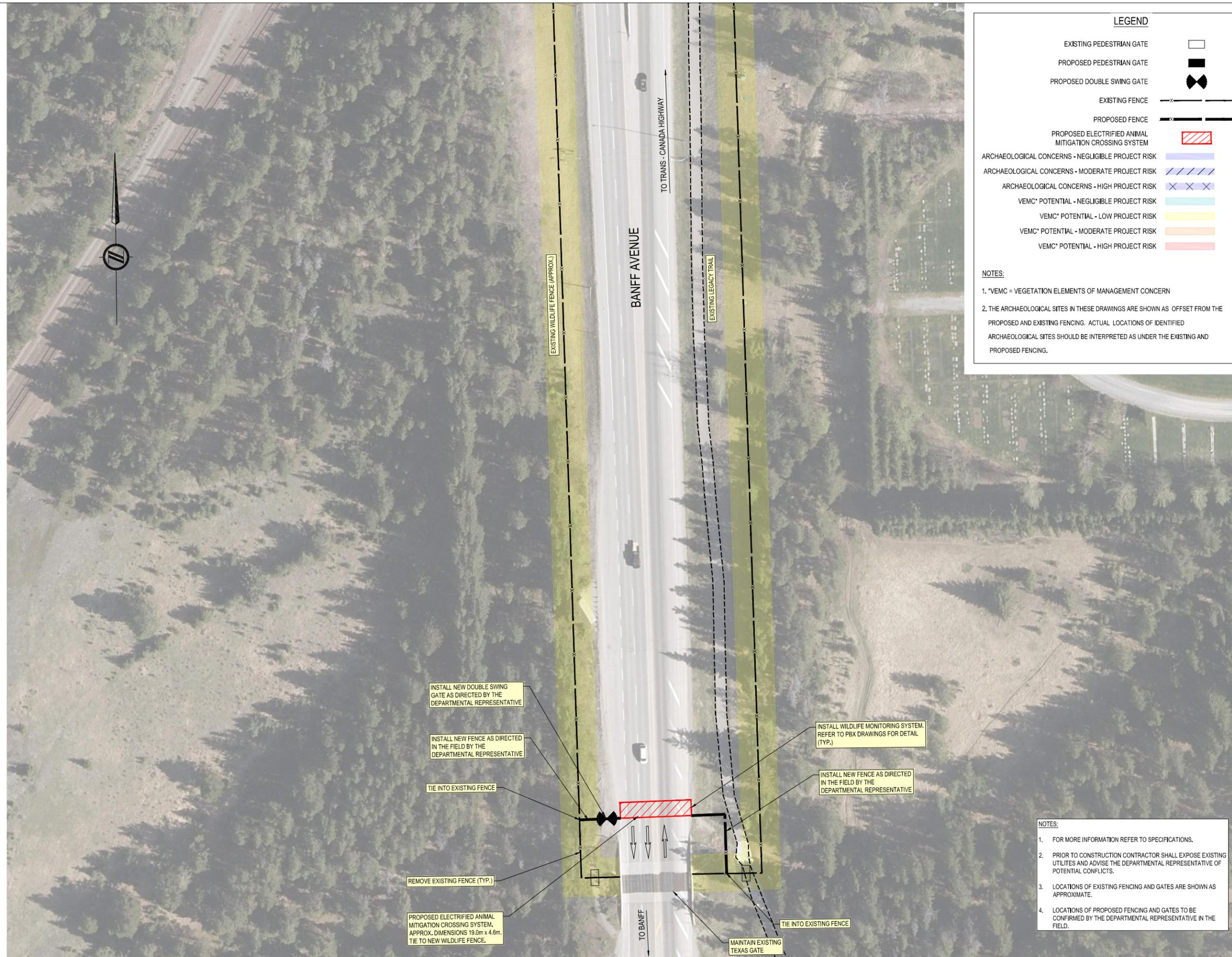
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Plotted:

NOT FOR CONSTRUCTION

EAMCS SITE No. 5 - Banff Avenue
SCALE 1:500

HALF SIZE



LEGEND

- EXISTING PEDESTRIAN GATE
- PROPOSED PEDESTRIAN GATE
- PROPOSED DOUBLE SWING GATE
- EXISTING FENCE
- PROPOSED FENCE
- PROPOSED ELECTRIFIED ANIMAL MITIGATION CROSSING SYSTEM
- ARCHAEOLOGICAL CONCERNS - NEGLIGIBLE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - MODERATE PROJECT RISK
- ARCHAEOLOGICAL CONCERNS - HIGH PROJECT RISK
- VEMC* POTENTIAL - NEGLIGIBLE PROJECT RISK
- VEMC* POTENTIAL - LOW PROJECT RISK
- VEMC* POTENTIAL - MODERATE PROJECT RISK
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B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

No.	Date/Date	Description/Description	Drawn by Dessiné par	Approved Approuvé
Revision / Revision				
A		detail number numéro de détail	A	
B		source drawing no. de dessin no.	B	C
C		detail on drawing no. détail sur dessin no.		

Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

Parks Canada Agency Western and Northern Region

L'Agence Parcs Canada Ouest et Nord Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

TRANS CANADA HIGHWAY WILDLIFE FENCING REALIGNMENT AND REPAIRS

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

EAMCS SITE No. 5 BANFF AVENUE

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

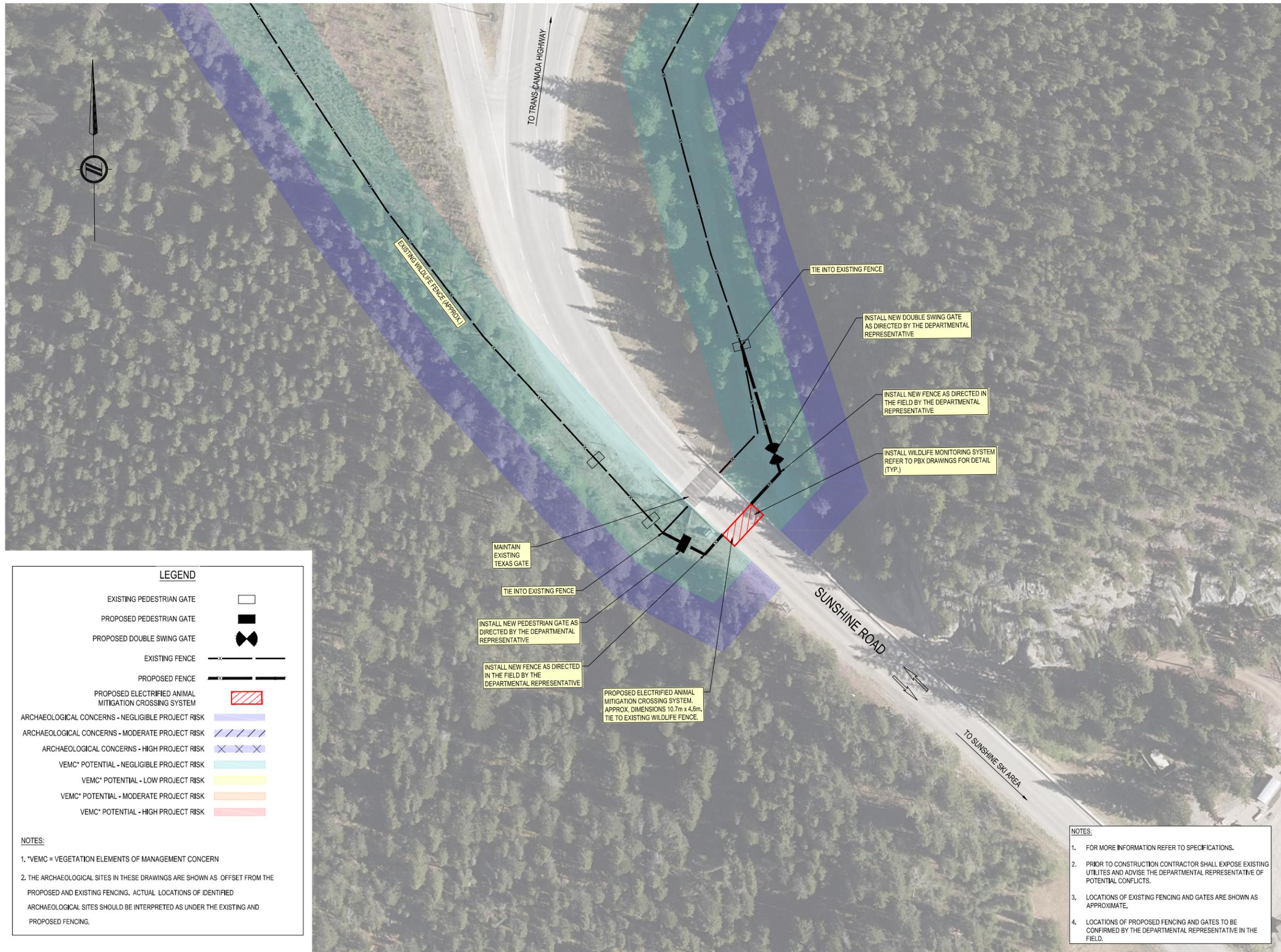
Client Acceptance/Acceptation du client	Approved by/Approuvé par

Parks Canada Responsible Officer/Responsable Parcs Canada

Project No./No. du projet	Asset No./No. du bien	Sheet No./No. de la feuille
201524		EM05
Drawing Reference No./No. de référence du dessin		
2121 00546 - 0		

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LEGEND

EXISTING PEDESTRIAN GATE	
PROPOSED PEDESTRIAN GATE	
PROPOSED DOUBLE SWING GATE	
EXISTING FENCE	
PROPOSED FENCE	
PROPOSED ELECTRIFIED ANIMAL MITIGATION CROSSING SYSTEM	
ARCHAEOLOGICAL CONCERNS - NEGLIGIBLE PROJECT RISK	
ARCHAEOLOGICAL CONCERNS - MODERATE PROJECT RISK	
ARCHAEOLOGICAL CONCERNS - HIGH PROJECT RISK	
VEMC* POTENTIAL - NEGLIGIBLE PROJECT RISK	
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- EXISTING WILDLIFE FENCE (APPROX.)
- TIE INTO EXISTING FENCE
- INSTALL NEW DOUBLE SWING GATE AS DIRECTED BY THE DEPARTMENTAL REPRESENTATIVE
- INSTALL NEW FENCE AS DIRECTED IN THE FIELD BY THE DEPARTMENTAL REPRESENTATIVE
- INSTALL WILDLIFE MONITORING SYSTEM REFER TO PBX DRAWINGS FOR DETAIL (TYP.)
- INSTALL NEW PEDESTRIAN GATE AS DIRECTED BY THE DEPARTMENTAL REPRESENTATIVE
- INSTALL NEW FENCE AS DIRECTED IN THE FIELD BY THE DEPARTMENTAL REPRESENTATIVE
- PROPOSED ELECTRIFIED ANIMAL MITIGATION CROSSING SYSTEM. APPROX. DIMENSIONS 10.7m x 4.6m. TIE TO EXISTING WILDLIFE FENCE.
- MAINTAIN EXISTING TEXAS GATE
- TIE INTO EXISTING FENCE

EAMCS SITE No. 6 - SUNSHINE ROAD
SCALE 1:500

- NOTES:**
- FOR MORE INFORMATION REFER TO SPECIFICATIONS.
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No.	Date/Date	Description/Description	Drawn by Dessiné par	Approved Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Révision

A	detail number numéro de détail	A
B	source drawing no. de dessin no.	B/C
C	detail on drawing no. détail sur dessin no.	

Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

	Parks Canada Agency Western and Northern Region		L'Agence Parcs Canada Ouest et Nord Région
--	--	--	---

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**EAMCS SITE No. 6
SUNSHINE ROAD**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client

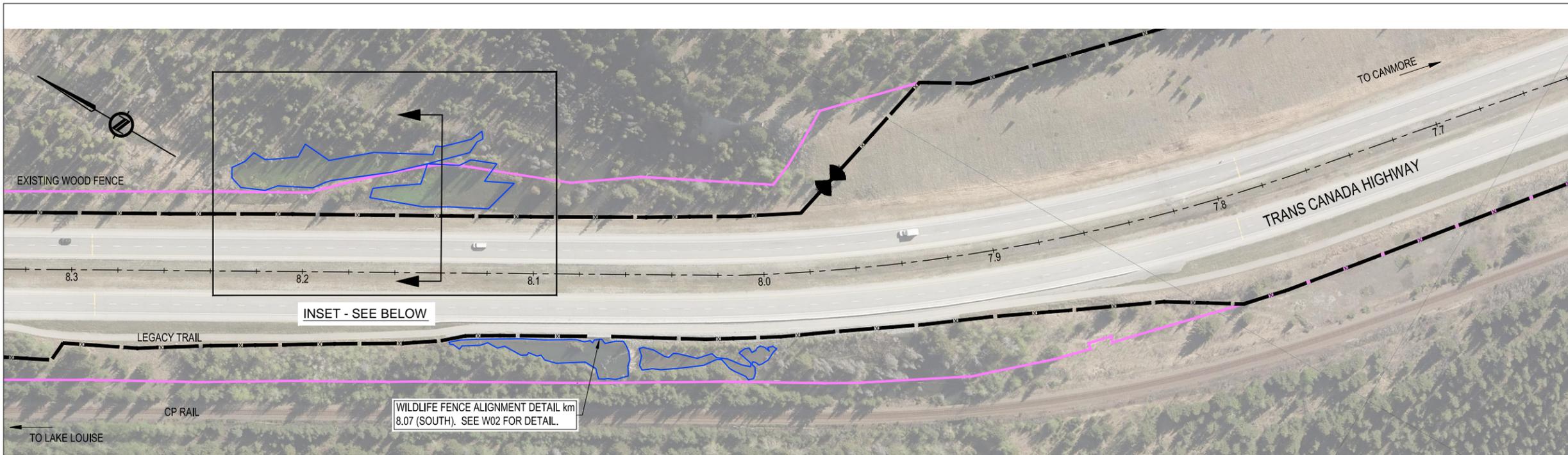
Approved by/Approuvé par

Project No./No. du projet	Asset No./No. du bien	Sheet No./No. de la feuille
201524		EM06
Drawing Reference No./No. de référence du dessin		
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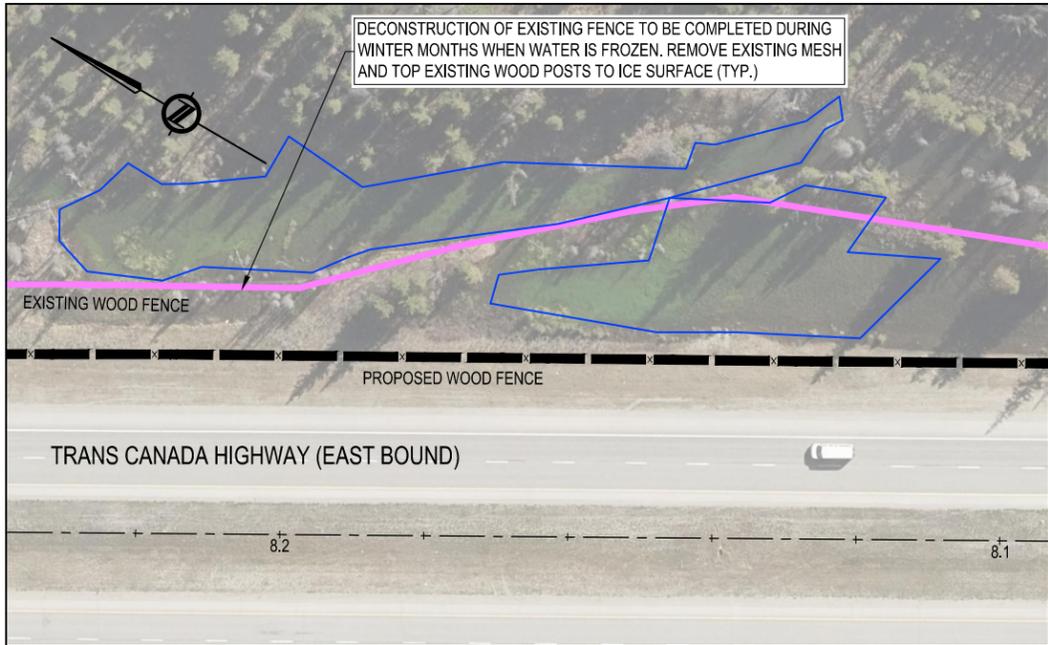
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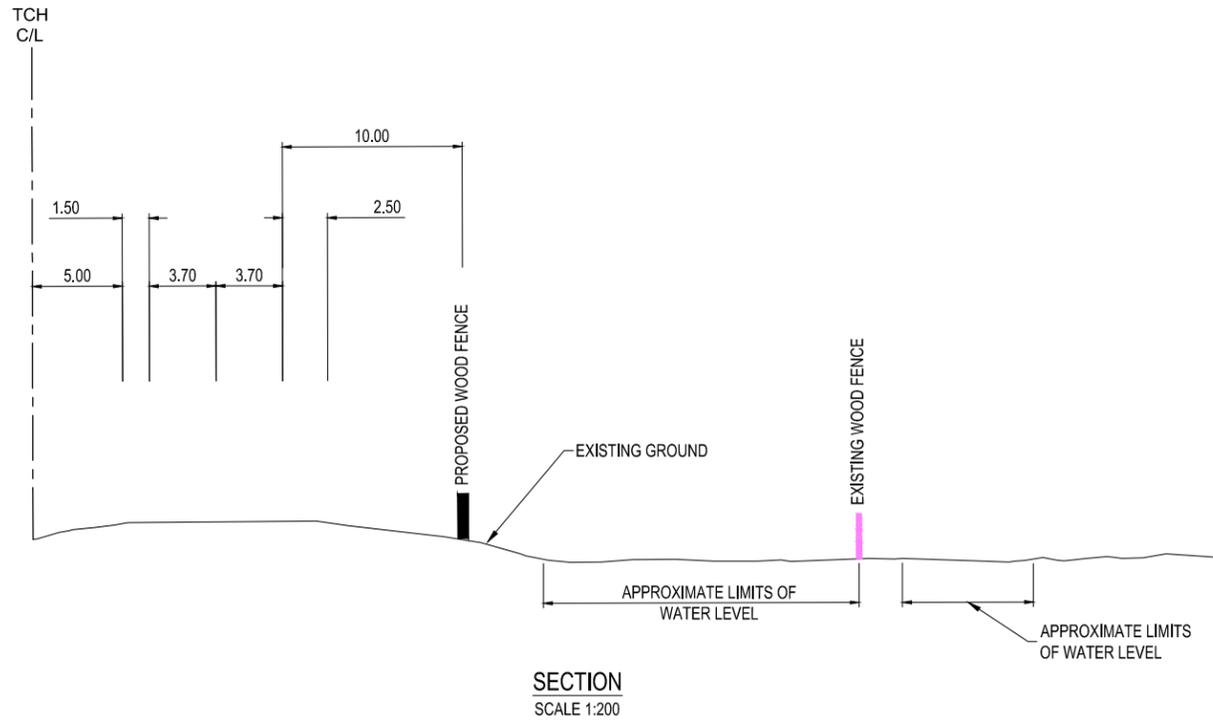
INSET - SEE BELOW

WILDLIFE FENCE ALIGNMENT DETAIL km 8.07 (SOUTH). SEE W02 FOR DETAIL.

PLAN
SCALE 1:1000



INSET
SCALE 1:500



SECTION
SCALE 1:200

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LEGEND	
EXISTING PEDESTRIAN GATE	
PROPOSED PEDESTRIAN GATE	
PROPOSED DOUBLE SWING GATE	
EXISTING FENCE	
EXISTING EPOXY COATED FENCE	
PROPOSED WOOD FENCE	
PROPOSED STEEL FENCE	
EXISTING TRAIL	
WATER BODY	

No.	Date/Date	Description/Description	Drawn by/Dessiné par	Approved/Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Révision	
A	A detail number / numéro de détail
B	source drawing no. / de dessin no.
C	detail on drawing no. / détail sur dessin no.

Consultant's Stamp Sceau de l'expert-conseil	Eng. Stamp Sceau de l'ingénieur
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Client/client	Parks Canada Agency Western and Northern Region	L'Agence Parcs Canada Ouest et Nord Région
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Consultant's Name
Nom de l'expert-conseil

Project title/Titre du projet
**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**
BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin
**WILDLIFE FENCE ALIGNMENT
DETAIL - km 8.14 (NORTH)**

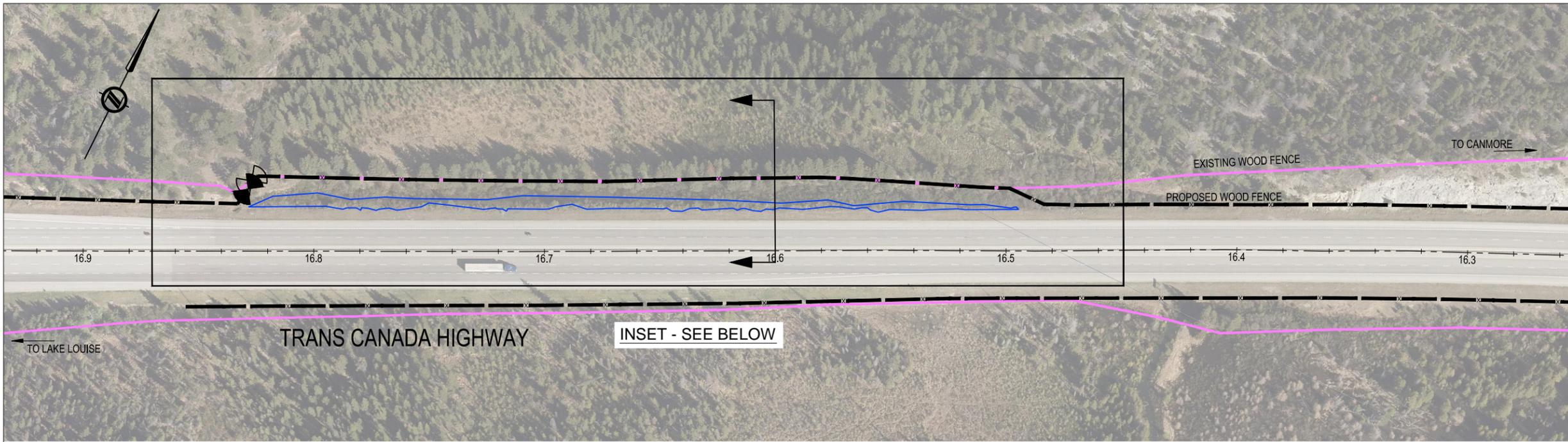
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	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada		
Client Acceptance/Acceptation du client	Approved by/Approuvé par	
Parks Canada Responsible Officer/Agent Responsable Parcs Canada		
Project No./No. du projet	Asset No./No. du bien	Sheet No./No. de la feuille
201524		W01
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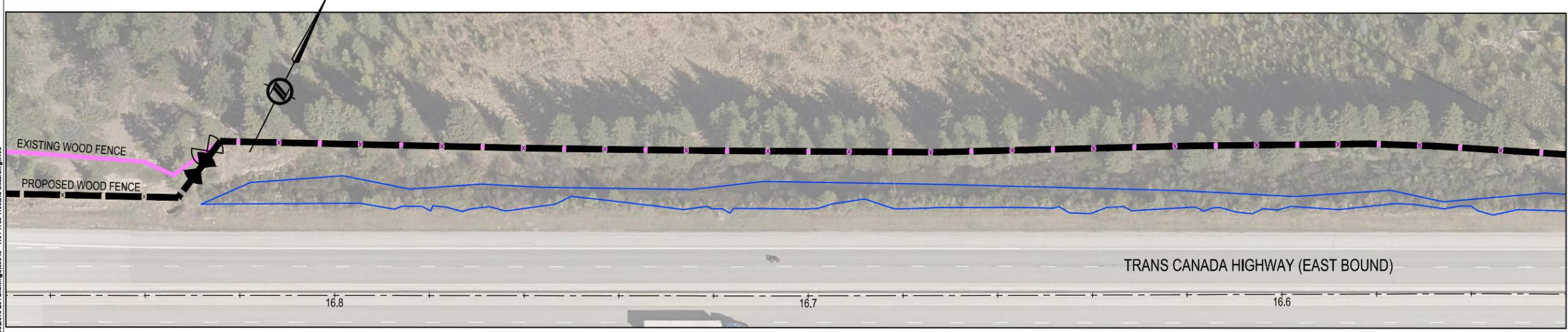
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NOT FOR CONSTRUCTION

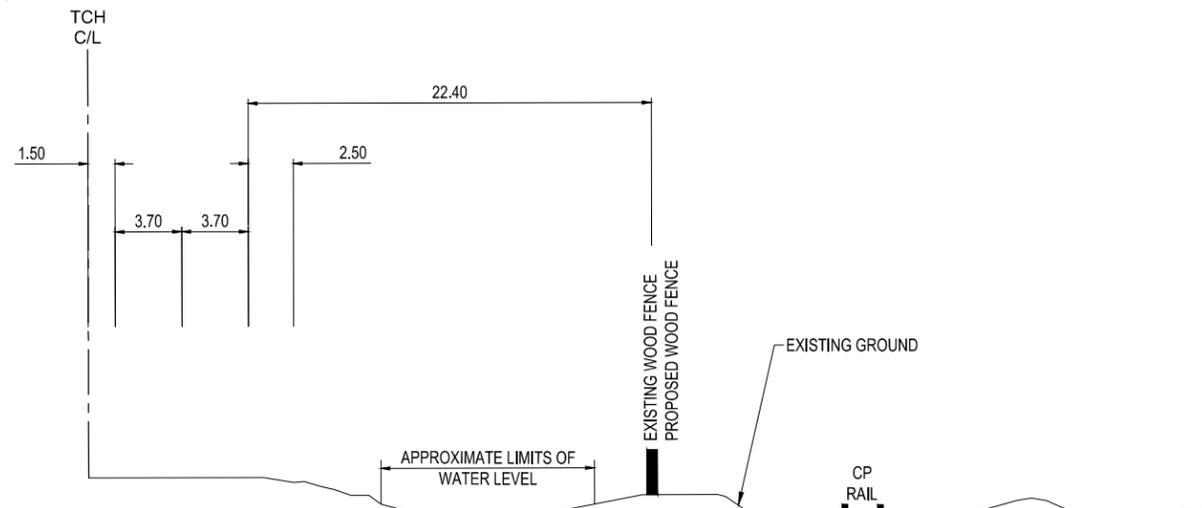
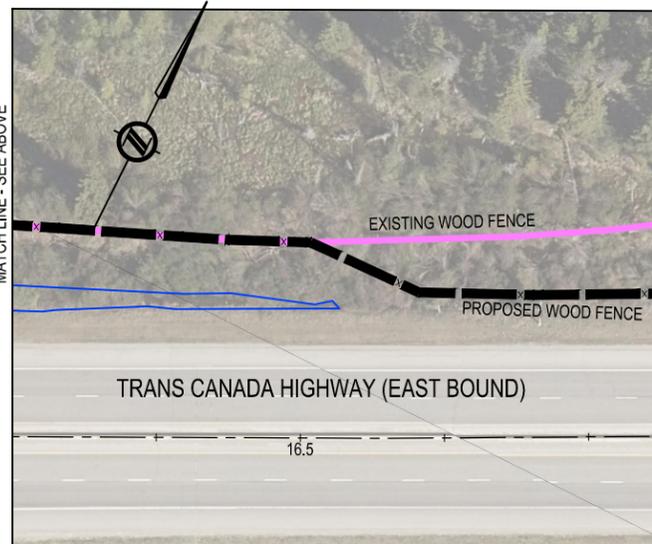
HALF SIZE



PLAN
SCALE 1:1000



INSET
SCALE 1:500



SECTION
SCALE 1:200

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LEGEND	
EXISTING PEDESTRIAN GATE	
PROPOSED PEDESTRIAN GATE	
PROPOSED DOUBLE SWING GATE	
EXISTING FENCE	
EXISTING EPOXY COATED FENCE	
PROPOSED WOOD FENCE	
PROPOSED STEEL FENCE	
EXISTING TRAIL	
WATER BODY	

No.	Date/Date	Description/Description	Drawn by/Dessiné par	Approved/Approuvé
B	15/11/20	PRELIMINARY DESIGN	AK	SF
A	15/07/31	PRELIMINARY DESIGN	AK	SF

Revision / Revision	
A	A detail number / numéro de détail
B	B source drawing no. / de dessin no.
C	C detail on drawing no. / détail sur dessin no.

Consultant's Stamp
Sceau de l'expert-conseil

Eng. Stamp
Sceau de l'ingénieur

Client/client

Parks Canada Agency
Western and Northern Region

L'Agence Parcs Canada
Ouest et Nord Région

Consultant's Name
Nom de l'expert-conseil

McElhanney

Project title/Titre du projet

**TRANS CANADA HIGHWAY
WILDLIFE FENCING
REALIGNMENT AND REPAIRS**

BANFF NATIONAL PARK, AB

Drawing title/Titre du dessin

**WILDLIFE FENCE ALIGNMENT
DETAIL - km 16.6 (NORTH)**

Surveyed by/Arpenté par	Drawn by/Dessiné par	Date/Date
	MB	2015-11-20
Designed by/Concept par	Reviewed by/Revisé par	Scale/Echelle
AK	SF	AS SHOWN

Parks Canada Project Manager/Administrateur de Projets Parcs Canada

Client Acceptance/Acceptation du client

Approved by/Approuvé par

Project No./No. du projet	Asset No./No. de bien	Sheet No./No. de la feuille
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Drawing Reference No./No. de référence du dessin		
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NOT FOR CONSTRUCTION

HALF SIZE



Appendix 4 - Summary of Ecosite Characteristics Present along the Trans-Canada Highway from km 0 - km 47

Abbreviation	Name	Soils	Vegetation	Wildlife	Management Considerations
AL1	Altrude 1	Eutric Brunisol	Lodgepole pine (<i>Pinus contorta</i>) forest	Deer (<i>Odocoileus spp.</i>), Elk (<i>Cervus canadensis</i>), Wolverine (<i>Gulo gulo</i>), Lynx (<i>Lynx Canadensis</i>), Wolf (<i>Canis lupus</i>), Cougar (<i>Puma concolor</i>), Coyote (<i>Canis latrans</i>), Snowshoe Hare (<i>Lepus americanus</i>), Columbian Ground Squirrel (<i>Urocyon columbianus</i>), Golden-mantled Ground Squirrel (<i>Callospermophilus lateralis</i>), Western Jumping Mouse (<i>Zapus princeps</i>), medium amount of breeding birds.	High water tables may present problems for sewage disposal.
AT1	Athabasca 1	Eutric Brunisol	Lodgepole pine forest	Very important to wildlife, especially ungulates, carnivores, and bats. Some small mammals in large numbers.	Slow vegetation growth, problems in revegetation.
FR1	Fireside	Eutric Brunisol	Lodgepole pine forest	Highly important to wildlife. Species include Deer, Elk, Moose, Coyote, Wolf, Coyote, Cougar, Lynx, Snowshoe Hare, Red Squirrel (<i>Tamiasciurus hudsonicus</i>), Beaver (<i>Castor canadensis</i>), Deer Mice (<i>Peromyscus maniculatus</i>), Red-backed Vole (<i>Clethrionomys gapperi</i>), Heather Vole (<i>Phenacomys intermedius</i>) and abundant breeding birds.	High water tables may present problems for sewage disposal.
HC1	Hector 1	Gleysol, gleyed regosolic, mesisol	Moist Engelmann spruce (<i>Picea engelmannii</i>) forest, wet Engelmann spruce-subalpine fir (<i>Abies lasiocarpa</i>) open forest, wet shrubby meadow, birch fen	Moose, Wolverine, Wolf, Coyote, Masked Shrew (<i>Sorex cinereus</i>), Dusky Shrew (<i>Sorex monticolus</i>), Western Jumping Mouse (<i>Zapus princeps</i>), high bird abundance. Willow meadows are critical winter habitat for White-tailed Ptarmigan (<i>Lagopus leucura</i>).	Major construction activities will change sedimentation and erosion patterns.
HD1	Hillsdale 1	Regosol	Aspen forest	Very important to wildlife. Critical range for Elk and Deer. High densities of small birds, birds, some carnivores,	Droughty and problems in revegetation.
HD2	Hillsdale 2	Regosol	Spruce open forest		
HD3	Hillsdale 3	Regosol	White spruce (<i>Picea glauca</i>) forest, white spruce-Douglas fir (<i>Pseudotsuga menziesii</i>) forest		
HD4	Hillsdale 4	Regosol	Grassland, lodgepole pine forest		
IB1	Ishbel 1	Eutric and Dystric Brunisol	Lodgepole pine forest		
BK4	Baker Creek 4	Eutric Brunisol, Gray Luvisol	Lodgepole pine, Engelmann spruce - subalpine fir forest	Highly important to wildlife. Moose.	Problems in sewage disposal because of ineffectiveness in ion filtration.
NY1	Norquay 1	Eutric Brunisol, Regosol	Lodgepole pine forest, Douglas fir forest	Deer, Bighorn Sheep (<i>Ovis canadensis</i>), Elk, Wolf, Coyote, Cougar, Columbian Ground Squirrel, medium breeding bird diversity.	Steep and locally eroding slopes.
NY3	Norquay 3	Eutric Brunisol, Regosol	White spruce - Douglas fir forest, lodgepole pine forest, Douglas fir open and closed forest, low shrub-herb meadow	Deer, Elk, Bighorn Sheep, Wolf, Coyote, Cougar, Marten (<i>Martes martes</i>), Red Squirrel, Deer Mouse, Heather Vole, Long-tailed Vole (<i>Microtus longicaudus</i>), high breeding bird diversity.	Vegetation removal increases erosion.
PR1	Panorama Ridge 1	Brunisol, Luvisol	Mesic pine	Moderately important to wildlife. Some carnivores and many small mammals.	Steep slopes.
PR2	Panorama Ridge 2	Brunisol, Luvisol	pine/buffaloberry (<i>Shepherdia canadensis</i>)		
PR6	Panorama Ridge 6	Brunisol, Luvisol	pine/buffaloberry, mesic pine		Problems in sewage disposal because of ineffectiveness in ion filtration.
PT1	Patricia 1	Eutric Brunisol, Gray Luvisol	Lodgepole pine forest	Highly important. Elk, Deer, Red Squirrel, some small mammals, breeding birds.	Moderate to steep irregular slopes.
SB4	Sawback 4	Eutric Brunisol, Regosol, Humic Regosol	Coniferous open forest, lodgepole pine forest, shrub-herb meadow	Mountain goat (<i>Oreamnos americanus</i>), Bighorn Sheep, Cougar, Pika (<i>Ochotona princeps</i>), Least Chipmunk (<i>Tamias minimus</i>), medium bird abundance.	Steep and locally unstable. Vegetation recovers slowly from disturbances.
VL3	Vermillion Lakes 3	Gleysol	Wet white spruce forest, shrubby meadow, wet shrub thicket	Critical winter range for Elk and Moose. Many small mammals. Carnivores attracted by prey. Numerous bird species in wetlands. Uncommon raptors such as Osprey (<i>Pandion haliaetus</i>) and Bald Eagle (<i>Haliaeetus leucocephalus</i>) nest.	High water tables and backwater flooding. Major construction activities will change sedimentation and erosional patterns.
VL4	Vermillion Lakes 4	Gelsol	Wet white spruce forest		

Reference: Alberta Institute of Pedology 1983



Appendix 5 - Vegetation element Occurrences within 5 km of the Trans-Canada Highway from km 0 - km 47

Common Name	Scientific Name	S Rank ²	GSAW ³	ESCC ⁴	AWA ⁵	COSEWIC ⁶	SARA ⁷
Ecological Communities							
June grass - pasture sagewort - wild blue flax	<i>Koeleria macrantha - Artemisia frigida - Linum lewisii</i>	S2S3					
limber pine / common bearberry - creeping juniper	<i>Pinus flexilis / Arctostaphylos uva ursi - Juniperus horizontalis</i>	S2					
Richardson needlegrass - June grass - small-leaved everlasting	<i>Stipa richardsonii - Koeleria macrantha - Antennaria parvifolia</i>	S2S3					
subalpine fir - limber pine - aspen / veiny meadow rue	<i>Abies bifolia - Pinus flexilis - Populus tremuloides / Thalictrum venulosum</i>	S2?					
Lichens							
dot lichen	<i>Myxobilimbia sabuletorum</i>	S2					
fringed rosette lichen	<i>Physcia tenella</i>	S2	Sensitive				
gold dust lichen	<i>Chrysothrix candelaris</i>	S1					
jelly flakes	<i>Collema undulatum var. granulosum</i>	S2S3	Sensitive				
lichen	<i>Catillaria subnegans</i>	S1					
multicolored dot lichen	<i>Cliostomum griffithii</i>	S1S2					
tree jelly lichen	<i>Collema subflaccidum</i>	S2					
Non-vascular Plants							
liverwort	<i>Anastrophyllum michauxii</i>	SU					
liverwort	<i>Athalamia hyalina</i>	S2					
moss	<i>Brachythecium calcareum</i>	S1					
moss	<i>Brachythecium plumosum</i>	S2					
moss	<i>Brachythecium reflexum</i>	S2					
moss	<i>Brachythecium rutabulum</i>	S2?					
moss	<i>Bryum algovicum</i>	S2					
Matted Bryum	<i>Bryum calophyllum</i>	S1					
round-leaved bryum	<i>Bryum cyclophyllum</i>	S2	Sensitive				
moss	<i>Bryum lanchoacaulon</i>	SU					
Muehlenbeck's bryum moss	<i>Bryum muehlenbeckii</i>	S1S2	Sensitive				
moss	<i>Bryum pallens</i>	S2					
moss	<i>Bryum uliginosum</i>	S2					
moss	<i>Conardia compacta</i>	S2					
liverwort	<i>Conocephalum salebrosum</i>	S2					
long-stalked beardless moss	<i>Desmatodon heimii</i>	S2					
moss	<i>Desmatodon leucostoma</i>	S2					
silky forklet moss	<i>Dicranella heteromalla</i>	S1	May Be At Risk				
marsh forklet moss	<i>Dicranella palustris</i>	S1	Sensitive				
false beard moss	<i>Didymodon fallax</i>	S2	Sensitive				
blunt-leaved hair moss	<i>Didymodon tophaceus</i>	S1S2	Sensitive				
brown moss	<i>Drepanocladus brevifolius</i>	SU	Sensitive				
common extinguisher moss	<i>Encalypta vulgaris</i>	S1S2					
maidenhair moss	<i>Fissidens adianthoides</i>	S2					
narrow-leaved Chinese phoenix moss	<i>Fissidens grandifrons</i>	S2	Sensitive				
alpine grimmia moss	<i>Grimmia alpestris</i>	S2					
pinnatifid curl moss	<i>Homalothecium pinnatifidum</i>	S2	Sensitive				
moss	<i>Hygroamblystegium tenax</i>	S2					
downy plait moss	<i>Hypnum callichroum</i>	S1	Sensitive				
moss	<i>Limprichtia cossonii</i>	SU					
liverwort	<i>Lophozia badensis</i>	S1					
liverwort	<i>Lophozia gillmanii</i>	S1					
liverwort	<i>Lophozia grandiretis</i>	S2					
liverwort	<i>Lophozia guttulata</i>	S2					
liverwort	<i>Lophozia heterocolpos</i>	S2					
ambiguous leafy moss	<i>Mnium ambiguum</i>	S2	Sensitive				
liverwort	<i>Nardia breidlerii</i>	S1					
moss	<i>Orthotrichum affine</i>	SU					
moss	<i>Orthotrichum pylaisii</i>	S1S2					
acid-soil moss	<i>Oxystegus tenuirostris</i>	S1					
moss	<i>Philonotis marchica</i>	S1	Sensitive				
liverwort	<i>Plagiochila porelloides</i>	SNR					
long-beaked leafy moss	<i>Plagiommium rostratum</i>	S1	Sensitive				
moss	<i>Pseudoleskeella sibirica</i>	S2					
moss	<i>Rhizomnium andrewsianum</i>	S1	Sensitive				
liverwort	<i>Riccia cavernosa</i>	S1					
liverwort	<i>Scapania cuspiduligera</i>	S2					
moss	<i>Scoleria aequatica</i>	S2					
chalk brittle moss	<i>Seligeria calcarea</i>	S1	Sensitive				
moss	<i>Seligeria campylopoda</i>	S2					
moss	<i>Timmia norvegica</i>	S2	Sensitive				
bent screw moss	<i>Tortella inclinata</i>	S2	Sensitive				
liverwort	<i>Tritomaria palita</i>	S2					
liverwort	<i>Tritomaria scitula</i>	S2S3					
Vascular Plants							
pink false dandelion	<i>Agoseris lackschewitzii</i>	S2					
scented everlasting	<i>Antennaria aromatica</i>	S2					
Lemmon's rock cress	<i>Arabis lemmanii</i>	S2					
sandwort	<i>Arenaria longipedunculata</i>	S1					
nodding arnica	<i>Arnica parryi</i>	S2					
boreal wormwood	<i>Artemisia borealis</i>	S2	May Be At Risk				
ascending grape fern	<i>Botrychium ascendens</i>	S2					
lance-leaved grape fern	<i>Botrychium lanceolatum</i>	S2					
northwestern grapefern	<i>Botrychium pinnatum</i>	S3					
spatulate grape fern	<i>Botrychium spatulatum</i>	S2					
browned sedge	<i>Carex adusta</i>	S1					
lens-fruited sedge	<i>Carex lenticularis var. dolia</i>	S1					
slender hawk's-beard	<i>Crepis atribarba</i>	S2					
Steller's rock brake	<i>Cryptogramma stelleri</i>	S2					
mountain bladder fern	<i>Cystopteris montana</i>	S2					
Macoun's whitlow-grass	<i>Draba macounii</i>	S2					
Porsild's whitlow-grass	<i>Draba porsildii</i>	S1S2					
whitlow-grass	<i>Draba ventosa</i>	S2					
western oak fern	<i>Gymnocarpium disjunctum</i>	S1					
Parry's rush	<i>Juncus parryi</i>	S2					
small-flowered rockstar	<i>Lithophragma parviflorum</i>	S2					
slender naiad	<i>Najas flexilis</i>	S2					
northern locoweed	<i>Oxytropis campestris var. davisii</i>	S2?					
hot-springs millet	<i>Panicum acuminatum</i>	SU					
Gaston's cliff brake	<i>Pellaea gastonyi</i>	S1					
smooth cliff brake	<i>Pellaea glabella ssp. occidentalis</i>	S1	May Be At Risk				
whitebark pine ⁸	<i>Pinus albicaulis</i>	S2		Endangered	Endangered	Endangered	Endangered
limber pine	<i>Pinus flexilis</i>	S2		Endangered	Endangered	Endangered	
Hooker's cinquefoil	<i>Potentilla hookeriana</i>	S2					
smooth-leaved cinquefoil	<i>Potentilla multisepta</i>	S2					
Colorado cinquefoil	<i>Potentilla subjuga</i>	S1					
Sitka romanzoffia	<i>Romanzoffia sitchensis</i>	S2					
pale blue-eyed grass	<i>Sisyrinchium septentrionale</i>	S3					
Eaton's aster	<i>Symphotrichum eatonii</i>	S2					

¹List generated from ACIMS (Government of Alberta 2014a)

²Status Ranks as Identified Below (Government of Alberta 2014a)

Conservation Status	Definition
S#	Subnational (i.e., provincial) conservation status rank
1	Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s).
2	Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors.
3	Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors.
4	Apparently secure. Taxon is uncommon but not rare. Potentially some cause for long term concern due to declines or other factors.
5	Secure. Taxon common, widespread and abundant.
NR	Not ranked. Conservation status not yet assessed.
S#S# /	A numeric range rank is used to indicate any range of uncertainty about the status of the taxon. Example - S2S3 or S1S3.
U	Taxon is currently unrankable due to lack of information or substantially conflicting information. Example - native versus non-native status not resolved.
?	Inexact numeric rank. Applied when a specific rank is most likely appropriate but for which some conflicting information or unresolved questions remain. Example - S2? Believed to be 6 - 20 occurrences but some uncertainty.

³General Status of Alberta Wildlife (Government of Alberta 2010).

⁴Endangered Species Conservation Committee (Government of Alberta 2014c).

⁵Alberta Wildlife Act (Province of Alberta 2000).

⁶Committee on the Status of Endangered Wildlife in Canada (Government of Canada 2014).

⁷Species at Risk Act (Government of Canada 2002).

⁸Also identified in Parks Canada Biotic Web Explorer (Parks Canada 2013).