

PARKS CANADA AGENCY

ENVIRONMENTAL IMPACT ANALYSIS FOR ROCK SCALING AND REMEDIATION WORK IN GLACIER NATIONAL PARK, TRANSCANADA HIGHWAY



REPORT

MAY 2013
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EXECUTIVE SUMMARY

Parks Canada Agency (PCA) retained EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA), to complete an Environmental Impact Analysis (EIA) related to remediation works proposed for rock and soil slopes located along the TransCanada Highway (TCH) between km 17.543 and 43.828 from the Glacier National Park (GNP) western boundary (Project Area; Figure 1). The remediation works will occur at six locations within a 26.285 km stretch of TCH. The sites range from rock and soil cut slopes to natural slopes.

The proposed work is based on findings from an inspection of high priority rock and soil slopes in GNP, conducted by EBA in September 2011. Suggested remediation strategies involve improving a catchment ditch, mechanical removal of loose material on the slopes (scaling), installation of concrete guardrails, removal of deteriorating features (trim blasting), or installation of rock anchors or shotcrete (EBA 2012).

The scope of the EIA included a review of background, online data. No environmental site visit was undertaken for this assessment; however, species specific information obtained from the Mount Revelstoke and Glacier national parks (MRG) Field Unit has been incorporated. Watercourses, including fish-bearing and tributaries to fish-bearing waters and sensitive ecosystems have been identified in the general Project Area and have the potential to be impacted by the project. Mitigation measures have been established for those sites with potential risks. MRG staff may exercise the right to conduct site specific visits to identify, assess and delineate sensitive areas. This report is an analysis of the potential effects to local vegetation, wildlife, cultural and heritage resources and aesthetic and visual values as a result of the proposed remediation works for rock and soil slopes located along the TCH between km 17.543 to 43.828.

Review of background environmental information and Project activities resulted in the identification of potential impacts to Valued Ecosystem Components (VECs) as a result of rock and soil slope remediation within the Project Area. EBA concludes that predicted impacts which may result from the proposed project activities can mostly be mitigated within the timeframe of the project.

Potential impacts from the proposed remediation activities include potential habitat alteration/loss as well as the loss of the SARA listed Coeur d'Alene salamander (*Plethodon idahoensis*) individuals, impacts to fish and fish habitat; wildlife avoidance of the area due to noise from the proposed works; loss or disturbance of local vegetation, including the SARA-listed Whitebark Pine (*Pinus albicaulis*) as a result of blasting and excavation activities; and impacts to air quality and aesthetic and visual components of site and surrounding area due to dust from blasting.

The loss of SARA listed individuals or alterations and loss of their habitat is considered significant. Other residual impacts, if the mitigation measures outlined in this report and outlined by regulatory authorities are adhered to, are expected to be of negligible to low magnitude and not significant.

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1.0 INTRODUCTION

Parks Canada Agency (PCA) retained EBA Engineering Consultants Ltd. operating as EBA, A Tetra Tech Company (EBA) to complete an Environmental Impact Analysis (EIA) related to remediation works proposed for rock and soil slopes located along the TransCanada Highway (TCH) between km 17.543 and 43.828 from the Glacier National Park (GNP) western boundary (Project Area; Figure 1). The remediation works will occur at six locations within a 26.285 km stretch of TCH. The sites range from rock and soil cut slopes to natural slopes. The proposed work is based on findings from an inspection of high priority rock and soil slopes in GNP, conducted by EBA in September 2011. Suggested remediation strategies involve improving a catchment ditch, routine removal of loose material on the slopes (scaling), installation of concrete guardrails, removal of deteriorating features (trim blasting) and installation of rock anchors or shotcrete (EBA 2012).

The scope of the EIA included a desktop review of background, online data. Given the proposed works, no environmental site visit was undertaken for this analysis as there were no watercourses or sensitive species or ecosystems identified in the general area deemed to be at risk of impact from the project. This report is an analysis of the potential effects to local vegetation, wildlife, and aesthetic and visual values as a result of the proposed remediation works for rock and soil slopes located along the TCH between km 17.543 and 43.828.

This EIA includes:

- The identification of project valued ecosystem components (VECs) in relation to possible effects from the project;
- An analysis of the potential effects of the remediation works;
- An analysis of the significance and geographic extent of the potential effects; and
- An outline of suggested mitigation.

2.0 PROJECT DESCRIPTION

2.1 Project Location and Components

The proposed remediation works are located along the TCH between km 17.543 and 43.828 from the GNP western boundary (Figure 1). The areas identified for rock scaling have all been scaled in the past and are part of an ongoing scaling program to maintain the highway infrastructure and ensure public safety.

Table 1 presents UTM coordinates for all chainage markings within the proposed Project Area and identify specific locations for proposed remediation works. Roadside catchment clearing is a regular and required component of the slope remediation works and will take place only at specific work locations identified along the TCH (Table 1).

Table 1: Project Site UTM Coordinates

Location	Chainage Km Start/End	UTM Coordinates Zone 11 U	
		Easting	Northing
1	17.543	464807.00 m E	5680211.00 m N
	17.858	464586.00 m E	5680381.00 m N
2	28.523	469413.00 m E	5687445.00 m N
	28.715	469460.00 m E	5687585.00 m N
3	30.861	469475.00 m E	5689584.00 m N
	31.521	469246.00 m E	5690549.00 m N
4	34.741	468763.31 m E	5693053.97 m N
	35.475	468385.35 m E	5693527.80 m N
5	36.197	467874.39 m E	5694287.12 m N
	36.747	467634.71 m E	5694787.21 m N
6	42.432	466785.81 m E	5699885.53 m N
	43.828	466707.19 m E	5701318.62 m N

The rock and soil slopes remediation will include:

- Excavation and common improvement of catchment ditches – includes the removal of accumulations of winter salts/gravels where necessary along the TCH. This is an ongoing activity following the winter season as significant amounts of gravels and debris are deposited into roadside catchment ditches which must be cleared to ensure the catchment has adequate volume available for fallen rock and debris. Catchment ditches which are suitably large enough will only require removal of post-remediation materials fallen from rock slopes. Following slope remediation, removal of accumulated construction debris (rock fall) from catchment areas identified in Table 1 will be required for all locations. Rock and other debris which falls into the catchment area is loaded into a truck with an excavator. Clearing along the TCH may also include the removal of roadside vegetation within the catchment;;
- Scaling – manual removal of loose material on rock slopes using pry bars, hydraulic press, brooms, shovels and suitable power equipment by personnel using roped access to a rock face;
- Trim blasting – controlled blasts in which explosive charges are placed within a predetermined pattern of holes drilled into the unstable rock followed by detonation;
- Installation of rock anchors or shotcrete;
- General limited clearing of vegetation may be required for safety reasons for all tasks;
- Removal temporary signage;
- Installation of concrete guardrails at specific sites, and
- Repair of damaged road surface, if required.

2.2 Consumptive Use of Natural Resources During Construction

Significant quantities of natural resources are not anticipated to be consumed given the scope of the proposed remediation works.

2.3 Project Timing

Precise start and end dates are currently unknown, however it is expected that the rock slope remediation will occur during the spring, summer or fall periods in 2013, 2014, or 2015. Project planning considerations should include potential disturbance during sensitive wildlife windows. Construction during the spring overlaps breeding seasons of several wildlife species, including mountain goats, and amphibians. Section 7 describes mitigation measures to reduce likelihood of effects to breeding wildlife.

3.0 METHODS

3.1 Data Collection

An information review for the six areas of proposed remediation was conducted. Multiple sources were reviewed to establish baseline information for species and ecosystems historically recorded at or near the Project Area:

- British Columbia Conservation Data Centre (CDC) Internet Mapping Service;
- British Columbia Species and Ecosystems Explorer;
- Biogeoclimatic Ecosystem Classification;
- Environment Canada Species at Risk Public Registry;
- Parks Canada Biotics Web Explorer, and;
- MRG Field Unit staff.

4.0 BIOPHYSICAL INVENTORY

4.1 Regional Context

The proposed remediation works are located within the Selkirk Mountain Range which is part of the larger Columbia Mountain Range. The Project Area falls predominantly within the Interior Cedar Hemlock biogeoclimatic zone (ICH) with exception of the location south of Rogers Pass which occurs within the Engelmann Spruce Subalpine Fir zone (ESSF). In southeastern BC this zone occupies the lower elevations (400 – 1500 m) of the Columbia Mountains. The ICH also extends to the western portion of the continental divide within the Rocky Mountains, a large portion of the Shuswap and Quesnel highlands, and parts of the Nass Basin, Hazelton and Skeena mountains in western BC.

The climate within the ICH is typically interior, continental, influenced by easterly moving air masses which result in cool wet winters and warm dry summers. Mean annual temperatures range from 2 to 8.7 °C; the

large range is the result of wide latitudinal span of the ICH. In zonal ecosystems, Humo-Ferric Podzols represent the dominant soil development. In wetter sections of the ICH Ferro-Humic Podzols are commonly found; however, in the drier sections brunisolic developments are common. The typical depth for soil development is 1 m (B.C. Ministry of Forest and Range 2011).

4.2 Local Context

There are multiple sites for the proposed remediation works located between km 17.543 and 43.828 from the GNP western boundary along the TCH. The proposed remediation sites are located both east and west of Roger's Pass.

4.2.1 Topography

The sites are located within the Columbia Mountain Range and more specifically the Selkirk Mountain Range. These ranges are characterized by rugged mountains with steep, deep, narrow valleys. Ice fields and glaciers can be found in these regions in addition to waterfalls and numerous avalanche paths (Parks Canada, 2009).

4.2.2 Vegetation

Vegetation within the ICH landscape is typically dominated by upland coniferous forests. Comparatively, the ICH has the largest diversity of tree species than any other biogeoclimatic zone in BC. Dominant climax species within the ICHmw3 and ICHwk1 include western red cedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*) while Douglas-fir (*Pseudotsuga menziesii*), lodgepole pine (*Pinus contorta*), western white pine (*Pinus monticola*), hybrid white spruce (*Picea engelmannii x glauca*), subalpine fir (*Abies lasiocarpa*), trembling aspen (*Populus tremuloides*), and common paper birch (*Betula papyrifera*) are also common seral species except lodgepole pine and trembling aspen which are rare in the wk1 variant of ICH. Typical understory species include black huckleberry (*Vaccinium membranaceum*), oval-leaved blueberry (*Vaccinium ovalifolium*), devils club (*Oplopanax horridus*) and falsebox (*Paxistima myrsinites*) (Braumandl and Curran 2002).

Climax tree species within the ESSFvc include: Engelmann spruce (*Picea engelmannii*), subalpine fir and mountain hemlock (*Tsuga mertensiana*) while western hemlock and western red cedar can be found at lower elevations of the variant. White flowered rhododendron (*Rhododendron albiflorum*) is a characteristic shrub of the ESSF and along with black huckleberry (*Vaccinium membranaceum*), oval-leaved blueberry and false azalea (*Menziesia ferruginea*) are common understory shrubs (Braumandl and Curran 2002). Whitebark Pine (*Pinus albicaulis*) is infrequent but not uncommon to GNP and may be found at the treeline on west-south rocky outcrops. White bark pine is a blue-listed S3 species in BC, is ranked as Endangered and designated as a Schedule 1 species under the *Species at Risk Act* (SARA).

The CDC Internet Mapping Tool was used to determine potential occurrences of vegetation species of concern at or near the Project Area and to ensure that provincial biodiversity objectives are considered during Project planning. Due to the scale of the proposed remediation works, the CDC vegetation search was limited to a 1 km radius from a central location for each identified stretch of highway where physical

works are to occur. At chainage km 17.543 – 17.858, three non-sensitive element occurrences¹ were recorded. Sites km 30.861 – 31.521 and km 36.197 – 36.747 had four and two non-sensitive element occurrences respectively. A description of both the Provincial Conservation Status and the BC List Status of the identified species are included in Table 2 and Table 3 is a description of the Provincial and BC List Rankings (BC Conservation Data Centre: Conservation Data Centre Mapping Service, 2012). It is noted that a rare plant survey may be conducted at the discretion of the MRG Field Unit.

Table 2: Rare Plants Recorded in Proximity to the Rock Slope Remediation Sites

Common Name	Scientific Name	Habitat	Provincial Status	BC List Status	SARA Schedule
Km 17.543 – 17.858					
least moonwort	<i>Botrychium simplex</i> var. <i>compositum</i>	Meadows, moist to wet vernal pools and ephemeral seepages	S2S3	Blue	Not Listed
Sutherland's larkspur	<i>Delphinium sutherlandii</i>	Mesic to dry shrublands, open forests. Found over shallow soils within avalanche chutes and bedrock outcrops	S2S3	Blue	Not Listed
western St. John's-wort	<i>Hypericum scouleri</i> ssp. <i>nortoniae</i>	Wet-meadows	S2S3	Blue	Not Listed
Km 30.861 – 31.521					
mountain moonwort	<i>Botrychium montanum</i>	Mesic, shady coniferous forests, riparian habitat, old growth forests	S1	Red	Not Listed
Dainty moonwort	<i>Botrychium crenulatum</i>	Marshy meadows, springy places in montane zone, highly saturated soils, riparian habitat	S2S3	Blue	Not Listed
crested wood fern	<i>Dryopteris cristata</i>	Swamps, wetlands, wet meadows	S2S3	Blue	Not Listed
blunt-sepaled starwort	<i>Stellaria obtusa</i>	Wet/moist meadows	S2S3	Blue	Not Listed
Km 36.197 – 36.747					
crested wood fern	<i>Dryopteris cristata</i>	Swamps, wetlands, wet meadows	S2S3	Blue	Not Listed
Slender spike-rush	<i>Eleocharis elliptica</i>	Lakeshores, stream sides and wet meadows	S2S3	Blue	Not Listed

Note: E-Flora BC, 2013; CDC, 2012; Environment Canada, 2012

¹ Element occurrences are areas where a species or ecological community is or was present. When element occurrences are non-sensitive this indicates that the data is not protected and may be released.

Table 3: Description of Provincial and BC List Rankings

Provincial Rank	Definition
SX	Presumed extirpated
SH	Historical (species) / possible extirpated (communities)
S1	Critically imperiled
S2	Imperiled
S3	Special concern, vulnerable to extirpation or extinction
S4	Apparently secure
S5	Demonstrably widespread, abundant, and secure
NA	Not applicable
NR	Not ranked
U	Unrankable
BC List	Definition
Red	SX, SH, S1, S1S2, S1S3, S2
Blue	S2S3, S2S4, S3
Yellow	S3S4, S3S5, S4, S4S5, S5

Note: (British Columbia Ministry of Environment, 2011)

4.2.3 Wildlife Resources

The CDC Internet Mapping Tool was used to determine potential occurrences of wildlife species of management concern within a 9 km radius from a central location within each of the identified Project areas. See Appendix B for the map generated by CDC.

Caribou (*Rangifer tarandus* pop. 1), a red-listed species, was reported to occur at or near all six sites within the Project Area. The population specific to the Project Area is the Southern Mountain Population (SMP) part of which is the Columbia South herd (BC Conservation Data Centre: Conservation Data Centre Mapping Service, 2012). This Caribou population is red-listed, ranked provincially as S1 and as Threatened under the *Species at Risk Act* (SARA). The Columbia South herd ranges through both Mount Revelstoke and Glacier National Parks.

The Southern Mountain population (SMP) of Caribou differ from other Caribou as their range varies by elevation in response to seasonal change as opposed to laterally. Specifically the Columbia South herd have adapted to the deep snow characteristic of the region, and use the deep snow pack to reach lichen growing on trees (Parks Canada, 2012). According to Thomas and Gray 2002, the SMP Caribou use low slopes and valley bottoms in early winter, moving to higher elevations when then snow pack deepens in mid to late winter where their diet is predominantly arboreal lichens. In spring, the Caribou descend to lower elevations to access other vegetation. Pregnant Caribou will move migrate upwards in elevation to older forests in May through June to birth their calves. They tend to prefer isolated areas with low predator densities, for example: islands in lakes, lakeshores, forests and tundra (Thomas and Gray 2002). Rutting typically takes place during the fall season (Parks Canada, 2012). See Table 3 for descriptions of rankings.

Mountain goats (*Oreamnos americanus*) are also frequently observed within GNP, where they use rocky bluffs as escape terrain including some locations identified for scaling. Grizzly bear (*Ursus arctos*) is known

to occur within GNP and is listed as a species of Special Concern by COSEWIC. Another species of Special Concern known to inhabit that area is the Wolverine (*Gulo gulo*) and may occur at or near the Project areas.

The Northern Myotis (*Myotis septentrionalis*) is ranked provincially as S2S3 and is blue-listed in BC. The Northern Myotis hunt nocturnally and typically emerge after sunset. Habitat used to hunt includes small ponds, forest clearings and forest edges at a height of 1 to 3 meters. Winter hibernacula are generally solitary or can occur in small groups. Narrow crevices are preferred where temperatures can be as low as 1.6 °C. Other species of bats are generally present. Hibernation usually begins after one or two killing frosts in September when there are no longer sufficient insects available for forage. During the summer months the Northern Myotis typically roost in crevices behind peeling bark or cavities of decaying trees. Such trees tend to be located in over-mature forest stands (Gill, 2007). Another bat species of management concern within the Park is the Little Brown Myotis (*Myotis lucifungus*); ranked provincially as S5 and is yellow-listed within BC. This bat species is not listed on any schedules of SARA; however, has been assessed as Endangered by COSEWIC 2012 due to recent high mortalities as a result of extensive spread of the White-nose Syndrome (WNS) (Forbes, 2012). The Little Brown Myotis uses caves and hollow trees but has also adapted to human-made structure for resting and maternity sites and generally forage in forested areas near water (BC CDC 2012).

The Coeur d'Alene Salamander is a blue-listed S3S5 species in BC and ranked as a species of Special Concern under the *Species at Risk Act* (SARA). This species lacks lungs and breathes through their skin, it requires moist, shady habitat which could include: rockwalls with flowing seepages or streams, waterfall splash zones, caves, streams with exposed bedrock, avalanche paths and moist talus. They are very unlikely to occur if rocky areas are devoid of moisture (Environment Canada, 2012). Based on these required habitats for the Coeur d'Alene salamander (*Plethodon idahoensis*) there is potential for them to exist within Km 28.523 through to km 36.747 near locations 2, 3 and 4.

The Western Toad (*Anaxyrus boreas*) is known to occur at lower elevations within GNP. The Western Toad is a blue-listed S3S4 species in BC and ranked as a species of Special Concern under SARA. This species spends a large majority of their time in terrestrial habitats including forested areas, moist shrublands, meadows and avalanche slopes. A wide variety of habitats are used by this species for breeding ranging from natural lakes to roadside ditches (Environment of Canada, 2012).

The Olive-sided Flycatcher is a blue-listed S3S4B species in BC and is ranked as Threatened under SARA. Habitat for this species generally constitutes open areas with tall trees or snags for perching including forest clearings, openings near water bodies or cut-blocks. Foraging occurs from high vantage points targeting flying insects (Environment of Canada, 2012). Another bird species at risk with potential to exist within GNP includes the Bank Swallow (*Riparia riparia*) is a species currently designated as a candidate for an upcoming assessment by COSEWIC and is yellow-listed within BC. There are approximately 183 species of birds found within Glacier and Mount Revelstoke National Parks. The diversity of bird species increases from May to August during the breeding season (Parks Canada, 2012a).

Two invertebrate species at risk, the Pale Jumping Slug (*Hemphillia camelus*), a blue listed S3 species in BC and the magnum mantleslug (*Magnipelta mycophaga*) a blue-listed S2S3 species in BC and designated as Special Concern also have potential to occur within the GNP. These species prefer moist coniferous forest habitat, including downed logs, depressions and within talus (BC CDC 2012).

Following a review of relevant information on the habitats present within the Project Area and potential Project related interactions with wildlife populations, it was determined that a wildlife field survey was not required and therefore was not conducted during the preparation of this EIA. Wildlife mitigation measures, including pre-work surveys for species of management concern, are included in Section 7.0.

4.2.4 Fisheries Resources

The Ministry of Environment’s Habitat Wizard database and MRG fish inventory information (based on recent electrofishing effort) were used to identify watercourses within 300 m of each of the six sites. To ensure the entire area of each site was investigated a 300 m search was conducted at both beginning and end kilometer markings for each site. Fish-bearing watercourses were identified within the Project Area including the Illecillewaet River, Beaver River and their tributaries. No fish or fish habitat surveys were conducted.

Km 17.543 to 17.858

This site is located within 300 m of the Illecillewaet River (watershed code: 360). According to the Habitat Wizard stream report for the Illecillewaet River, identified fish species present are included in Table 4:

Table 4: Fish Species Present in the Illecillewaet River

Bridgelip Sucker (<i>Catostomus columbianus</i>)	Brook Trout (<i>Salvelinus fontinalis</i>)
Bull Trout (<i>Salvelinus confluentus</i>)	Kokanee (<i>Oncorhynchus nerka</i>)
Lake Chub (<i>Couesius plumbeus</i>)	Mountain Whitefish (<i>Prosopium williamsoni</i>)
Rainbow Trout (<i>Oncorhynchus mykiss</i>)	Sculpin (General) (<i>Cottus</i> spp.)
Torrent Sculpin (<i>Cottus rhotheus</i>)	Westslope (Yellowstone) Cutthroat Trout (<i>Oncorhynchus clarkii lewisi</i>)

Km 28.523 to 28.715

This site is located within 300 m of Connaught Creek (watershed code: 300-885700-39500). Habitat wizard did not identify fish species within this water body; however, the MRG fish inventory identified bull trout within the creek near Rogers Pass (Figure 1). Connaught Creek is a tributary of the Beaver River. The Beaver River and its tributary Grizzly Creek, both fish-bearing watercourses, are located east and southeast of the project locations (Figure 1).

Km 30.861 to 31.521

This site is located within 300 m of the Beaver River (watershed code: 300-885700). The stream report for the Beaver River identified four fish species present as shown in Table 5:

Table 5: Fish Species Present in the Beaver River

Bull Trout	Mountain Whitefish
Rainbow Trout	Sculpin (General)

Km 34.741 to 35.475

This site is located within 300 m of Stoney Creek (watershed code: 300-885700-32400) and the Beaver River (watershed code: 300-885700). No fish species were documented for Stoney Creek. Table 5 includes fish species reported to be present in the Beaver River.

Km 36.197 to 36.747

This site is located within 300 m of the Beaver River (watershed code: 300-885700). Table 5 includes fish species present in Beaver River and unnamed tributary streams on both the west and east side of the TCH. Species present in these tributaries include westslope cutthroat trout and bull trout.

Km 42.432 to 43.828

This site is located within 300 m of the Beaver River (watershed code: 300-885700), as well as an unnamed tributary (watershed code: 300-885700-13900). See Table 5 for fish species present in Beaver River.

4.2.5 Cultural or Heritage Resources

Project locations are located both north and south of Roger's Pass, a National Historic Site of Canada located in the centre of GNP and a popular area for ski touring and mountaineering (Parks Canada, 2009).

4.2.6 Visual and Aesthetic Resources

The Project Area is located within the Selkirk Mountain ranges known for rugged mountain tops and dramatic landscapes. The TCH is the main roadway through GNP, which combined with the recreational and aesthetic draws for tourism, can lead to high seasonal variations in traffic.

5.0 IDENTIFICATION OF VALUED ECOSYSTEM COMPONENTS

5.1 Introduction

Environmental impact analysis is used as a planning tool during the conceptual design phase of a project to identify potential environmental effects of a project and ensure they receive careful consideration before they are undertaken (Canadian Environmental Assessment Agency [CEAA] 2012). Environmental impact analysis for a project is a transparent process involving multiple steps which include:

- Determination of VECs;
- Identification of project activities that may interact with VECs;
- Identification of potential impacts that could interact with VECs as a result of the project;
- Identification of mitigation measures that can be used to reduce impacts;
- Determination and characterization of residual environment effects;
- Determination of the significance of any residual environmental effects; and
- Determination of cumulative effects of the project.

5.1.1 Determination of Valued Ecosystem Components

Following the background review of environmental information, potential VECs were identified for this project, including biological resources (vegetation and wildlife) and visual and aesthetic values. The potential VECs were assessed to determine if they are present in the Project Area and if they are subject to stakeholder or regulatory concern. Based on these criteria and the professional judgement of the study team, EBA professionals used this information to determine the final VEC selection for the purposes of the environmental impact analysis for this project.

5.1.2 Identification of Project Activities that May Interact with Valued Ecosystem Components

Project activities that may interact with VECs are identified by investigating the various components of the project that have potential effect pathways to the receiving environment. The potential effects pathway for this project involves remediation works proposed for rock and soil slopes in GNP. The project pathway was compared to the list of identified VECs and the interactions were documented for further consideration in the EIA process (See Section 6.3.1, Table 8).

5.1.3 Identification of Potential Impacts on Valued Ecosystem Components

The documented interactions between the project pathway and the VECs are used to identify potential impacts. Knowledge of both the project and VECs are used to identify potential adverse effects of the project on the environment.

5.2 Determination of the Significance of Impacts

5.2.1 Determination of the Significance of Any Residual Environmental Effects

Assigning residual impact significance is required to determine if a project is “likely to cause significant adverse environmental effects, taking into account the implementation of mitigation” (CEAA, Section 20-1). When considering significance relative to a project or a project’s components, the concepts of “adverse” and “likely” have been incorporated (Federal Environmental Assessment Review Office 1994).

EBA has chosen a transparent method of significance determination, as presented in Table 6.

Table 6: Significance Rating Criteria

Impact Magnitude	Geographic Extent	Duration	Significance
Negligible	Any	Any Duration	Not Significant
Low	Any	Any Duration	Not Significant
Moderate	Local	Any Duration	Not Significant
	Project Area (km 17.543 to 43.826 in GNP)	Short-term	Not Significant
		Medium-term	Not Significant
		Long-term	Significant
	Park-wide	Short-term	Not Significant
		Medium-term	Significant
		Long-term	Significant
	Regional	Short-term	Not Significant
		Medium-term	Significant
		Long-term	Significant
High	Local	Short-term	Not Significant
		Medium-term	Not Significant
		Long-term	Significant
	Project Area (km 17.543 to 43.826 in GNP)	Short-term	Not Significant
		Medium-term	Significant
		Long-term	Significant
	Park-wide	Any Duration	Significant
	Regional	Any Duration	Significant

6.0 IMPACT ANALYSIS

6.1 Project Land Use Description, Construction and Engineering

The rock and soil slopes remediation will include works described in Section 2.1.

6.1.1 Determination and Characterization of Residual Environmental Effects

Residual effects are those that remain following the application of mitigation measures. They can be characterized by their direction, magnitude, geographic extent, frequency, duration, and reversibility (Table 7).

Table 7: Residual Impacts Rating Criteria

Criteria	Rating Term	Definition
Direction	Positive	Beneficial change.
	Neutral	No change.
	Negative	Adverse change.
Geographic Extent	Local	Effect is limited to the footprint of the project site.
	Area Surrounding Project Area (km 17.543 to 43.826 in GNP) on Highway 1	Effect extends to an area immediately surrounding the project footprint.
	Park-wide	Effect has implications to Glacier National Park.
	Regional	Effect extends beyond Glacier National Park.
Duration	Short Term	Effect present during construction or less.
	Medium Term	Effect remains for remediation phase.
	Long Term	Effect last beyond decommissioning of property.
Frequency	Once	Effect occurs once during remediation.
	Intermittent	Effect occurs periodically.
	Continuous	Effect occurs continuously during remediation.
Reversibility	Reversible	Effect is reversed after the activity ceases.
	Partially-reversible	Effect is partially reversed after the activity ceases.
	Non-reversible	Effect will not be reversed when activity ceases.
Magnitude	Negligible	No measurable impacts.
	Low	Potential impact may result in slight decline in resource in/on the property during the life of the project. Research, monitoring, and/or recovery initiatives would not normally be required.
	Moderate	Potential impact could result in decline in resource to lower-than-baseline, but stable levels on the property after project closure. Regional management actions such as research, monitoring, and/or recovery initiatives may be required.
	High	Potential impact could threaten sustainability of the resource and should be considered a management concern. Research, monitoring, and/or recovery initiatives should be considered.

6.2 Selection of Valued Ecosystem Components

VECs were selected if they are present at or near the Project locations and are of stakeholder or regulatory concern. Based on these criteria it was determined that vegetation, wildlife, cultural or historical resources and visual and aesthetic values are VECs for this Project.

6.3 Potential Project Impacts

6.3.1 Project Activities that May Interact with Valued Ecosystem Components

The interactions between the VECs and Project activities were identified by investigating the various components of the project that have the potential to affect the receiving environment. The identified interactions were documented for further consideration in the EIA process. Table 8 shows the potential

Project-VEC interactions based on the anticipated pathways from the planned remediation work (EBA 2012).

Table 8: Project Pathways

Project Activity	Vegetation	Wildlife	Fisheries	Cultural and Heritage	Visual and Aesthetic	Applicable Mitigation
Proposed Remediation Works						
Common excavation and catchment ditch improvement	X	X	X	X	X	7.2.1; 7.2.2; 7.2.3; 7.2.4; 7.2.5
General vegetation clearing	X	X	X		X	7.2.1; 7.2.2; 7.2.3; 7.2.5
Rock scaling	X	X	X	X	X	7.2.1; 7.2.2; 7.2.3; 7.2.4; 7.2.5
Trim blasting	X	X	X	X	X	7.2.1; 7.2.2; 7.2.3; 7.2.4; 7.2.5
Installing of rock anchors or shotcrete		X	X		X	7.2.2; 7.2.3; 7.2.5
Installing concrete guardrails			X		X	7.2.3; 7.2.5
Equipment and material transport	X	X	X			7.2.1; 7.2.2; 7.2.3; 7.2.5
Garbage generated by on-site activities		X	X		X	7.2.2; 7.2.3; 7.2.5
On-site handling of deleterious substances	X	X	X		X	7.2.1; 7.2.2; 7.2.3; 7.2.5

6.3.2 Potential Impacts on Valued Ecosystem Components

After the Project-VEC interactions have been established, the potential impacts can be identified. Knowledge of both the project and VECs are used to identify potential adverse effects of the project on the environment. The following three sections outline the potential negative impacts to all identified VECs as a result of the proposed Project activities.

6.3.3 Biological Impacts

6.3.3.1 Vegetation

Vegetation is established along the cliff edges of most sites and those plants closest to the edge may need to be removed for safety considerations. Permanent loss of vegetation is a potential negative impact due to Project activities, particularly if Whitebark Pine exists in these locations. Other potential impacts to vegetation include dust settling on surrounding areas and a spill of deleterious substances or the introduction of non-native species on disturbed sites, brought to the area by construction equipment.

The CDC review indicated that nine species of concern have known occurrences within a 1 km radius at three of the six proposed project areas (Table 1). Of these nine species, eight require moist habitat

including wet meadows, riparian habitat, bogs and swamps. Due to the relatively dry nature of the rock slopes these species are not likely to occur at or near the proposed project locations. Locations for staging and stockpiling will be identified in collaboration with PCA in order to avoid moist habitats. Sutherland's larkspur; however, prefers shallow soils found over avalanche chutes and bedrock within mesic to dry shrub lands and open forests and occurs near one of the six proposed work areas (km 17.543 – 17.858). This occurrence documented approximately 20 plants in a large avalanche chute growing in shallow soil over bedrock in 2004. This occurrence is greater than 500 m away from the proposed Project location and therefore impacts are not expected. Furthermore, it is not likely that the Sutherland's larkspur will occur within the proposed Project Areas due to their disturbed nature and lack of soil resulting from routine rock-face maintenance.

6.3.3.2 Wildlife

There is potential for impact/mortality to Coeur d'Alene salamanders as a result of proposed works on rock faces (scaling) which may change climatic (moisture, temperature) and hydrological habitat conditions due to vegetation and rock removal and potential shifts to water source patterns. The clearing of catchment ditches composed of fine gravels and organics will not likely result in salamander mortality, however, clearing of ditches composed of existing talus and broken rock may, particularly in locations 2, 3 and potentially 4 (Figure 1).

Western Toads are known to occur in the Project Area, particularly along the western portion of the TCH at locations 2 through 5, and have been known to breed within roadside ditches. Therefore, pre-work catchment ditch clearing along the TCH and post-remediation debris clearing in general have potential to impact breeding amphibians, including the Western Toad. In addition, side-casting of overburden and equipment staging activities have potential to impact Western Toad habitat along the western side of the TCH. In general, where there is adequate volume within a catchment ditch adjacent to a roadway such that there is potential for water storage and ponding, clearing will generally not have to occur, further limiting the potential impact to pond-breeding amphibians.

Noise from blasting and construction as well as human presence/proximity could potentially cause avoidance behaviour in local wildlife particularly the Caribou, Mountain Goat and Northern Myotis; this is a potential short-term negative effect. Given the nature and timing of the blasting and the seasonal distribution of Caribou, Mountain Goats and Northern Myotis, it is expected that potential impacts will be observed as avoidance behaviour.

Dust generated from on-site activities could potentially affect air quality and have a short-term negative effect on local wildlife. Further short-term negative effects could occur from dust should large volumes of it settle in surrounding water ways. Improper management of food and on-site waste could result in potential for wildlife attraction and human interaction. Highway traffic, the risk of collisions with wildlife and human interaction with wildlife could have an impact on local wildlife, particularly local bears and goats. It is not anticipated that the proposed work would result in increased traffic therefore the risk is not likely to be more than during normal park operations.

Vegetation removal can directly impact breeding birds during the nesting season and other species dependent on trees. Spills of deleterious substances and/or the removal of vegetation could result in potentially negative impacts to habitat or individuals.

6.3.4 Fisheries Resources

Fish-bearing watercourses have been identified within or near each of the proposed project locations. Potential impacts to fish and fish habitat may result from the proposed remediation works such as loss of riparian habitat through vegetation clearing and ditch clearing, reduced water quality as a result of inputs of deleterious substances (sediment, cementitious materials, hydrocarbons and work-site refuse) to watercourses or their tributaries due to erosion or slope stability issues and spills or leaks from equipment (Table 8).

6.3.5 Cultural/Historical Resource Impacts

Remediation sites are located both north and south of Roger's Pass, a National Historic Site of Canada located in the centre of GNP and a popular area for ski touring and mountaineering (Parks Canada, 2009). Project works are not going to occur at or adjacent to Roger's Pass and no impacts to cultural and historical resources are expected to occur as a result of the proposed remediation activities.

6.3.6 Aesthetic and Visual Impacts

The following are potentially short-term negative impacts to aesthetic and visual values as a result of the proposed remediation works: dust, noise, presence of construction equipment, extra signage and parked vehicles along the highway. Blasting, heavy equipment and power tools will produce noise and emissions. This section of the TCH is used by tourists, recreationalist and commercial transportation. The experience of TCH users could be negatively impacted should the proposed remediation activities not be properly controlled.

7.0 MITIGATION RECOMMENDATIONS

7.1 Identification of Mitigation

Mitigation measures can be applied by adhering to operational protocol or through project design alterations adopted by the Project to lessen impacts to the identified VECs. It is recommended that an Environmental Management Plan (EMP) is prepared in accordance with PCA Environmental Procedures and incorporating mitigation measures described below. An on-site environmental professional (Environmental Monitor) shall be utilized for construction/effects monitoring intermittently over the construction period or according to regulatory approval criteria. In addition, it is expected that all staff and contactors will understand and comply with all National Park regulations within the Park. Pre-work briefings/meetings are recommended to address environmental sensitivities within the Project Area and where required by PCA, pre-work wildlife surveys. The Contractor shall also be aware of sensitive wildlife windows described above. Where works are scheduled to occur around important windows (breeding, nesting etc.) consultation with PCA is recommended.

7.2 Mitigation Methods

7.2.1 Mitigation of Vegetation Impacts

The following mitigation measures are suggested to reduce the potentially negative impacts to vegetation:

- The MRG Field Unit may, at their discretion, request a rare plant inspection (to identify rare plants such as Mountain Moonwort and Whitebark Pine) on rock faces or within catchment ditches prior to works beginning. EBA employs appropriately qualified biologists and can undertake pre-work inspections.
- No vegetation clearing is to occur without prior notification of the Environmental Assessment coordinator and/or responsible biologist. Further, no clearing is to take place within the MRG Bird Nesting window of April 1 through August 31. Any variance for vegetation removal must be obtained from the FU Superintendent in advance of works (Parks Canada 2012b).
- No clearing of Whitebark Pine or other rare or endangered vegetation is to occur without acquisition of appropriate permits (e.g. SARA).
- In areas where vegetation loss is unavoidable, MRG Re-vegetation Guidelines are to be incorporated into a restoration plan (Parks Canada 2011).
- Limit traffic (foot or vehicle) on exposed soils to reduce soil compaction.
- Efforts shall be made to ensure the minimum amount of vegetation is cleared or disturbed at each site.
- Prior to accessing the site, construction equipment, particularly tire treads, shall be pressure washed to prevent the introduction of non-native species.
- Should non-native species be identified on-site and are suspected to have occurred during construction, PCA shall be notified and the appropriate removal should be undertaken.
- Should side-casting, staging or stockpiling need to occur, it will only be at locations specified by PCA which have approved waste sites along the TCH.
- Spills on-site should be managed in accordance with methods outlined in section 7.3 of this document.
- Should impacts to surrounding vegetation be detected, appropriate measures to re-vegetate and rehabilitate should be implemented using MRG approved methods and seed mix. If soil is imported due to loss of vegetation it should be free of invasive plants.

7.2.2 Mitigation of Wildlife Impacts

The following mitigation measures are suggested to reduce the potentially negative impacts to wildlife:

- Works shall be scheduled to occur outside sensitive wildlife periods (nesting, rutting, breeding etc.) as much as possible. Where works are required to occur within sensitive wildlife periods, care will be taken to prevent the disturbance or harm during the remediation activities.

- All wildlife sightings will be immediately reported to PCA personnel on a regular basis. PCA shall be notified immediately in the event of human-wildlife interactions, or activity or encounters with bears, goats, cougars, caribou, wolverine or any species at risk.
- 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.
- All food and garbage should be stored in vehicles and removed from site daily.
- Where catchment ditch clearing is required prior to remediation works to increase catchment ditch area, ditches containing water shall be inspected for breeding amphibians. EBA employs appropriately qualified biologists and can undertake pre-work inspections. Timing of ditch clearing activities shall be scheduled to avoid sedimentation during periods when larvae or eggs may be destroyed, if possible. Any locations deemed to be permanent amphibian habitat by PCA shall be identified and avoided. If these areas are required for ditch clearing works, PCA shall be consulted to determine appropriate actions to avoid amphibian mortality.
- Should any large trees meeting habitat requirements for Northern Myotis or Little Brown Bat be marked for clearing, the on-site Environmental Monitor or MRG Field Unit should inspect the tree for presence.
- Should vegetation removal be required, the Environmental Assessment Coordinator and/or responsible biologist must be contacted prior to disturbance as per the MRG Bird Nesting Guidelines. The general bird nesting window for MRG is April 1 to August 31. Variance from this window must be obtained from the FU Superintendent.
- Prior to blasting and periodically during scaling, the Contractor shall “sweep” the work area and maintain a continuous watch for wildlife that may be present. If wildlife is present, work shall be halted until the wildlife have passed through the area and/or have been hazed out of the area by the ESO appropriately qualified biologist.
- Should blasting or construction works take place within the calving window of late May early June, any caribou presence or signs should be reported immediately to PCA and work shall be halted until approval is issued.
- Species at risk could potentially be observed on or near the Project locations. Should this occur, operations in the immediate vicinity of the species should be halted and should re-commence only when the species has left the immediate area. PCA Resource Conservation staff shall be notified immediately via Jasper Dispatch.
- All work activities shall meet or exceed the standards outlined in DFO’s “Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters”; Canadian Technical Report of Fisheries and Aquatic Sciences 2107, 1998.
- Best Management Practices for working in and around water will be applied when working near water courses. Considerations for working near water, such as erosion and sediment control measures, are to be incorporated into the project EMP.

- Construction traffic should yield right-of-way to wildlife. A Traffic Safety Plan will incorporate protocol for wildlife occurrences along roads within the project area, due to presence of mountain goats and bears which can both be aggressive towards humans.
- Firearms and pets are prohibited on site.
- Spills on-site should be managed in accordance with methods outlined in this document.

7.2.2.1 Mitigations of Coeur d'Alene Salamanders Impacts

Mitigation goals related to Coeur d'Alene Salamanders include:

- Microhabitat conditions are maintained such that streamside moisture levels and natural flow regimes of watercourses are unaltered;
- Structural habitat (rock fissures, talus) integrity remains intact and is protected from blasting or siltation, and;
- Populations are protected from physical disturbance and direct mortality.

To meet these goals, mitigation measures shall emphasize avoidance of siltation, changes to watercourses and changes to the climatic conditions via vegetation removal and increased solar inputs. On a particular rock slope if the presence of Coeur d'Alene Salamanders is considered likely their presence will be confirmed prior to the start of any work on a slope. This will be directed by a PCA representative and a qualified biologist will, using roped access techniques, investigate parts of a rock slope where salamanders are likely to occur such as moist open or gapped joints, fissures and other discontinuities. This species requires moist habitat and if rock areas are devoid of moisture they will not occur. Inspections will occur during overnight periods following or during wet weather, during which the chance of observing this species is considered to be higher than might otherwise be the case. The inspection will use methods based on Cassirer et al. 1994 and RISC standards No. 36 (BC MOE, 1999).

In the event that salamanders are detected the PCA MRG Field Unit ecologist team leader will be notified. Rock slope remediation work may continue, however, the techniques used will be modified to take into account the salamander presence. Rock scaling using pry bars and mechanical methods to remove loose rock may continue. However, rock scaling will not use high pressure compressed air or water to scale the rock face.

In the event that trim blasting is the only option, having exhausted all alternatives to stabilize the rock slope, a limited capture, hold, release program may be initiated in consultation with the MRG Field Unit and conducted under appropriate permits and approvals. If there is a requirement to capture, temporarily hold and release salamanders, methods described above and in RISC Standard No. 3 (Live Animal Capture and Handling Guidelines, 1998) and by P. Ohanjanian (pers. comm) will be incorporated into appropriate permit applications prior to works. The use of 6V lanterns has previously proven effective during time-constrained surveys (Cassirer et al. 1994) to view and probe the cracks and fissures to try and detect salamanders. Salamanders to be temporarily held (not longer than 24 hours) will be kept within closed, moist containers with suitable habitat elements such as moist moss, rocks etc. and then returned,

preferably upstream² of the capture location where microhabitat conditions meet the species requirements following localized blasting, if it is necessary.

7.2.3 Mitigation of Fisheries Resource Impacts

Impacts to fisheries resources can be mitigated through application of Best Management Practices for working in or around water. Unless otherwise stated, the requirements related to sediment, drainage, and water quality management for the Project are applicable to all Project construction areas. The mitigation and monitoring measures described below will be used as the basis for preparing the final sediment, drainage, and water quality management plan:

- No works will occur instream.
- Disturbance to natural materials and vegetation that contribute to fish habitat or stream channel stability will be minimized. Should vegetation which contributes to fish habitat need to be removed, a restoration plan that meets the MRG Guidance document (Parks Canada 2011) for re-vegetation will be compiled subject to MRG review and acceptance.
- The natural rate of water flow must be maintained immediately upstream and downstream of the worksites during all phases of activity.
- Deleterious substance control and spill management will be incorporated into the project EMP/EPP and will include, but not be limited to, a Spill Response Plan, an Erosion and Sediment Control Plan and a Hazardous Waste Management Plan. EMP/EPP are subject to MRG review.
- Spill response should contain spill prevention and spill reporting requirements along with step-by-step procedures for responding to potential spill incidents.
- Work will be undertaken and completed in such a manner as to prevent the release of sediment-laden water, raw concrete or concrete leachate, or any other deleterious substance into a watercourse, tributary or drainage ditch which leads to fish habitat.
- Hydraulic fluids for on-site equipment will be biodegradable in case of accidental loss of fluids.
- Contractors shall ensure vehicles and equipment will not be serviced or refuelled within 30 m of any watercourse, tributary or drainage ditch which connects to fish habitat. Tanks, hoses and connections will be inspected prior to use. All hose connections will be wrapped and secured with absorbent pads during fuel/oil transfers. All hoses, valves and equipment are to be kept in a containment area whenever possible. Minimize hose length and the number of connections - use dripless connections if possible. Drain hoses when finished.
- Hazardous materials must be labelled and disposed of according to the Workplace Hazardous Materials Information System criteria and the Transportation of Dangerous Goods (TDG) Regulations;

² Above the location of disturbance where habitat remains undisturbed and mimics the required climatic conditions of the species.

- Hydrocarbon and coolant storage, if required on site, shall be within an impermeable containment facility capable of holding 110% of the storage tank contents. This may be achieved through the use of double-walled storage tanks or constructing a containment berm out of durable material. These containment basins shall be inspected daily for leaks and wear points, kept clean and any measurable rainwater removed and disposed of appropriately. If practical, the containment area should be covered to prevent infilling with rainwater. Where leaks and/or wear points are found, they shall be repaired promptly to restore full containment.
- Contractors shall ensure that small containers (i.e., jerry cans) will be stored in a secure location, protected from weather. These containers must be designed solely for the purpose of storing and pouring fuel and shall not be more than 5 years old. Containers must not leak and must be sealed with a proper fitting cap or lid.
- Contractors shall stabilize any waste materials removed from the work site to prevent them from entering a watercourse. This shall include covering soil stockpiles with poly, or geotextile fabric when left for 24 hours or greater. All storage of waste materials shall be kept a minimum of 30 m from any watercourse to reduce the potential for any deleterious substance entering the water.
- All work sites must have emergency spill kits (stocked with pads, sorbent booms, carbon dioxide cylinders, etc.) available on site. The kits shall be suitable for the quantities and types of material in use and stored at the site. All mobile equipment must contain fully stocked, dedicated spill kits. Contract personnel must be trained in the proper use of the kits in case of a spill.
- All spills to ground and water, regardless of volume, must be reported to the Contractors Project Manager, Environmental Monitor and MRG representative immediately.

7.2.4 Mitigation of Cultural or Historical Resource Impacts

Impacts to cultural or historical resources are not anticipated. However, in the unlikely event that a cultural or historical artifact is observed during works, the following mitigation measures are to be implemented:

- Any artifact uncovered during site activities will be left undisturbed and reported to PC immediately.
- All known artifacts of historical importance at or near worksites will be left undisturbed.
- All wildlife artifacts (e.g. antlers, bones, skulls) at or near worksites will be left undisturbed.

7.2.5 Aesthetic and Visual Mitigation

Due to the anticipated short timeline of the proposed remediation works potential negative impacts to aesthetic and visual values are estimated to be minimal and mitigable. The primary mitigation measure is keeping the Project Area clean through daily upkeep and waste management. Littering within the Project Areas is strictly prohibited and all waste products (hazardous or not) will be transported from site to the appropriate waste disposal facility. Noise and air pollution are other potential negative impacts to aesthetic and visual values of the site. In order mitigate these effects blasting will be kept to a minimum to reduce noise and dust. Should dust become an issue for local air quality, a spray truck can be brought to

site. Furthermore, reduction in unnecessary idling of construction equipment and vehicles as well as ensuring the equipment is in good working order can result in a lower emissions and exhaust.

7.2.6 Accidents and Malfunctions

During the proposed remediation works, there will be potential for the release of deleterious substances and/or the risk of project related accidents/malfunctions. The following mitigation will be implemented during proposed remediation work:

- An Environmental Management Plan (EMP) and Environmental Protection Plan (EPP) will be developed and implemented by the contractor prior to Project initiation. These plans will be submitted to the MRG Field Unit for review prior to implementation. These plans will be available to all staff during project activities and will detail appropriate work methods, spill response procedures, erosion control methods, spill and emergency response contacts, and a fire suppression plan.
- An on-site environmental professional should be utilized for construction/effects monitoring intermittently over the construction period or according to regulatory approval criteria.
- A spill containment kit will be kept on site and readily accessible. All equipment on site will be equipped with a spill kit adequate for the specific type and size of individual items.
- The storage of fuels and deleterious substances will be kept at least 100 m from any drainage course and will be sufficiently contained to accommodate at least 110% of the volume stored. All fuels and deleterious substances will be stored in accordance with applicable Workplace Hazardous Materials Information System (WHMIS) standards.
- All workers will be instructed to abide by all applicable Work Safe BC guidelines and will complete a project-specific worker safety orientation prior to working on site.
- Public access to the Project work area will be denied during Project activities.
- Erosion and sediment control devices will be kept in place and in good working order during the Project. These will be further specified in the EMP.
- No fires are permitted at work sites and adequate fire response equipment will be available in order to respond to accidental fires.

8.0 SIGNIFICANCE OF IMPACTS

8.1 Determination and Characterization of Residual Environmental Effects and Significance Ratings

Potential residual environmental effects of the Project were assessed, characterized and found to be negligible or of low magnitude and not significant with exception of potential loss of SARA listed species. Project impacts that can be mitigated are not considered to have a residual impact are therefore have not been rated or incorporated into the Effects Table below.

Table 9: Summary of Residual Impact and Significance Ratings

Potential Impact	Residual Impact	Residual Impact Rating						Significance
		Direction	Frequency	Extent	Duration	Reversibility	Magnitude	
Species at Risk loss	Yes	Negative	Intermittent	Local	Long-term	Non-reversible	Moderate-High	Significant
Deleterious substance spills as a result of accidents or malfunctions during construction (vegetation and wildlife).	Yes	Negative	Intermittent	Local	Short or long-term	Non-reversible	Moderate	Not Significant
Loss and/or disturbance of vegetation during remediation (vegetation).	Yes	Negative	Intermittent	Local	Long-term	Non-reversible	Low	Not Significant
Loss of wildlife habitat. Including habitat for SARA listed species.	Yes	Negative	Continuous	Local	Medium-term	Non-reversible	Moderate - High	Significant
Disruption or barriers to wildlife movement.	Yes	Negative	Continuous	Local	Medium-term	Reversible	Low	Not Significant
Wildlife disturbance (noise) during construction.	Yes	Negative	Continuous	Local	Short-term	Reversible	Low	Not Significant
Wildlife avoidance due to use; remediation.	Yes	Negative	Continuous	Local	Short-term	Reversible	Low	Not Significant

8.2 Determination of the Significance of Any Residual Environmental Effects

Despite implementation of mitigation measures and BMPs as described in this document there is potential for loss of SARA listed individuals (Coeur d’Alene salamander, Western Toad and Whitebark Pine). Residual impacts of this nature, while considered to be unlikely, are significant.

Other residual impacts for the Project are related to potential of spilling of deleterious substances as a result of accidents or malfunctions, permanent loss of vegetation/wildlife habitat (excluding SARA listed species), disruption/barrier to wildlife movement, and disturbance to wildlife due to construction noise resulting in avoidance behaviour. Disturbances to wildlife will be localized as the proposed works will be limited to the specified Project locations. Excluding potential losses to SARA listed species, the magnitude of residual impacts are considered to be low to moderate and not significant should the mitigation measures of this document be honoured.

9.0 SUMMARY AND CONCLUSIONS

Review of background environmental information and Project activities resulted in the identification of potential impacts to VECs associated with the rock and soil slope remediation along the TCH between km 17.543 and 43.828 within the GNP. EBA has concluded that the majority of the predicted impacts potentially resulting from the proposed Project activities can be mitigated within the timeframe of the project.

Potential residual impacts from the proposed Project include the loss of SARA listed individuals (salamander and tree species), while considered unlikely, are significant.

Other residual impacts identified are expected to be of negligible to low magnitude and not significant if the mitigation measures outlined in this report and outlined by regulatory authorities are adhered to.

10.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Sincerely,
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REFERENCES

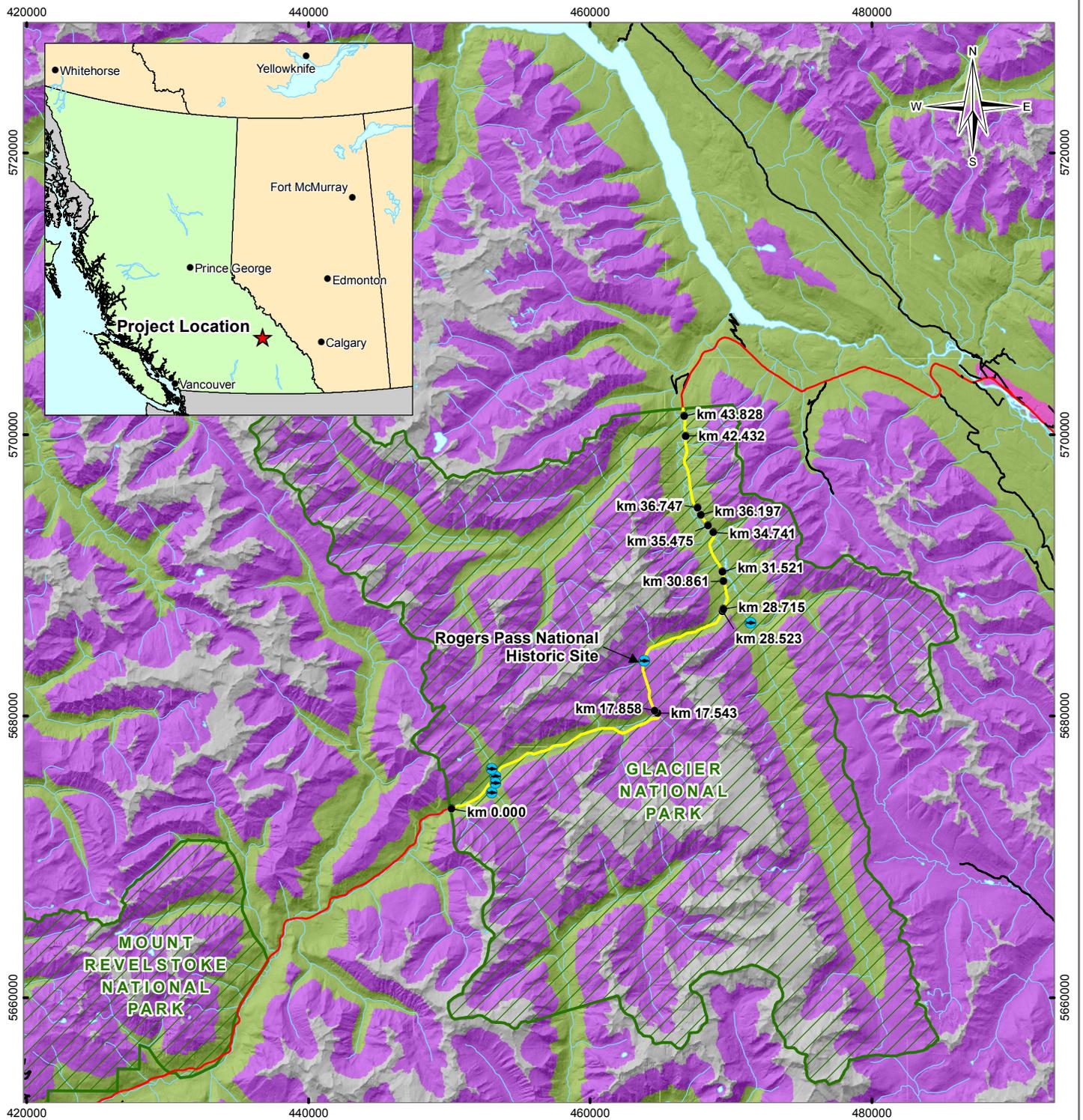
- Axys Environmental Consulting Ltd. and David Walker & Associates. 1998. Best Available Methods for Common Leaseholder Activities. Prepared for Line Leaseholders Working Group Jasper National Park.
- BC Conservation Data Centre. 2012. Conservation Data Centre Internet Mapping Service (iMAPBC). Victoria, British Columbia, Canada. Available: <http://webmaps.gov.bc.ca/imfx/imf.jsp?site=imapbc> (Accessed Nov 1, 2012).
- BC Conservation Data Centre. 2012. BC Species and Ecosystems Explorer. BC Minist. of Environ. Victoria, BC. Available: <http://a100.gov.bc.ca/pub/eswp/> (Accessed Nov 1, 2012).
- British Columbia Ministry of Forest and Range. 2011. Biogeoclimatic Ecosystem Classification Program. Retrieved October 25, 2012 from: <http://www.for.gov.bc.ca/hre/becweb/>
- BC Ministry of Environment MOE): Habitat Wizard. 2012. Available: <http://www.env.gov.bc.ca/habwiz/> (Accessed Sep 7, 2012).
- EBA, A Tetra Tech Company. 2012. Inspection of High Priority Rock and Soil Slopes Glacier National Park TransCanada Highway. Prepared for Parks Canada Agency.
- E-Flora. 2013. E-Flora BC: Electronic Atlas of the Plants of British Columbia. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. Accessed February 5, 2013 from: <http://www.geog.ubc.ca/biodiversity/eflora/>
- Environment Canada. 2012. Species at Risk Public Registry. Retrieved February 5, 2013 from: http://www.sararegistry.gc.ca/default_e.cfm
- Forbes, G. 2012. Technical Summary and Supporting Information for an Emergency Assessment of the Little Brown Myotis *Myotis lucifungus*. Terrestrial Mammal Subcommittee, Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
- Meidinger, D. and J. Pojar. 1991. Ecosystems of British Columbia. BC Ministry of Forests. Victoria, BC.
- Parks Canada. 2009. Rogers Pass National Historic Site of Canada. Retrieved October 25, 2012 from: <http://www.pc.gc.ca/eng/lhn-nhs/bc/rogers/index.aspx>
- Parks Canada. 2011. Mount Revelstoke and Glacier National Park Planting Criteria – Internal and External Expectations.
- Parks Canada. 2011a. Biotics Web Explorer. Retrieved April 29, 2013 from: http://www.pc.gc.ca/apps/bos/BOSMain_e.asp
- Parks Canada. 2012. Species at Risk. Woodland Caribou – Southern Mountain Population. Retrieved January 29, 2013 from: <http://www.pc.gc.ca/nature/eep-sar/itm3/eep-sar3caribou.aspx>
- Parks Canada. 2012a. Glacier National Park Neotropical Migrant Birds. Retrieved February 5, 2012 from: <http://www.pc.gc.ca/pn-np/bc/glacier/natcul/natcul6/e.aspx>

Parks Canada. 2012b. Nesting Bird Windows – Mt Revelstoke and Glacier National Parks.

Thomas, D.C. and Gray, D.R. 2002. Update COSEWIC status report on the woodland caribou *Rangifer tarandus caribou* in Canada, in COSEWIC assessment and update status report on the Woodland Caribou *Rangifer tarandus caribou* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. 1-98 pp.

FIGURES

Figure 1 Project Location



\\eba.local\corp\Van\GIS\ENVIRONMENTAL\IV232\23203109-01\Map\23203109_GNP_Figure01.mxd modified 4/24/2013 by stephanie.leusink

LEGEND

- Kilometre Markers
 - ⦿ MRG Electrofishing Location
 - Project Location
 - Trans-Canada Highway
 - Other Road
 - ▭ National Park
 - ~ Watercourse
 - ⦿ Waterbody
-
- #### Biogeoclimatic Zones of BC
- Interior Mountain-heather Alpine (IMA)
 - Engelmann Spruce - Subalpine Fir (ESSF)
 - Montane Spruce (MS)
 - Interior Cedar - Hemlock (ICH)

NOTES
 BEC data from DataBC (Version 8, Feb 2012).
 Base data source: NTS 1:250,000; GeoBase DEM.

STATUS
 ISSUED FOR USE

ENVIRONMENTAL IMPACT ANALYSIS FOR ROCK SCALING AND REMEDIATION WORK IN GLACIER NATIONAL PARK

Project Location

PROJECTION UTM Zone 11		DATUM NAD83		CLIENT Parks Canada / Parcs Canada	
Scale: 1:400,000 					
FILE NO. V23203109_GNP_Figure01.mxd					
PROJECT NO. V23203109-01	DWN SL	CKD MEZ	APVD JB	REV 0	
OFFICE EBA-VANC		DATE April 24, 2013			

Figure 1

APPENDIX A

EBA'S GEO-ENVIRONMENT REPORT – GENERAL CONDITIONS

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO EBA BY OTHERS

During the performance of the work and the preparation of the report, EBA may rely on information provided by persons other than the Client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

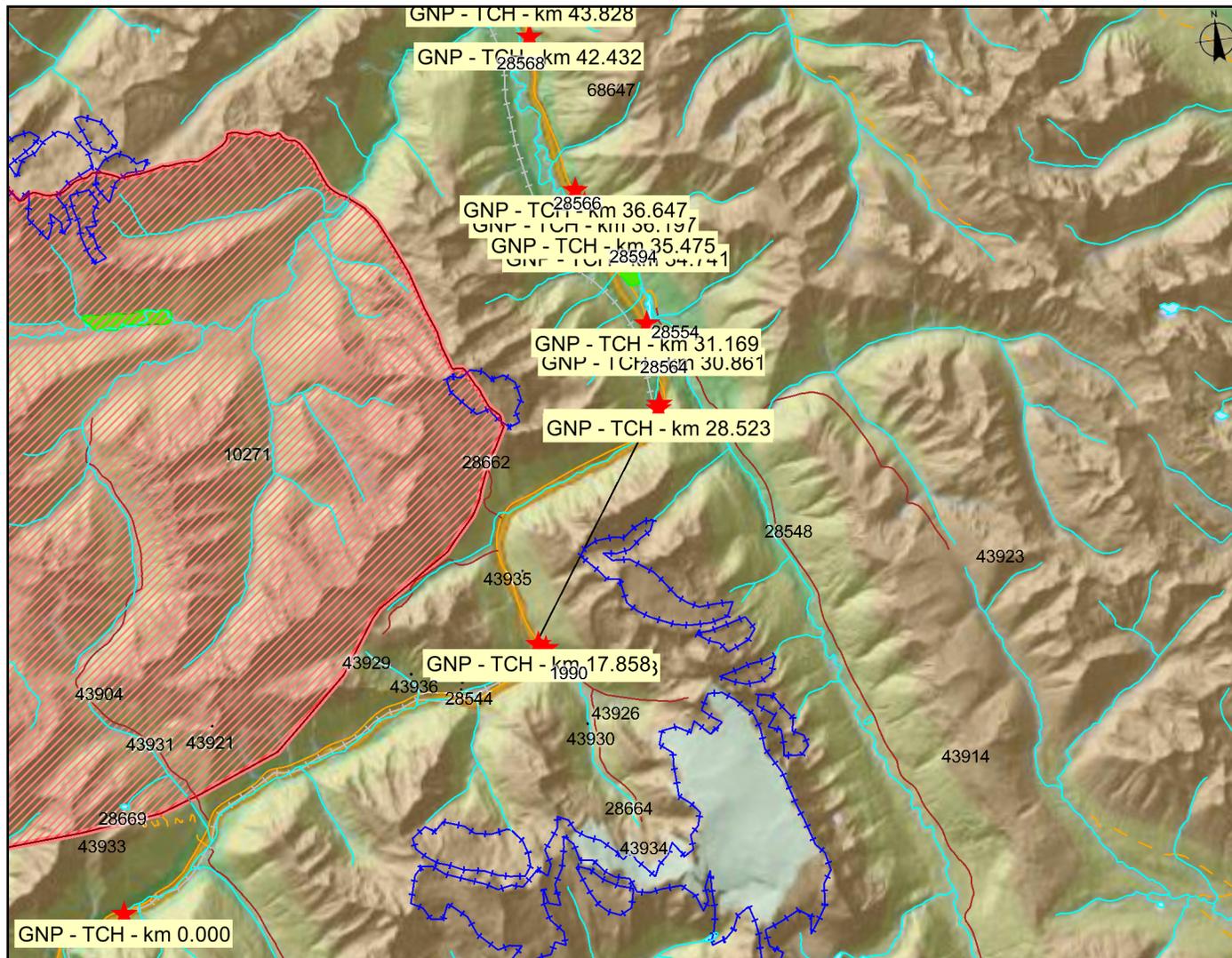
APPENDIX B

PROXIMITY OF ROCK WORKS TO CARIBOU HABITAT



BC Conservation Data Centre - Occurrence Report

Proximity of Rock Works to Caribou Habitat in GNP



Legend

Non-sensitive Occurrences

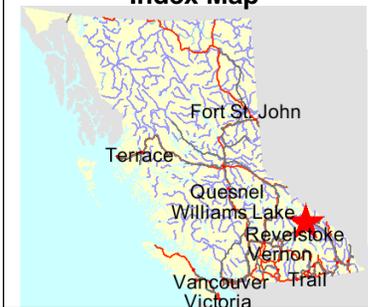
- Animal - Vertebrate
- Animal - Invertebrate
- Plant - Vascular
- Plant - Non-vascular
- Ecological Community

Masked Sensitive Occurrences

- Big Trees

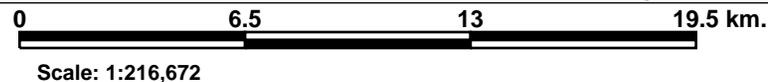
Occurrence data is updated frequently. This map should be considered out of date 6 months after **January 30, 2013**. For more information about the BC CDC visit: <http://www.env.gov.bc.ca/cdc/>

Index Map



Map center: 51°19' N, 117°27' W

MAP COMPILATION
Projection: Albers Equal Area Conic
Datum: NAD 83



Province of British Columbia
Ministry of Environment
Map Created January 30, 2013