Crown Mountain Coking Coal Project

Figure 15.5-17
American Marten Year-round Habitat Suitability in the Terrestrial LSA

LEGEND

Habitat Suitability

- Very High
- High
- Moderate
- Low
- Very Low
- Unclassified
- Terrestrial Local Study Area
- Project Footprint

- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area

- British Columbia/Alberta Border

0 2 4
Kilometres

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

Map Created By: RB
Map Checked By: HEB
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-11

Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\ExistingConditions\Wildlife\Carnivores\126231_EC_WHmrt_AmericanMartenHabitatSuitabilityLSA.mxd

Approximately 4,736 ha of the Terrestrial LSA (20%) was rated as very high or high suitability habitat for American marten. Areas of high-quality habitat for American marten in the Terrestrial LSA were located on the Crown Mountain, the Alexander drainage and forested mountain passes and riparian areas in the northwest portion of the Terrestrial LSA (Figure 15.5-17). Approximately 408,850 ha of the Terrestrial RSA (22%) was predicted as very high or high habitat suitability.

High quality American marten habitat in the interior of B.C. may support a minimum winter population density of 33 individuals/100 km^2 (Mowat and Paetkau, 2002) and a maximum of 200 individuals/100 km^2 (Lofroth and Steventon, 1990 cited in Government of B.C., 1994). Based on this assumption, the high-quality habitat available to American marten in the Terrestrial LSA (67.8 km^2) can support from 22 to 136 individuals during late winter.

Canada Lynx

Habitat Use

The overall estimate of Canada lynx occurrence annually was 0.565 (SE = 0.068), or Canada lynx potentially use approximately 56% of the Terrestrial LSA. The greatest determining factors of Canada lynx occurrence was an avoidance of areas with relatively greater human influence and selection for old and mature forests and riparian habitats. Snowshoe hare showed strong selection for early seral forests, herb dominated ecosystems, and areas with high spring solar radiation. Other strongly determining factors included an avoidance of primary roads (Appendix 15-C).

Habitat Suitability

Model results indicates that the best Canada lynx habitats include valleys up to high elevation alpine areas across the Terrestrial LSA, excluding areas around roads and highways. Very high habitat suitability habitat is specifically found throughout the Rocky Mountain range and through its transboundary mountain passes, into the Alexander Creek drainage, and up along the eastern slopes of Erickson Ridge. Model results are shown in and Figure 15.5-18 and summarized in Table 15.5-24.

Table 15.5-24: Canada Lynx Habitat Suitability in the Project Footprint, Terrestrial LSA, and Terrestrial RSA

Habitat Suitability	Habitat in the Project Footprint		Habitat in the Terrestrial LSA		Habitat in the Terrestrial RSA	
	Area (ha)	% of Project Footprint	Area (ha)	% of Terrestrial LSA	Area (ha)	% of Terrestrial RSA
Very High (0.8-1)	658	51	7,523	31	525,072	28
High (0.6-0.8)	502	39	10,197	42	897,155	48
Moderate (0.4-0.6)	3	<1	1,068	4	98,965	5
Low (0.2-0.4)	88	7	1,267	5	161,363	9
Very Low (0-0.2)	0	0	101	<1	20,769	1
Unclassified	34	3	4,065	17	172,372	9

Approximately 1,159 ha of the Project footprint (90%) was predicted as very high or high habitat suitability for Canada lynx. Quality habitats for Canada lynx occur extensively within the Project footprint and are

Crown Mountain Coking Coal Project

Figure 15.5-18
Canada Lynx Year-round Habitat Suitability in the Terrestrial LSA

LEGEND

Habitat Suitability

- Very High
- High
- Moderate
- Low
- Very Low
- Unclassified
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
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located across Crown Mountain. Approximately 17,721 ha of the Terrestrial LSA (73%) was predicted as very high or high habitat quality for Canada lynx. Areas of quality winter habitat for Canada lynx within the Terrestrial LSA are located extensively across the Rocky Mountain Range, Erickson Ridge, Alexander Drainage, and throughout transboundary mountain passes (Figure 15.5-18). Approximately 1,422,227 ha of the Terrestrial RSA (76%) was predicted as very high or high habitat quality for Canada lynx.

15.5.3 Project Effects Assessment

15.5.3.1 Thresholds for Determining Significance of Residual Effects

The CEAA guidance document *Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects* (CEAA, 2015b) and the KNC's *Recommended Minimum Standards for Proponents in Determining Significance of Effects in Environmental Assessments (EAs) in the Elk Valley* (KNC, 2020) provide guidance on significance determination and the role of thresholds beyond which an effect is considered unacceptable. For wildlife species listed under SARA (2002) there are prohibitions against destruction of mapped critical habitat (depending on the species and land ownership). This can readily be applied as a threshold that can be used for determining the significance of residual effects. Aside from mapped critical habitat, there are no government or industry regulations or established objectives, environmental standards, or established benchmarks to establish thresholds for the significance of residual effects on carnivore VCs resulting from the Project. The desired endpoint for wildlife management is for persistent and self-sustaining wildlife populations. Any effect then that diminishes the ability of a wildlife population to be persistent and self-sustaining was therefore used as a threshold for the determination of significance for a residual effect.

Thus, in consideration of the above, a significant adverse residual environmental effect on the carnivore community is one where the Project:

- Causes the non-permitted contravention of any of the prohibitions stated in Sections 32 to 36 of the Species at Risk Act including injury, harassment, or mortality of a carnivore species at risk;
- Results in the non-permitted loss of critical habitat for carnivore species at risk; or
- Causes a decline in abundance or change in distribution of carnivore populations such that the populations will not be sustainable in the Terrestrial or Grizzly Bear RSA.

Grizzly bear is one of four valued components in the EV-CEMF (and the only carnivore). The EV-CEMF uses four indicators to assess conditions for grizzly bear in the Elk Valley: habitat, connectivity, mortality, and population trend. The retrospective assessment (analysis of historic and current conditions) of these indicators provides some context to evaluate significance of impacts to grizzly bear, though there are no relevant thresholds.

15.5.3.2 Project Effects

Potential effects on carnivore VC habitat availability and distribution, known occurrences, and abundance may occur as a result of Project activities associated with mine development. Potential effects on wildlife are discussed with respect to changes at both the individual level (i.e., behaviour, physiological condition, survival) and the population level (i.e., population size, distribution, mortality rate). The assessment focuses only on planned activities within the designed scope of the Project. Effects related to unplanned events (e.g., collisions, spills, equipment malfunctions, accidents) are presented in Chapter 21.

Potential effects to wildlife are interrelated with other assessment disciplines and components that represent pathways to effects on carnivore VCs:

- Atmospheric Environment Assessment (Chapter 6);
- Acoustic Environment Assessment (Chapter 7);
- Soil and Terrain Assessment (Chapter 8);
- Groundwater Assessment (Chapter 9);
- Surface Water Quantity Assessment (Chapter 10);
- Surface Water Quality Assessment (Chapter 11);
- Landscapes and Ecosystems Assessment (Chapter 13); and
- Human and Ecological Health Assessment (Chapter 22).

15.5.3.2.1 Project Interactions

Project activities during the Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure phases have the potential to affect carnivore VCs. Key Project activities that are expected to interact with carnivore VCs, with a potential for adverse effects, are presented in Table 15.5-25. Specific details on Project activities and components are discussed in Chapter 3.

Most Project activities have the potential to interact with carnivores VCs. The key interactions resulting in potential significant adverse effect or significant concern (indicated as level III in Table 15.5-25) are primarily those involving habitat loss or alternation. Many of the potential adverse effects that are not key but require mitigation (indicated as level II) are related to noise and other sensory disturbance related to construction and operations and operation of vehicles. Project activities with no predicted interactions with carnivore VCs are:

- Stockpiling of wood waste in Operations to be used for reclamation;
- Labour (hiring and training);
- Water management activities;
- The inactive rail line during Post-Closure; and
- Monitoring activities.

15.5.3.2.2 Overview of Potential Effects

Potential effects of the Project on carnivore VCs were identified through working group meetings, consultations, review of other developments in the region, through mitigation included with BMPs, scientific literature, and using technical expertise/professional opinion. Potential effects of the Project on carnivore VCs were categorized as:

- Habitat loss and degradation;
- Sensory disturbance;
- Disruption to movement; and
- Increased mortality risk.

The health effects of carnivore VC exposure to contaminants of potential concern are described in Chapter 22 and are therefore not repeated here.

The rationale and a description of each potential effect on carnivore VCs is provided in Table 15.5-26.

Table 15.5-25: Project-Carnivore Interaction Matrix and Ranking

Project Phase	Project Component	Description of Activities	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx
Construction and Pre-Production	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II	II	II	II	II
	Logging of Merchantable Timber	Merchantable timber will be logged from the infrastructure and pre-production development footprint	III	III	III	III	III
	Clearing and Grubbing	After the merchantable timber has been removed, the remaining vegetation will be cleared and grubbed from the infrastructure and pre-production development footprint	III	III	III	III	III
	Stockpiling Wood Waste	Wood waste will be stockpiled on site and used for reclamation as a source of coarse woody debris	I	I	I	I	I
	Quarry for Construction Materials	Excavation of road bed materials from the North Pit footprint for use on Grave Creek Road	II	II	II	II	II
	Water Management or Water Management Structures	Water management structures to support initial construction activities will be built prior to soil being salvaged from the run of mine (ROM) and plant site	II	II	II	II	II
		Interim Sediment Pond will be built prior to the soil removal and stockpiling from the pit access road and initial phase of the North Pit	II	II	II	II	II
		Grave Creek Reservoir will be constructed to act as a back-up source of process water	II	II	II	II	II
	Soil Salvage	Soil will be salvaged from the footprint of the infrastructure	II	II	II	II	II
	Road Upgrading and Construction	Branch C Road will be widened and upgraded to facilitate construction and mine traffic to plant site area	II	II	II	II	II
		Grave Creek Road will be widened to facilitate the clean coal haul	II	II	II	II	II

Project Phase	Project Component	Description of Activities	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx
		A new road will be constructed off the Valley Road to access the rail loadout for construction and operation	II	II	II	II	II
	Linear Infrastructure	Installation of the powerline	II	II	II	II	II
		Installation of the natural gas line	II	II	II	II	II
	Overland Conveyor	Clearing, grubbing, and construction of overland conveyor from the plant site to Grave Creek Road	III	III	III	III	III
	Coal Handling Process Plant Construction	Excavating and pouring of foundation	II	II	II	II	II
		Transportation of materials and personnel to site	II	II	II	II	II
		Constructing of the Coal Handling Process Plant (CHPP)	II	II	II	II	II
		Commissioning of the CHPP	I	I	I	I	I
	Workshop / Mine Dry Construction	Excavating and pouring of foundations	II	II	II	II	II
		Transportation of materials to site	II	II	II	II	II
		Construction of workshop / mine dry	II	II	II	II	II
		Equipment wash bay and heavy equipment parking	II	II	II	II	II
		Administration, first aid, and mine dry building	II	II	II	II	II
		Diesel tank farm	II	II	II	II	II
		Warehouse	II	II	II	II	II
		Potable water system	II	II	II	II	II
		Septic system	II	II	II	II	II

Project Phase	Project Component	Description of Activities	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx
		Water supply pipelines from Grave Creek and West Alexander Creek	II	II	II	II	II
		Commissioning of the facilities	I	I	I	I	I
	Explosives Factory Construction	Construction of the explosives factory	II	II	II	II	II
	Rail Loadout Construction	Excavation and preparation of the rail bed	II	II	II	II	I [19]
		Excavation and preparation of foundation stockpiling and coal handling systems	II	II	II	II	I [19]
		Transportation of materials and personnel to site	II	II	II	II	I
		Construction of rail loadout	II	II	II	II	I
		Connection to the CP Fording Sub-line	II	II	II	II	I [19]
		Commissioning of the rail loadout	I	I	I	I	I
	Labour	Hiring of personnel for the mine, CHPP operations, administration, and coal haul	I	I	I	I	I
		Training of personnel	I	I	I	I	I
	Construction Waste Materials	Collection and transfer to a recycling facility or other approved facility	I	I	I	I	I
Operations	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II	II	II	II	II

[19] Canada Lynx has a very low occurrence probability in the RLO area and therefore limited potential for interaction

Project Phase	Project Component	Description of Activities	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx
	Explosives Factory	Ammonium nitrate / emulsion storage facilities which have the ability to load explosive agents into delivery trucks	I	I	I	I	I
		Wash facility to decontaminate the bulk explosive delivery trucks	I	I	I	I	I
		Storage of explosives (detonators and boosters)	I	I	I	I	I
	Fuel Storage	Receiving bulk fuel deliveries	I	I	I	I	I
		On-site storage of fuel	I	I	I	I	I
		Dispensing fuel	I	I	I	I	I
		Transferring fuel to on-site delivery trucks	I	I	I	I	I
	Mine Roads Development	Building roads from material sourced on-site	II	II	II	II	II
	Mining	Progressive clearing	III	III	III	III	III
		Removal of unconsolidated material	II	II	II	II	II
		Loading, hauling, and stockpiling of soil	II	II	II	II	II
		Drilling and loading of blastholes	II	II	II	II	II
		Detonating the explosives	II	II	II	II	II
		Loading, hauling, and dumping of mine rock	II	II	II	II	II
		Loading, hauling, and stockpiling of coal	II	II	II	II	II
	Site Water Requirements	Using contact water as the primary process make-up water from Interim Sediment Pond (Year 1 to 5)	I	I	I	I	I

Project Phase	Project Component	Description of Activities	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx
	Coal Processing	Using contact water as the primary process make-up water from the North Pit (Year 5 to 15)	I	I	I	I	I
		Backup reservoir in Grave Creek as a secondary source of process make-up water	I	I	I	I	I
		Run of mine coal sizing	II	II	II	II	II
		Washing coal	II	II	II	II	II
		Mechanical and thermal drying of coal	II	II	II	II	II
		Coal reject disposal (part of loading, hauling, and dumping of mine rock activities)	II	II	II	II	II
		Conveying clean coal	II	II	II	II	II
	Sewage Treatment	Sewage will be treated by a septic system constructed at the plant site which will support the administration, mine dry, and CHPP facilities	II	II	II	II	II
	Main Sediment Pond	Construction of Main Sediment Pond in Year 4	II	II	II	II	II
		Management of the Main Sediment Pond discharge	I	I	I	I	I
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	II	II	II	II	II
Reclamation and Closure	Transportation	Use of Highway 43, Line Creek Mine Road, Valley Road, and Grave Creek Road by highway transport trucks, light duty vehicles, and crew busses to transport personnel, materials, and consumable items	II	II	II	II	II
	Dismantling Infrastructure and Buildings	Dismantling of the CHPP, maintenance facilities, administration, and other facilities	II	II	II	II	II
		Dismantling, salvaging, collecting, and transferring materials to a recycling facility or other approved facility	II	II	II	II	II
		Removal of the powerline	II	II	II	II	II

Project Phase	Project Component	Description of Activities	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx
	Removal of Linear Infrastructure	Removal of the natural gas line	II	II	II	II	II
	Reclamation	Reclaiming available areas as soon as possible to achieve reclamation objectives	II	II	II	II	II
	Monitoring	Reclamation monitoring	I	I	I	I	I
		Geotechnical monitoring	I	I	I	I	I
		Aquatic effects monitoring	I	I	I	I	I
	Water Management	Management of the Main Sediment Pond discharge	I	I	I	I	I
Post-Closure	Water Management	Decommissioning the Main Sediment Pond once water quality objectives have been met	II	II	II	II	II
	Road Use	Branch C Road will remain as a permanent access road for future commercial and recreational use	II	II	II	II	II
	Rail Line	The rail line will remain as a permanent feature	I	I	I	I	I
	Monitoring	Reclamation monitoring	I	I	I	I	I
		Geotechnical monitoring	I	I	I	I	I
		Aquatic effects monitoring	I	I	I	I	I

Notes (after EAO, 2013):
I = No or negligible effect (positive or adverse) is anticipated; not carried forward in the assessment
II = Potential adverse effects requiring additional mitigation or substantive positive effects are expected; carried forward in the assessment
III = Key interaction resulting in potential significant adverse effect or significant concern; carried forward in the assessment

Table 15.5-26: Potential Effects on Carnivore VCs

Potential Effect	Rationale for Selection of Environmental Effect
Habitat Loss and Degradation	Project components and activities may cause habitat loss and degradation for carnivore VCs. Habitat loss and degradation includes the complete loss or reduction in value of a particular set of resources that the specific habitat provides, such as forage, security, thermal, reproduction, or movement. Physical disturbances including ground disturbance and vegetation clearing can cause direct loss of ecosystems and the corresponding resources they provide. A loss of key resources required to fulfill life requisites can result in reduced body condition, survivorship, and reproductive success. Carnivores may respond to habitat alteration by reducing their use of areas, avoiding habitats for a period of time (i.e., displacement), or abandoning portions of their current range. The potential effects of habitat alteration may be particularly high when Project activities and components are within or adjacent to seasonally limiting habitats such as breeding areas. Habitat loss and degradation includes the potential effects of ground disturbance, logging and vegetation clearing, construction, and use of building infrastructure and linear features that results in the direct loss or reduction in value of ecosystems important for food (plants and via habitat loss for prey species), security and reproduction, direct loss or disturbance of trails and movement routes connecting seasonal or daily habitats and changes in terrain causing displacement or entrapment, and indirect effects of change to snow avalanche regimes that may result in degradation of loss of avalanche chute habitats (important for grizzly bear). Habitat degradation can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Each of these may affect the availability of food (plants and via habitat loss for prey species).
Sensory Disturbance	Project components and activities may cause sensory disturbance for carnivore VCs. Sensory disturbance includes behavioural responses to Project-related noise, light, dust, and human presence. Sensory disturbances can lead to disruptions in animal behaviour, causing individuals to lose time and energy normally allocated to foraging, hunting, breeding, and avoiding predators. A loss of time towards fulfilling key life requisites can result in reduced body condition and reduced reproductive success. Carnivores may also respond to sensory disturbances by reducing their use of habitats near the source of disturbance, avoiding habitats for a period (i.e., displacement), or abandoning portions of their current range. Such behavioural responses result in a functional loss of habitat.
Disruption To Movement	Project components and activities have the potential to create physical and/or sensory barriers that prevent or impede movements between daily or seasonal habitats. Physical and sensory barriers lead to disruptions in animal behaviour, causing individuals to lose time and energy normally allocated towards accessing forage and prey, breeding, and avoiding predators. Some carnivore VCs exhibit seasonal movement patterns that are largely driven by food availability (e.g., grizzly bear, wolverine, and Canada lynx). Disruption to carnivore VC movement patterns can result in reduced body condition, enhanced predation rates, and reduced gene flow between populations, which has implications for species population viability and long-term persistence. Disruption to movement may be particularly high when Project activities and components are within restricted terrain features including narrow valleys or canyons (e.g., Grave Creek Canyon).

Potential Effect	Rationale for Selection of Environmental Effect
Increased Mortality Risk	Mortality risk includes the potential effects of: 1) collisions with Project-related traffic during terrain disturbance and clearing of vegetation, 2) collisions with Project-related traffic on access or mine site roads and powerline, 3) entrapment during avalanche control, 4) collisions with rail, 5) operational mining activities including blasting, 6) ingestion of toxic products from materials stored on-site, and 7) entrapment during construction and operation of Project facilities such as CHPP, holding and sediment ponds, or along access roads during winter due to high snowbanks. Attractants includes the effect of any human activity or material that may attract wildlife and could lead to behavioural changes or increased human-wildlife conflict. Attractants include food odours, food waste, domestic garbage, grey water, and sewage. Attractants also includes vegetation along roadways. Attractants are primarily associated with human activities and would therefore decline and eventually cease after Operations. Chemical hazards (e.g., ingestion of toxic products) from materials stored on-site during Operations may reduce wildlife survival and reproduction.

15.5.3.2.3 Discussion of Potential Effects

The potential effects (habitat loss and degradation, sensory disturbance, disruption to movement, direct mortality, indirect mortality, attractants, and chemical hazards) are discussed in the context of each Project phase below.

Habitat Loss and Degradation

The Project footprint overlaps with suitable habitat for carnivore VCs. The total Project footprint area is 1,283 ha, though this includes a buffer area intended to account for uncertainty in precise boundaries of disturbance and not all of the buffer areas will be cleared. The amount of carnivore VC habitat potentially lost varies among species (see Section 15.5.2.3.2 for a detailed summary of habitat suitability calculations).

Construction and Pre-Production

During Construction and Pre-Production, habitat loss will result from clearing and grubbing the infrastructure and pre-production development footprint, which includes the quarry, Interim Sediment Pond, Grave Creek Reservoir, the CHPP and workshop, initial portions of North Pit and Mine Rock Storage Facility, upgrading of the mine site road and Grave Creek Road, construction of a new road to the explosives factory, the overland conveyor, and the rail loadout.

Habitat degradation may occur in areas not yet cleared, in contingency areas and areas directly adjacent to the footprint, through dust deposition, spread of invasive species and sedimentation from surface water runoff.

Operations

Direct habitat loss will occur during Operations as a result of progressive clearing of the pits, Mine Rock Storage Facility, construction of mine roads, and clearing for the construction of the Main Sediment Pond. Clearing will continue until Year 15 of Operations.

Habitat degradation may occur in areas not yet cleared, in contingency areas, and in areas directly adjacent to the Project footprint through dust deposition, spread of invasive species, and sedimentation from surface water runoff.

The east side of the Project footprint includes a contingency area that extends over the top of Crown Mountain and downslope for approximately 250 m. This area contains the start zones for avalanche chutes that continue downslope toward Alexander Creek. If the start zones are modified through excavation or stockpiling, the avalanche regime may change and may degrade or eliminate avalanche chute habitat outside the Project footprint. Avalanche chutes provide especially important habitat for grizzly bear.

Reclamation and Closure

There will be no additional loss of habitat for carnivore VCs during Reclamation and Closure. Habitat degradation may occur during decommissioning of mine site infrastructure and managing the Main Sediment Pond discharge though dust deposition, spread of invasive species, and sedimentation from surface water runoff.

Post-Closure

There will be no additional loss or degradation of habitat for carnivore VCs during Post-Closure, as all activities with the potential to result in habitat loss or degradation will be completed prior to mine closure.

Sensory Disturbance

The effects of noise and vibration on wildlife receptors are assessed in Chapter 7. Noise and vibration modelling was completed for the worst-case operating scenario. It was determined that operational Year 10 of the Project was the worst-case year for noise and vibration effects from the Project on surrounding sensitive receptors. The effects of Project-related noise in all other years will be less than those arising during operational Year 10. Noise and vibration sources associated with the Project potentially affecting wildlife receptors were split into two primary categories: continuous operations and blasting operations. The area affected by continuous noise was based on the modelled noise levels for:

- Continuous Project-related noise ≥ 55 dBA – the daytime sound level from the Project that is expected to cause disturbances for wildlife; and
- Continuous Project-related noise ≥ 45 dBA – the nighttime sound level from the Project that is expected to cause disturbances for wildlife.

The area affected outside the Project footprint by continuous project-related noise is approximately 242 ha in daytime and 1,118 in nighttime.

The area affected by noise from blasting operations was based on modelled peak noise (air overpressure) ≥ 108 dB from blasting. This threshold is the peak noise level at wildlife receptors that is expected to cause disturbed habitat. This distance was estimated to be at 1,500 m from pit blast sites, which affects 1,955 ha outside the Project footprint.

The key sources of ground vibration are rail and blasting operations. Rail-induced ground vibration was not expected to have a significant impact on wildlife (See Chapter 7).

Vibration levels from blasting greater than the threshold level of 10 mm/s will occur at distances of up to 400 m to 500 m from the pits. As such, terrestrial wildlife could be adversely affected by vibration within the Project site itself; however, terrestrial wildlife are not anticipated to be present on-site during Operations and no impacts are therefore expected.

Other types of sensory disturbance (light, dust, and human presence) are expected to extend much shorter distances than noise and vibration.

Construction and Pre-Production

Sensory disturbance is expected from the transportation of personnel and materials, land clearing activities, soil salvage, road construction and upgrading, construction of the rail loadout, excavation of the quarry, construction of the coal handling process plant, and construction of water management infrastructure such as the Grave Creek Reservoir and Interim Sediment Pond. Increased human presence on the landscape from labour is also expected to result in sensory disturbance to carnivore VCs.

Operations

During Operations, noise will be generated from progressive clearing and grubbing, further mine road development, detonating explosives (two to three times per week), loading, hauling, and dumping of mine rock, coal processing, operation of the conveyor, hauling to the rail loadout, operation of the rail loadout, and construction of the Main Sediment Pond. Progressive reclamation will also generate noise, dust, and human presence.

Reclamation and Closure

During Reclamation and Closure, some sensory disturbance is expected to be generated from the dismantling of infrastructure and buildings and removal of linear infrastructure. Low-level sensory disturbance is also expected to be generated from human activity associated with monitoring and maintenance.

Post-Closure

Sensory disturbance is expected to be minimal during the Post-Closure phase of the Project. Sensory disturbance may arise from noises from light vehicle traffic and human activity associated with monitoring and maintenance activities.

Disruption to Movement

Project components and activities have the potential to create physical and/or sensory barriers that prevent or impede movements between daily or seasonal habitats for all carnivore VCs.

Construction and Pre-Production

Construction activities will create sensory disturbance through noise, light, and human presence that may partially or completely disrupt movements in localized construction areas. Carnivore VCs may avoid the mine and access roads due to noise from increased traffic and road upgrading and construction activities, thus disrupting movements across roads. Land clearing activities including logging of merchantable timber and clearing and grubbing of the infrastructure and pre-production development footprint will eliminate carnivore VC habitat, causing fragmentation and reducing functional connectivity that may disrupt

carnivore VC movements. Built structures, like buildings and the CHPP will be a complete barrier, though on a localized scale. Steep pit walls may also impede carnivore VC movements. Tall and steep snowbanks from snow clearing along access roads may be a barrier to carnivore VCs in the winter.

Construction of the conveyor may disrupt carnivore VC movements through obstruction, sensory disturbance and habitat loss. Once constructed, the conveyor will be elevated to 3 m at approximately 500 m intervals to allow for carnivore passage beneath the conveyor. The use of the conveyor underpasses by carnivore VCs may be affected by noise of the conveyor.

Operations

Disruption to carnivore VC movement is expected to continue during Operations as a result of regular transportation on mine and access roads, mine roads development, pit and dump development, mining activities such as blasting and dumping of mine rock, and conveying of the clean coal. The construction of the Main Sediment Pond may further reduce functional connectivity. Progressive clearing of pits and dump areas will remove carnivore habitat, causing fragmentation and reducing functional connectivity that will disrupt carnivore VC movements.

The conveyor with the underpasses at approximately 500 m intervals is likely to continue as a semi-permeable barrier to carnivore VC movements.

Reclamation and Closure

Disruption to movement is expected to be reduced during Reclamation and Closure as Project infrastructure is removed and habitats are reclaimed. Some disruption to movement is expected to arise from noise and human presence associated with dismantling of infrastructure and buildings and removal of linear infrastructure. Vegetation cover in reclaimed areas will develop and progressively restore functional connectivity.

Post-Closure

It is anticipated that disruption to movement will be minimal during the Post-Closure phase of the Project because these effects would result primarily from the vehicle traffic and human activity associated with monitoring and maintenance activities. Habitat fragmentation and loss of functional connectivity for carnivore VCs that require forest cover will be present for many decades until forest cover has been restored.

Increased Mortality Risk

There is potential for increased risk of direct and indirect mortality of carnivore VCs in all phases of the Project.

Construction and Pre-Production

Direct mortality during Construction and Pre-Production may arise from collisions with Project-related traffic during terrain disturbance and clearing of vegetation, collisions with Project-related traffic on access or mine site roads, entrapment during avalanche control, collisions with rail, operational mining activities including blasting, ingestion of toxic products from materials stored on site, and entrapment in holding and settlement ponds or along access roads during winter due to high snowbanks.

Traffic along access roads from the RLO to the respective plant and storage areas is estimated to be 140 round trips per day. 60% of these vehicle trips will be haul trucks.

The project will involve loading of 120 trains per year. Trains will not be travelling at high speeds within the rail loadout, and train-wildlife collisions in this area are unlikely. There will be an incremental increase in rail traffic on the main rail lines as a result of the Project (one additional train every three days on average) where the risk of wildlife-train collisions is higher.

During Construction and Pre-Production, food odours, food waste, and domestic garbage may be attractants for carnivore VCs. This may lead to increased human-wildlife conflict and may result in animal control and mortality. Seeded vegetation adjacent to roads may attract grizzly bear, leading to increase animal-vehicle collisions.

The creation of new road access during Construction and Pre-Production may lead to indirect mortality of carnivore VCs by increasing hunter access. In addition, indirect mortality may arise from reduced body condition resulting from habitat loss and degradation, sensory disturbance, or disruption to movement.

Public access along Grave Creek Road will be maintained during all Project phases and after closure. This may provide increased access to hunters.

Operations

The potential for increased mortality risk described in Construction and Pre-Production will continue into Operations.

Reclamation and Closure

The potential for increased mortality risk will progressively reduce due to reduced vehicle and equipment traffic and the end of active mining.

Post-Closure

The potential for increased mortality risk will be minimal during the Post-Closure phase as vehicle traffic will occur only occasionally with monitoring and maintenance activities.

15.5.3.2.4 Transboundary Effects

Grizzly bear, wolverine, and Canada lynx are highly mobile and wide-ranging animals. It is likely that individuals present in the Terrestrial LSA make seasonal or occasional movements into Alberta and possibly the U.S.A and into federal lands located within the Grizzly Bear and Terrestrial RSAs (refer to Chapter 1, Figure 1.3-4). American badger and American marten have high dispersal capability and those present in the Terrestrial LSA may disperse into Alberta and potentially the closest federal lands to the Project, Dominion Coal Block Parcels 73 and 82 located outside the Terrestrial LSA and approximately 20 and 40 km southwest of the Project, respectively. American badgers are believed to part of the same population as those in Montana. Residual effects to carnivore VCs (if present) have the potential to be considered transboundary effects with Alberta and U.S.A and on federal lands.

15.5.3.3 Mitigation Measures

The mitigation measures proposed for carnivore VCs are based on available BMPs, provincial and federal guidance documents, mitigation measures conducted and accepted for similar projects, and professional judgment. The identification and selection of technically and economically feasible mitigation measures followed the mitigation hierarchy approach outlined by the provincial Environmental Mitigation Policy and related Environmental Mitigation Procedures (B.C. MOE, 2014a and 2014b). Technical and economic constraints dictated the highest level of the mitigation hierarchy that could be achieved for managing each potential effect.

Mitigation measures were identified for each potential effect on carnivore VCs, though are intended to apply to all carnivores. For the purposes of this assessment, mitigation measures are defined to include project design features, procedures, or practices that will reduce or eliminate Project-related effects to carnivore VCs. Potential Project-related changes to carnivore VCs will be reduced through design mitigation, regulatory requirements, site reclamation, and BMPs, including management plans, monitoring, and adaptive management. Where mitigation measures are considered to be completely effective, potential Project effects to carnivore VCs are not identified as residual effects.

Many of the measures to mitigate impacts to carnivore VCs are part of protocols described in the following management plans:

- Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13);
- Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1);
- Ecological Restoration Plan (Chapter 33, Section 33.4.1.3);
- Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4);
- Landform Design and Reclamation Plan (Chapter 33, Section 33.4.1.6);
- Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7);
- Site Water Management Plan (Chapter 33, Section 33.4.1.8);
- Soil Management Plan (Chapter 33, Section 33.4.1.9);
- Spill Prevention, Control, and Countermeasures Plan (Chapter 33, Section 33.4.1.10);
- Waste Management Plan (Chapter 33, Section 33.4.1.12); and
- Traffic Control Plan (includes access management; Chapter 33, Section 33.4.2.4).

The following subsections describe mitigation for potential Project effects on carnivore VCs. The Wildlife Monitoring Program in the Wildlife Management and Monitoring Plan (Chapter 33, Section 33.4.1.13) will be used to validate the efficacy of the proposed mitigation measures.

15.5.3.3.1 Mitigation Measures for Habitat Loss and Degradation

Loss and degradation of carnivore VC habitat will occur primarily through:

- Loss from clearing and grubbing; and
- Degradation through dust deposition, spread of invasive species, and sedimentation from surface water.

Measures to mitigate the impact of carnivore VC habitat loss and degradation include:

- Minimizing disturbance and encroachment into natural vegetation, to the extent feasible, by clearing and grubbing only what is required for Construction and Pre-Production activities and progressive development of pits and the Mine Rock Storage Facility;
- Clearing vegetation only in the year in which the area will be required for construction or operation to minimize the extent of cleared vegetation, to the extent possible;
- Sequencing the development of pits and the Mine Rock Storage Facility to limit total disturbance during any one period and maximize progressive reclamation opportunities;
- Progressively reclaiming areas, as described in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3) and Landform Design and Reclamation Plan (Chapter 33, Section 33.4.1.6) as soon as possible to restore habitat for carnivore use (further details on the post-mining landscape are described below);
- Implementation of the Erosion and Sediment Control Plan (Chapter 33, Section 33.4.1.4); to reduce the potential for sedimentation of riparian, wetland, and aquatic habitat used by carnivore VCs; and
- Implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) to reduce deposition of dust on vegetation that can affect plant vigour.

Ecological restoration is the primary mitigation for habitat loss and degradation. The reclamation and closure of the Project footprint aims to restore the pre-existing landscapes and uses, including a vegetation mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands and riparian areas, and habitat capability for key wildlife species (among other goals). Revegetation (reclamation) activities will begin during the Operations phase, soon after stable topography is created within the mine footprint and will proceed progressively as the area of stable topography grows during the Operations phase. Revegetation is planned to start in Year 6 of Operations, with other revegetation taking place in Years 8, 10, 11, and 15 of Operations and continuing into the Reclamation and Closure phase.

As part of the planning, a post-mine terrestrial ecosystem map (TEM) has been developed to envisage the post-mine environment functioning and successional trajectory and guide the selection of appropriate species to revegetate the Project footprint. The post-mine TEM accounts for factors such as elevation, aspect, soil, and plant ecology, and as such, it is the lens for envisioning a realistic post-mine environment. Approximately 790 ha in seven ecosystem types are planned for reclamation within the Project footprint. Remaining areas within the footprint include pit highwalls (to be left in their post-mine configuration with the intention of creating escape terrain habitat features for bighorn sheep [and mountain goats, slope dependent]), water features, and buffer (or contingency) areas. Disturbed portions of the buffer areas (if any) will be assigned appropriate end-use objective according to their elevation, aspect, slope steepness, and proximity to water features (for riparian and wetland ecosystems). Further details of the ecological restoration can be found in the Ecological Restoration Plan (Chapter 33, Section 33.4.1.3).

The mitigation measures described above will contribute to minimizing the effects of habitat loss and degradation on carnivore VCs with moderate effectiveness. These measures will not eliminate all effects and there will be a residual effect of habitat loss and degradation on carnivore VCs as a result of the Project.

15.5.3.3.2 Mitigation Measures for Sensory Disturbance

Sensory disturbance to carnivore VCs will occur from Project-related noise, light, dust, and human presence. Measures to mitigate the impact of sensory disturbance on carnivore VCs include:

- A wildlife education program (as described in the Wildlife Management and Monitoring Plan, Chapter 33, Section 33.4.1.13) will be developed to raise awareness of requirements and commitments to avoid wildlife and protect wildlife and wildlife habitat;
- Implementation of the Noise and Vibration Management Plan (Chapter 33, Section 33.4.1.7) that includes the following measures:
  - Limit construction activities, especially those with high noise impact, to daytime hours;
  - Appropriately time construction activities to minimize cumulative noise levels;
  - Select equipment for construction activities that is appropriate for the task;
  - Construction equipment at a minimum, is fitted with standard noise-damping devices such as mufflers or enclosures, where possible;
  - Discourage unnecessary idling of construction equipment;
  - Perform regular vehicle maintenance and inspections on all Project equipment, including replacement of old and worn parts;
  - Inform employees of noise impacts and potential mitigation/control measures through appropriate training;
  - Install and maintain noise mitigation measures, where possible, on and around Project infrastructure;
  - Clear blasting areas of terrestrial wildlife;
- Directed/focused lighting will be used where possible, rather than broad area lighting, to minimize sensory disturbance. Light in non-essential areas will only be used when necessary, without compromising worker safety; and
- Implementation of the Air Quality and Greenhouse Gas Management Plan (Chapter 33, Section 33.4.1.1) to minimize dust around wildlife in off-site areas.

The mitigation measures described above will contribute to minimizing the effects of sensory disturbance on carnivore VCs with high effectivenss. These measures will not eliminate all effects and there will be a residual effect of sensory disturbance on carnivore VCs as a result of the Project.

15.5.3.3.3 Mitigation Measures for Disruption to Movement

Disruption to carnivore VC movement may primarily occur from the creation of physical and/or sensory barriers that prevent or impede animal movements between daily or seasonal habitats and loss or degradation of habitat that provides connectivity among seasonal habitats. Measures to mitigate the impact of disruption to movement of carnivore VCs include:

- The mitigations for habitat loss and sensory disturbance listed above contribute to mitigation of disruption to movement;
- New road access is limited to the 900 m road to the explosives factory. There will be no other new roads outside of the pits and mine rock dumps;
- Underpasses will be created by elevating the conveyor to at least 2.4 m above ground (or higher where terrain can be used to create more clearance) at intervals of two per 1,000 m.

- Management of vehicle traffic contributes to minimization of sensory disturbance along roads and reducing the barrier effect of roads. Traffic related measures are documented in the Traffic Control Plan (Chapter 33, Section 33.4.2.4) and include:
  - Speed limits will be clearly marked and signed on all Project access roads. Lower speed limits will be set where monitoring and wildlife observation records indicate a high-risk area for animal-vehicle collisions (e.g., at identified wildlife crossings);
  - Wildlife will be given the right-of-way on all Project roads;
  - Project traffic will be minimized to the greatest extent practicable;
  - Site workers will travel on crews buses to limit road traffic; and
- Gaps will be created in snowbanks to allow for unimpeded carnivore passage across roads at regular intervals.

The mitigation measures described above will contribute to minimizing the effects of disruption to movement on carnivore VCs. The effectiveness of the proposed mitigations are as follows:

- The conveyor underpasses are expected to allow passage of carnivore VCs beneath the conveyor; however, the degree of use is unknown. This mitigation is predicted to have moderate effectiveness with moderate uncertainty;
- The traffic measures are expected to reduce the barrier effect of increased activity along Grave Creek Road; however, the degree to which carnivores will continue to cross Grave Creek Road is unknown. This mitigation is considered to have moderate effectiveness with moderate uncertainty; and
- All other mitigation measures are considered to have moderate effectiveness with low uncertainty.

These measures will not eliminate all effects and there will be a residual effect of disruption to movement on carnivore VCs as a result of the Project.

15.5.3.3.4 Mitigation Measures for Increased Mortality Risk

An increased risk of mortality of carnivore VCs may occur from:

- Collisions with Project-related traffic during terrain disturbance and clearing of vegetation;
- Collisions with Project-related traffic on access or mine site roads and powerline;
- Destruction of occupied grizzly bear and American badger dens;
- Entrapment during avalanche control;
- Collisions with rail;
- Operational mining activities, including blasting;
- Ingestion of toxic products from materials stored on site;
- Entrapment during construction and operation of Project facilities such as the CHPP, holding and sediment ponds, or along access roads during winter due to high snowbanks; and
- Increased trapper access post-closure.

Measures to mitigate the impact of increased mortality risk on carnivore VCs include:

- A wildlife education program (as described in the Wildlife Management and Monitoring Plan, Chapter 33, Section 33.4.1.13) will be developed to raise awareness of requirements and commitments to avoid wildlife and protect wildlife and wildlife habitat;

- Conduct den surveys in high potential denning habitat for grizzly bear and American badger to determine whether active dens are present and, if so, develop management strategies to avoid known active dens during vegetation removal and clearing;
- Management of vehicle traffic and access contributes to minimization of direct mortality during all project phases. Traffic related measures are documented in the Traffic Control Plan (Chapter 33, Section 33.4.2.4) and include:
  - Speed limits will be clearly marked and signed on all Project access roads. Lower speed limits will be set where monitoring and wildlife observation records indicate a high-risk area for animal-vehicle collisions (e.g., at identified wildlife crossings);
  - Additional road signs will be posted for wildlife crossings, speed limit changes, advisory corner speeds, areas with limited visibility, and other potential road hazards;
  - Wildlife will be given the right-of-way on all Project roads;
  - Wildlife sightings and incidents will be reported to the site supervisor as soon as possible;
  - Project traffic will be minimized to the greatest extent practicable;
  - Site workers will travel on crews buses to limit road traffic;
  - Where possible, roads will be designed with clear lines of sight to increase the ability of drivers to see wildlife or other hazards; and
  - Vegetation along Project roadsides will be mowed/brushed as necessary to for visibility of wildlife and to reduce the risk of wildlife-vehicle collisions;
- Measures will be implemented to minimize potential Project effects on movement corridors (e.g., through Grave Creek Canyon); measures will include signage along Project roads to warn vehicle operators of the potential to encounter wildlife;
- Prior to winter avalanche control along the access road, avalanche control areas will be visually searched for wildlife prior to avalanche control activities; avalanche control activities will not be conducted when carnivores are present in potential slide areas;
- Clearing, grubbing, and construction activities will be conducted in such a manner that if carnivores are present, there is escape;
- Prior to blasting at pits, the blast area will be searched for the presence and wildlife and cleared from the area, if necessary;
- To avoid and minimize attractants that could lead to increased human-wildlife conflict, the following measures will be implemented:
  - If a carcass is found along access roads, it will be reported and removed to discourage scavenging wildlife along access roads;
  - To minimize attraction to roads from de-icing materials, use of salt (sodium chloride) will be minimized where possible, the road will be maintained such that concentrations of salt in pools are minimized and alternatives to salt for de-icing will be explored; and
  - Implementation of the Waste Management Plan (Chapter 33, Section 33.4.1.12) that includes:
    - General waste will be separated at the source and will be handled, stored, and transported off-site for disposal at an approved facility; and
    - Wildlife-proof containers will be used for temporary on-site storage of waste; and
- To avoid and minimize the potential for exposure to chemical hazards, the following measures will be implemented:
  - The Spill Prevention, Control, and Countermeasures Plan (Chapter 33, Section 33.4.1.10) contributes to eliminating or minimizing exposure of wildlife to spills;

- Petroleum products and chemicals will be stored in holding tanks or closed facilities that exclude wildlife; and
- Grey water and sewage will be contained in a closed system of holding tanks that will be pumped out as required.

The mitigation measures described above are expected to contribute to avoidance and minimization of the risk of mortality on carnivore VCs with high effectiveness. The effects of increased mortality risk on carnivore VCs are not expected to be fully mitigated and a residual effect may occur.

15.5.3.3.5 Summary of Mitigation Measures

A summary of the key mitigation approaches and their effectiveness to mitigate potential effects is provided in Table 15.5-27. The mitigation measures, their rationale, and the potential for residual effects are similar for all five carnivore VCs and are grouped for summary purposes.

The potential for residual effects were assessed in consideration of the expected effectiveness of the mitigation measures to avoid, minimize, restore, or compensate for potential effects and the carnivore community measurement indicators defined in the AIR (habitat availability and distribution, and known occurrences and abundance).

Where mitigation measures do not or may not mitigate all effects or if there is a low level of confidence in their effectiveness, the effect is carried forward for further analysis of residual effects. For all five carnivore VCs, the effects of habitat loss and degradation, sensory disturbance, and disruption to movement cannot be completely mitigated and are therefore carried forward for further analysis and characterization. For increased mortality risk, the potential effects to grizzly bear and American badger may not be fully mitigated and are also carried forward for further analysis and characterization. For wolverine, American marten, and Canada lynx, the effects of increased mortality risk are considered very low after mitigation is applied and are therefore not carried forward as a residual effect.

No other technically and economically feasible mitigation measures were considered for the carnivore VCs, and NWP is not aware of potential future technology innovations that could help further mitigate effects.

15.5.3.4 Characterization of Residual Effects, Significance, Likelihood, and Confidence

15.5.3.4.1 Methods

The assessment of potential residual effects on carnivore VCs was characterized using a combination of quantitative methods and qualitative discussions. Quantitative methods were used to measure habitat loss and degradation and sensory disturbance. Qualitative discussions are based on scientific literature, baseline studies, habitat models, and professional judgement and were used to characterize disruption to movement and increased mortality risk.

Habitat loss and degradation was measured by calculating the loss of high-quality habitat within the footprint. High-quality habitat was defined as areas with high and very high habitat suitability.

Table 15.5-27: Summary of Proposed Mitigation Measures Related to Carnivore VCs

Valued Component	Potential Effect	Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
All Carnivore VCs	Habitat Loss and Degradation	• Minimization through Project design • Delay clearing until needed • Erosion and sediment control • Air quality and dust management • Progressive reclamation	• These measures contribute to avoidance, minimization, and restoration of habitat loss and degradation. • Not all effects of habitat loss and degradation are expected to be mitigated.	• Construction and Pre-Production • Operations	Moderate	Yes
All Carnivore VCs	Sensory Disturbance	• Noise and Vibration Management Plan • Lighting management • Management of vehicle traffic and site access	• These measures contribute to avoidance and minimization of sensory disturbance. • Not all effects of sensory disturbance are expected to be mitigated.	• Construction and Pre-Production • Operations • Reclamation and Closure	High	Yes
All Carnivore VCs	Disruption to Movement	• Sensory disturbance measures • Wildlife education • Limited new roads • Conveyor elevated to create underpasses • Progressive reclamation • Management of vehicle traffic and site access • Gaps in snowbanks	• These measures contribute to avoidance, minimization, and restoration of habitat loss and degradation. • Not all effects of disruption to movement are expected to be mitigated.	• Construction and Pre-Production • Operations • Reclamation and Closure	Moderate	Yes

Valued Component	Potential Effect	Mitigation Measures	Rationale	Applicable Project Phases	Effectiveness	Residual Effect
Wolverine, American Marten, Canada Lynx	Increased Mortality Risk	• Wildlife education • Pre-disturbance den surveys • Management of vehicle traffic and site access • Prevent wildlife entrapment • Clear area before blasting and avalanche control • Minimize attractants • Manage chemical hazards	• These measures contribute to avoidance and minimization of increased mortality risk. • Increased mortality risk is expected to very low and mitigated for wolverine, American marten, and Canada lynx.	• Construction and Pre-Production • Operations • Reclamation and Closure • Post-Closure	High	No
Grizzly Bear and American Badger	Increased Mortality Risk	• Wildlife education • Pre-disturbance den surveys • Management of vehicle traffic and site access • Prevent wildlife entrapment • Clear area before blasting and avalanche control • Minimize attractants • Manage chemical hazards	• These measures contribute to avoidance and minimization of increased mortality risk. • Increased mortality risk may not to fully mitigated for grizzly bear and American badger.	• Construction and Pre-Production • Operations • Reclamation and Closure • Post-Closure	High	Yes

The effect of sensory disturbance used noise modelling presented in Chapter 7 and summarized earlier in Section 15.5.3.2.3. Sensory disturbance was evaluated by calculating the amount of high-quality habitat that the VC may abandon or be disturbed, based on the modelled noise levels for:

- Continuous Project-related noise ≥ 55 dBA – This is the sound level from the Project that is expected to cause disturbances for wildlife in daytime;
- Continuous Project-related noise ≥ 45 dBA – This is the sound level from the Project that is expected to cause disturbances for wildlife in nighttime; and
- Peak noise (air overpressure) ≥ 108 dB from blasting - This is the peak noise level from blasting at wildlife receptors that is expected to cause disturbed habitat. This was estimated to be at 1,500 m from pit blast sites.

Noise modelling was completed for the worst-case operating scenario. It was determined that operational Year 10 of the Project was the worst-case year for noise from the Project on surrounding sensitive receptors. The effects of Project-related noise in all other years will be less than those arising during operational Year 10. This thus represents a conservative approach.

Residual effects were characterized using the criteria described in Chapter 5, Section 5.3.4.5. The following limits were used for the magnitude of a residual effect on carnivores:

- Negligible: No detectable changes from baseline conditions;
- Low: 0-5% change;
- Moderate: 6-15% change; and
- High: >15% change.

The residual effects of contaminants of potential concern on carnivore VCs are described in Chapter 22 and are therefore not repeated here.

15.5.3.4.2 Grizzly Bear

Grizzly bear was assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk. Mitigation measures will contribute to avoidance, mitigation, and restoration of these effects, but residual effects will remain. All four effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk.

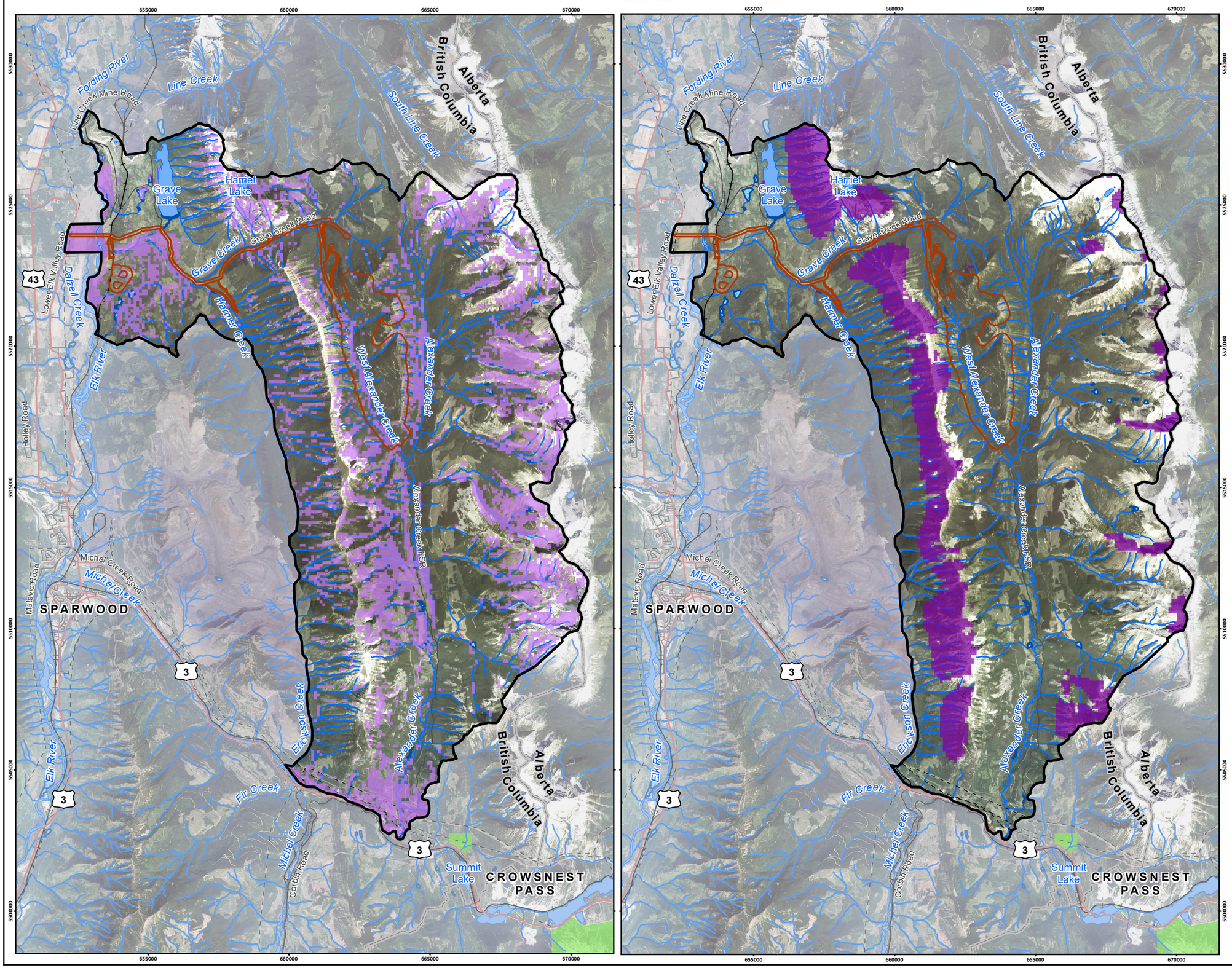
Characterization of Residual Effects

Habitat Loss and Degradation

The Project footprint overlaps with high-quality grizzly bear habitat (Figure 15.5-19 and Figure 15.5-20, and summarized in Table 15.5-28). The grizzly bear model predicts that high-quality habitat in the Project footprint is present in spring, summer, and fall. The Project will result in a predicted loss of up to 228 ha (in fall) of high-quality grizzly bear habitat, representing a loss of up to 3.7% of the total amount of high-quality grizzly bear habitat available in the Terrestrial LSA (6,195 ha). High-quality habitat loss will be in various portions of the Project footprint including the rail loadout, the utility corridor, and upgrading of the lower portions of the access road and the mine site. On a proportional basis, the availability of high-quality grizzly bear habitat is lower within the Project footprint compared to the Terrestrial LSA as whole

FALL

WINTER



Crown Mountain Coking Coal Project

Figure 15.5-19
High-Quality Grizzly Bear Fall and Winter Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality Grizzly Bear Fall Habitat
- High-Quality Grizzly Bear Winter Habitat
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Scale 1:130,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC OrthoImagery (Aug 2016).

Map Created By: PR
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-14

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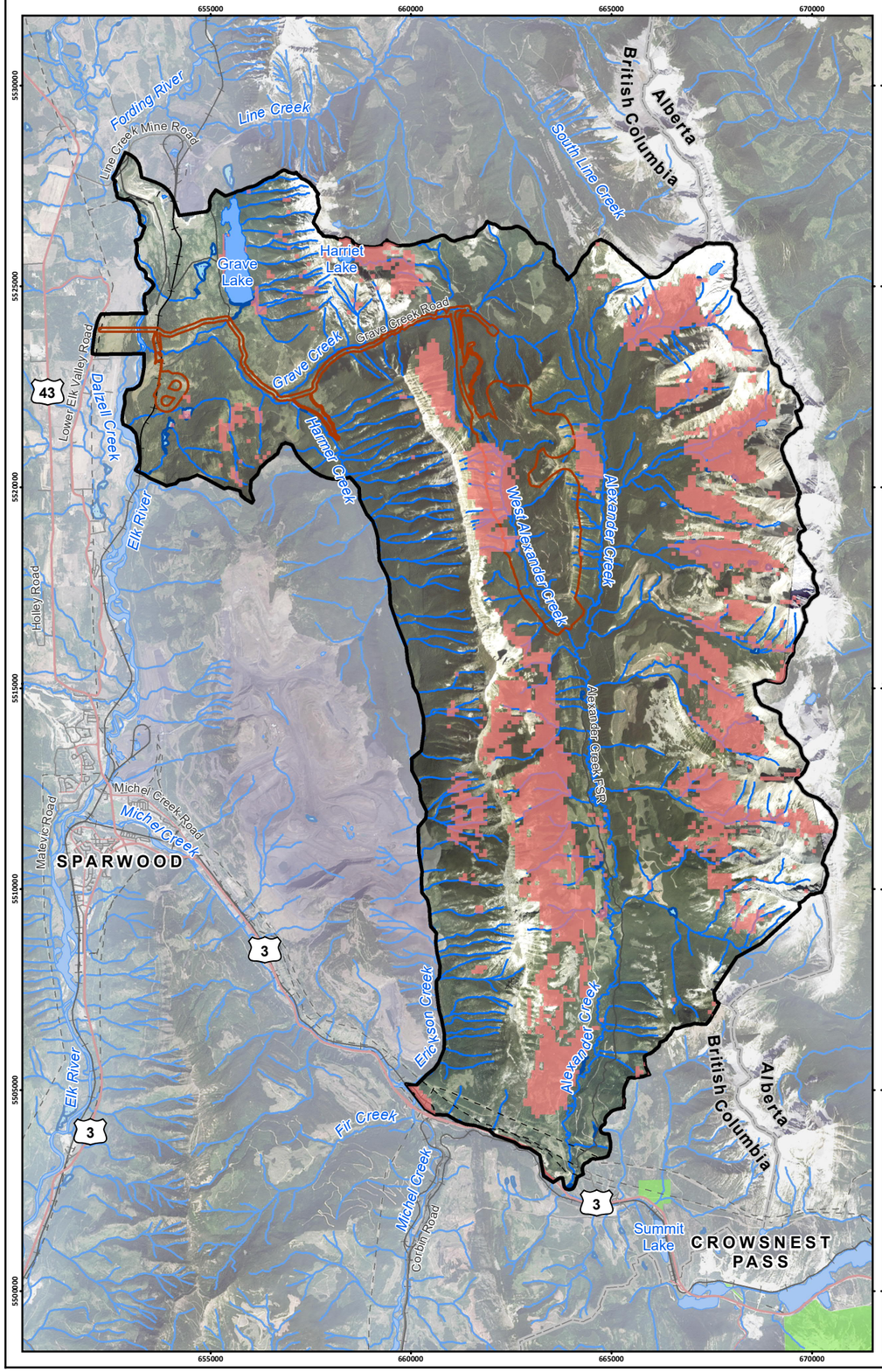
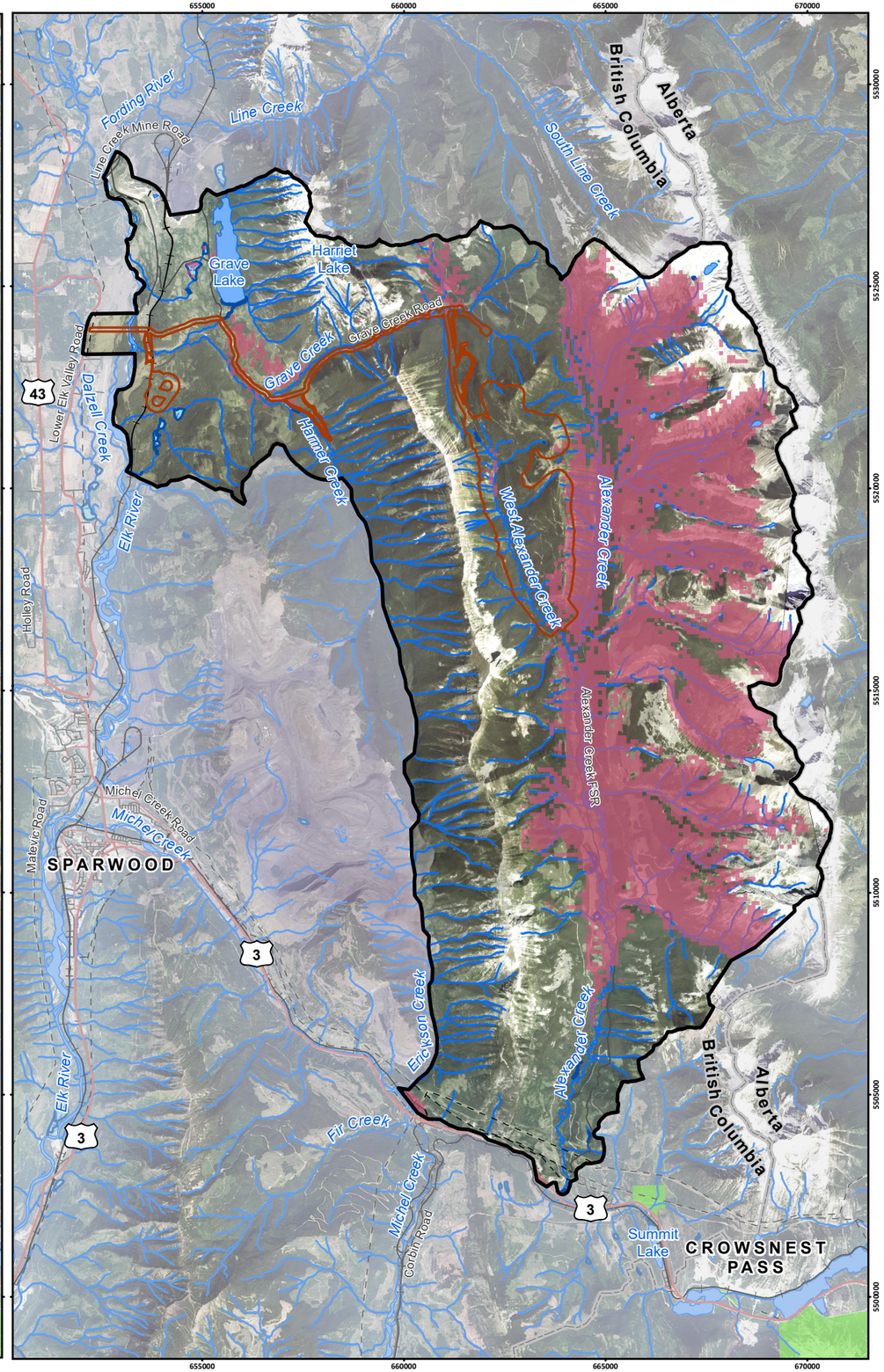
SPRING

SUMMER





Crown Mountain Coking Coal Project

Figure 15.5-20
High-Quality Grizzly Bear Spring and Summer Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality Grizzly Bear Spring Habitat
- High-Quality Grizzly Bear Summer Habitat
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Scale 1:130,000

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(0 to 18% for the Project footprint and 13 to 27% for the Terrestrial LSA, depending on the season), meaning high-quality habitat is more common outside the footprint than it is within.

Table 15.5-28: Change in High-Quality Grizzly Bear Habitat in the Project Footprint and Relative to the Terrestrial LSA

Season	Area (ha) of High Quality-Habitat in Project Footprint	% of Project Footprint	Area (ha) of High-Quality Habitat in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
Fall	228	18	6,195	26	-3.7%
Winter	0	0	3,225	13	0.0%
Spring	127	10	3,863	16	-3.3%
Summer	142	11	6,481	27	-2.2%

Clearing will begin in Construction and Pre-Production with initial portions of the 1,283 ha footprint (including the buffer) prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline, and the rail loadout. During Operations, progressive clearing of the pits, Mine Rock Storage Facility, and Main Sediment Pond will continue through to Year 15. Habitat loss will have a continuous adverse effect until progressive reclamation begins in Year 10 of Operations. With progressive reclamation between Years 10 and 15 and continued reclamation in the Reclamation and Closure phase, the effect of habitat loss will begin to decline.

The service corridor with the 138 kV powerline will be cleared during Construction and Pre-Production. The area beneath the powerlines and between power poles will naturally revegetate over time and will be accessible to grizzly bear (though may be avoided due to sensory disturbance). Areas that were previously forest will no longer provide security and thermal protection but will provide forage for grizzly bear. After decommissioning, trees will eventually return, though not established as a forest for several decades.

A 100 m wide corridor has been allocated for construction of the 2.7 km long overland coal conveyor. Not all portions of the corridor will require clearing, and temporary construction areas will rapidly revegetate and provide forage for grizzly bear (though may be avoided due to sensory disturbance).

The east side of the Project footprint includes a contingency area that extends over the top of Crown Mountain and downslope for approximately 250 m. This area contains the start zones for avalanche chutes that continue downslope toward Alexander Creek. If the start zones are modified through excavation or stockpiling, the avalanche regime may change and may degrade or eliminate avalanche chute habitat downslope and outside the Project footprint. Avalanche chutes provide important habitat for grizzly bear. The extent of alteration and potential loss will depend on how much of the contingency area is used (if any) and the slopes of the areas altered. It is likely, though not certain, that there will be very little change to avalanche start zones and therefore little to no change to avalanche regimes. There are 45 ha of shrub avalanche chute outside the Project footprint that may be affected if their start zones are modified or lost (shown in Chapter 13, Figure 13.6-1). This therefore represents an additional 45 ha of additional high-quality habitat loss (1.1% of high-quality spring habitat in the Terrestrial LSA) beyond that already occurring within the Project footprint.

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands and riparian areas (described in Section 15.5.3.3.1 and in the Ecological Restoration Plan, Chapter 33, Section 33.4.1.3). Most of the restored ecosystems will provide habitat for grizzly bear (i.e., food, security, or thermal protection) over time. Reclamation will begin in Year 10 of Operations for limited areas and then accelerating at the end of Operations. Within five years of closure, graminoids, forbs, and some shrubs will have become established and will begin to provide food for grizzly bear, though the quality will be variable and may be limited in many areas. Grizzly bears have been found to access reclaimed mines to forage on vegetation and prey on ungulates (Cristescu et al., 2011); however, mine reclamation areas have generally not been found to support high value forage used by grizzly bears (Teck Coal Limited, 2014; Mowat et al., 2018). Food availability will progressively improve at 25 and 50 years post-closure. Forest will begin to become established at 50 years post-closure onward, especially at low elevations, and begin to provide security. The Project footprint is ultimately expected to be a landscape similar in structure and composition to the pre-Project landscape.

Habitat degradation of areas outside the Project footprint can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Mitigation for each of these effects was described in Chapter 13 and found to have no residual effects to each of the ecosystem VCs.

The Project footprint includes a buffer area intended to account for uncertainty in precise boundaries of disturbance. Not all of the buffer area will be disturbed, and the calculations of habitat loss are therefore conservative and may be overestimated.

The residual effect to grizzly bear from habitat loss and degradation is characterized as follows:

- Duration: *Long-term*, as lost habitat will begin to be reclaimed prior to the Post-Closure phase.
- Magnitude: *Low*, there will be up 3.7% loss of high-quality grizzly bear habitat (fall) in the Terrestrial LSA.
- Geographic Extent: *Discrete*, as the effect of habitat loss will be within the Project footprint only.
- Frequency: *Continuous*, the effect of habitat loss is expected to be continuous until lost habitat is reclaimed.
- Reversibility: *Reversible long-term*, the effect of habitat loss is anticipated to be reversible once the Project footprint is reclaimed.
- Context: *Low,* as grizzly bear has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Sensory Disturbance

Grizzly bear habitat will be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for grizzly bear includes behavioural responses to Project-related noise, vibration, light, dust, and human presence. Sensory disturbance from noise has the potential to extend furthest and is the focus of the residual effects assessment. Potential effects arising from vibration, light, dust, and human presence would be expected to be less than those arising from noise.

Continuous Project-related noise at ≥ 45 dBA (nighttime threshold) will affect up to 1,118 ha outside the Project footprint. This overlaps with up to 254 ha of high-quality habitat, depending on the season (Figure 15.5-21, Figure 15.5-22, and Table 15.5-29) when Project-related noise is at its peak in Year 10 of Operations. This represents up to 6.6% of high-quality grizzly bear habitat in the Terrestrial LSA. A much smaller amount of high-quality habitat may be affected in daytime using the ≥ 55 dBA daytime threshold.

Peak noise from blasting could affect up to 573 ha of high-quality habitat depending on the season (Figure 15.5-21, Figure 15.5-22, and Table 15.5-29). This represents up to 8.9% of high-quality grizzly bear habitat available in the Terrestrial LSA.

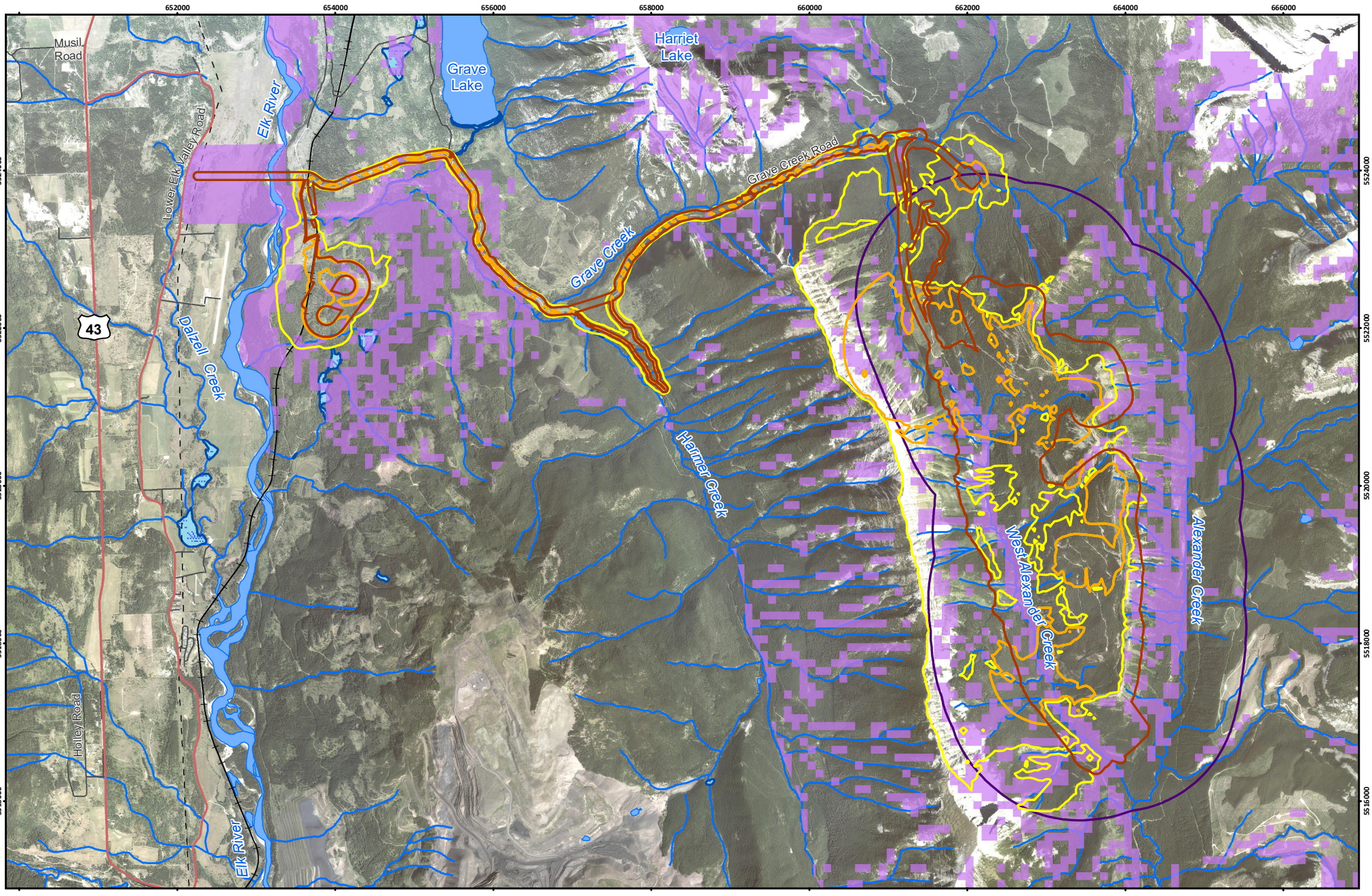
Table 15.5-29: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality Grizzly Bear Habitat

Season	Zone of Influence Area (ha)	Area (ha) of High-Quality Habitat Affected Outside Project Footprint	Area Affected as Proportion of High-Quality Habitat in Terrestrial LSA
Continuous Project-related noise ≥ 55 dBA (daytime threshold)			
Fall	1,118	53	0.9%
Winter		50	1.6%
Spring		56	1.5%
Summer		0	0.0%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Fall	242	238	3.9%
Winter		200	6.2%
Spring		254	6.6%
Summer		5	0.1%
Peak noise ≥ 108 dB from blasting			
Fall	1,195	475	7.7%
Winter		74	2.3%
Spring		294	7.6%
Summer		573	8.9%

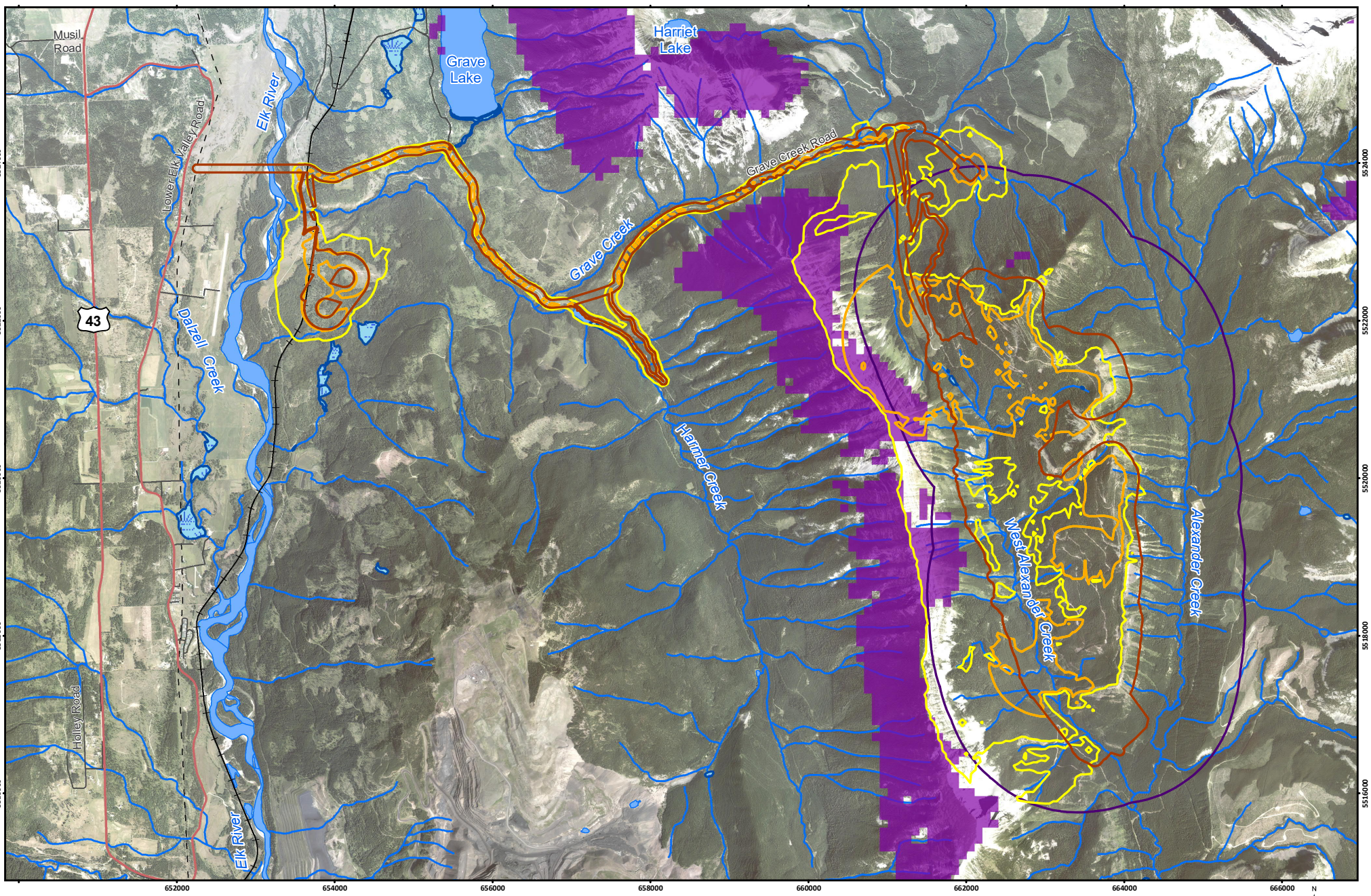
Grizzly bears are sensitive to human activities and may be displaced within the noise zones of influence. Habitat is not lost, but grizzly bear may spend less time in areas affected by noise, effectively degrading the quality of habitat or eliminating availability completely. The zone of influence from noise is largest at the pit where the CHPP and most heavy equipment is located.

Once the Operations phase is complete, noise will substantially decrease and noise from blasting will cease. Noise during Reclamation and Closure will be from decommissioning and removal of infrastructure and reclamation activities, though to lesser levels than during Operations.

FALL



WINTER



Crown Mountain Coking Coal Project

Figure 15.5-21
High-Quality Grizzly Bear Fall and Winter Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality Grizzly Bear Fall Habitat
- High-Quality Grizzly Bear Winter Habitat
- Continuous Project Related Noise - 45 dBA Contours
- Continuous Project Related Noise - 55 dBA Contours
- Offsite Peak Noise Levels From Blasting >108 dB
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

0 1 2
Kilometres

N W E S

Scale 1:65,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd., Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By ESRI.

Map Created By: PR
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

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Project: 12-6231
Status: FINAL
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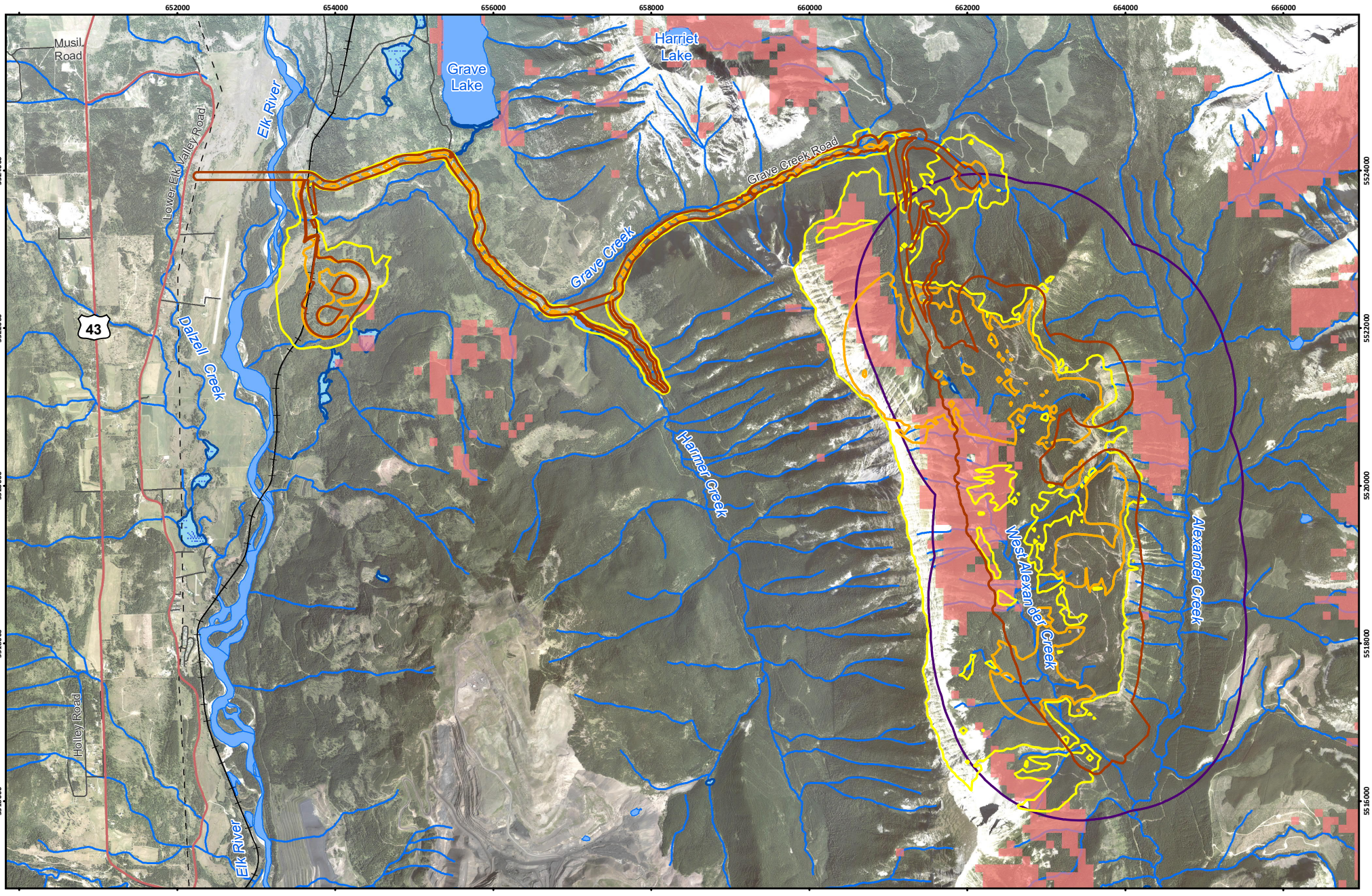
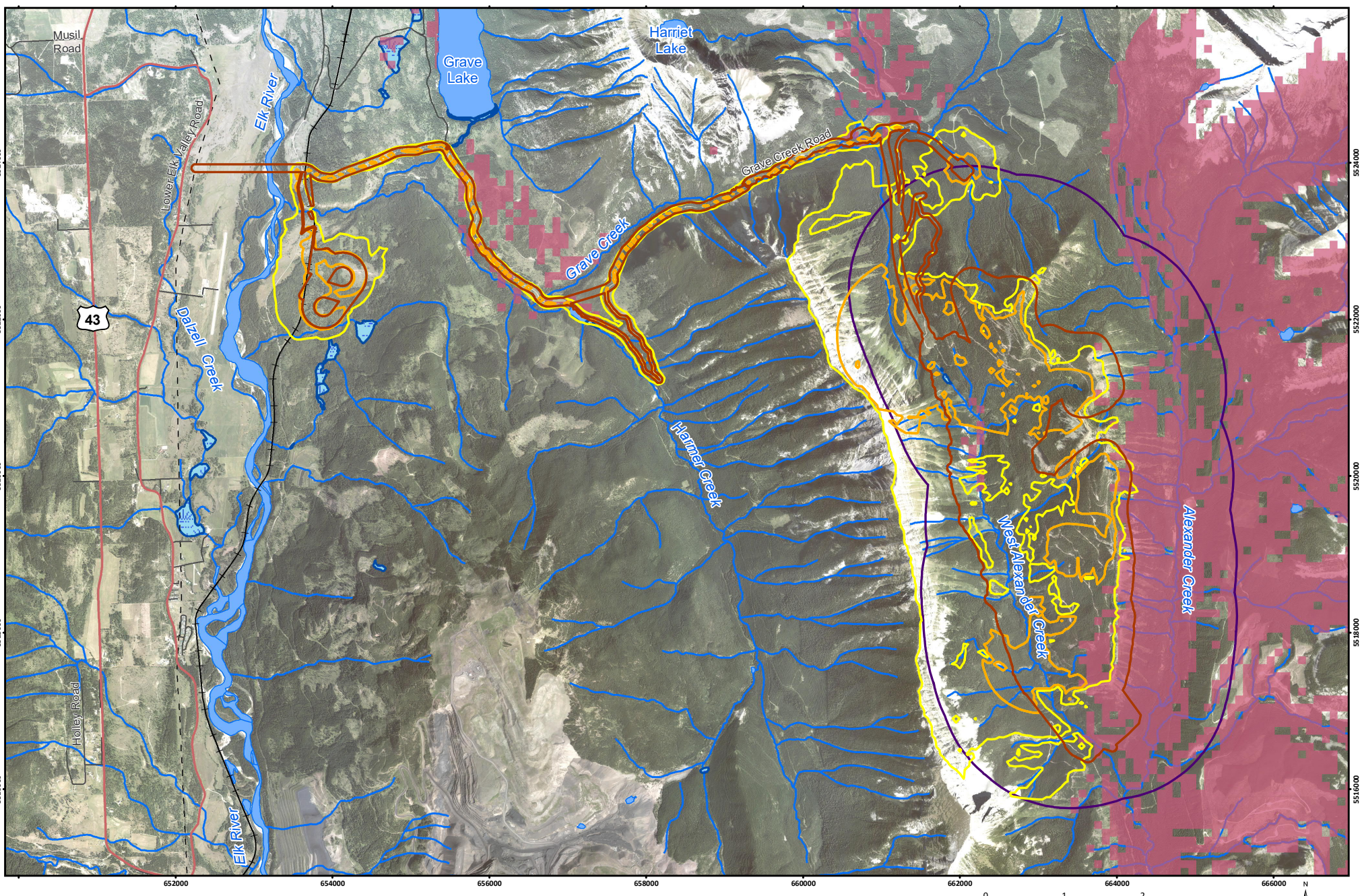
SPRING



SUMMER



Crown Mountain Coking Coal Project

Figure 15.5-22
High-Quality Grizzly Bear Spring and Summer Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality Grizzly Bear Spring Habitat
- High-Quality Grizzly Bear Summer Habitat
- Continuous Project Related Noise - 45 dBA Contours
- Continuous Project Related Noise - 55 dBA Contours
- Offsite Peak Noise Levels From Blasting >108 dB
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

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Scale 1:65,000

Map Drawing Information:
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Status: FINAL
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Document Path: \\42dillon\CAD\GIS\2012 and Prior\126231 Crown Mountain\EA_Report\EffectsAssessment\Wildlife\126231_EA_WHbear_GrizzlyBearHabitat_Footprint_Noise_Contours_SS.mxd

The residual effect to grizzly bear from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Moderate*, up to 8.9% of high-quality grizzly bear habitat will be affected by noise, depending on the season.
- Geographic Extent: *Local*, as the effect of habitat loss will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying levels till the end of Operations, peaking at Year 10 of Operations. Noise from blasting will be intermittent.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as grizzly bear has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Disruption to Movement

Grizzly bears make daily movements between habitats that provide food, security, and thermal protection, and seasonal movements that track food availability. The Project has the potential to block both daily and seasonal movements. Disruption to grizzly bear movement patterns can result in reduced body condition and reduced gene flow between populations, which has implications for species population viability and long-term persistence. Disruption to movement may be particularly high when Project activities and components are within restricted terrain features including narrow valleys or canyons.

The baseline assessment showed that grizzly bears regularly utilize riparian and alpine areas for movement. Movement corridors included Alexander Creek, West Alexander Creek, and the Grave Creek Canyon. Other connectivity habitats included the Michel-Alexander Creek linkage at the southern extent of the Terrestrial LSA and transboundary mountain passes (i.e., Deadman, Racehorse, and North Fork Passes) in the eastern portion of the Terrestrial LSA. The results indicate that potential barriers to movement include roads, open canopy low elevational forest, large rivers and their tributaries, mined landscapes, and agricultural and settled areas.

When the Project is at its largest extent and prior to any large areas of reclamation (around Year 10 of Operations), the mine site footprint will occupy a large portion of the West Alexander Creek valley and will be an impermeable barrier in the area that it occupies. The upper slopes of the west side of the valley will remain intact, but will be degraded by sensory disturbance and use for connectivity between daily or seasonal habitats may be reduced.

Along the conveyor, underpasses will be created by elevating the conveyor to at least 2.4 m above ground (or higher where terrain can be used to create more clearance) at intervals of two per 1,000 m. Use of the conveyor underpasses and habitats adjacent to the conveyor will be dependent on sensitivity to the physical presence of the conveyor and the noise that is generated. The conveyor is expected to represent a semi-permeable barrier to grizzly bear.

The explosives factory will be accessed by 900 m of new road. All other access roads are pre-existing (aside from those in the pits and dump areas). Access roads will be upgraded and will have higher levels of daily traffic relative to existing conditions. Grizzly bears generally avoid roads, though can still be attracted to

roads for forage. Grizzly bears were recorded along Grave Creek Road in baseline surveys. In general, roads represent a semi-permeable barrier to grizzly bear, provided that no physical barriers are created during road upgrade. The predicted traffic level of 140 vehicles per day is unlikely to affect crossing success, especially with speed reductions in areas known to have frequent wildlife (e.g., Grave Creek Canyon) and that wildlife have the right-of-way. Traffic levels between 300 and 500 vehicles per day have been suggested as a threshold for highways acting as a barrier to carnivore movements based on a multi-species study in the Canadian Rocky Mountains (Alexander et al., 2005).

The utility corridor is primarily composed of the powerline and the buried gas line. Suitable habitat will be present beneath the powerline after construction. The powerline may not be a barrier to movement on its own but since it parallels the road, it may be avoided due to proximity and function as a semi-permeable barrier in combination with the road.

The Terrestrial LSA has approximately 317.9 km of existing roads. This includes 2.4 km of highway, 1.8 km of paved, and 313 km of gravel roads. This is a road density of 1.31 km/ km^2. A portion of the gravel road calculation includes deactivated roads that are not passable with vehicles. The calculation is therefore an overestimate of active roads that may affect grizzly bear; however, it at least provides some context to consider the effect of new roads and other linear disturbance as a result of the Project. The Project will create 900 m of new road to the explosives factory. The conveyor will add approximately 5 km of new linear disturbance that may have a similar effect as an active road given the presence and noise associated with the conveyor operation. The utility corridor parallels the existing Grave Creek Road for most of its length and was therefore not included as new linear disturbance. The total amount of new linear disturbance is therefore 5.9 km. This represents 1.9% of additional linear disturbance in the Terrestrial LSA. The conveyor corridor will be reclaimed, and the explosives factory road will be deactivated after Operations.

The residual effect to grizzly from disruption to movement is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Moderate*, given the semi-permeable nature of the linear infrastructure.
- Geographic Extent: *Local*, as the effect will extend outside the Project footprint but within the Terrestrial LSA.
- Frequency: *Continuous,* as the effect will continue through Operations to Reclamation and Closure.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as grizzly bear has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Increased Mortality Risk

Pathways of increased risk of mortality (described in Sections 15.5.3.2.3) that are unlikely to be fully mitigated are collisions with Project-related traffic on access or mine roads, collisions with trains, and increased hunter access after closure.

Even with the traffic control mitigations described in Section 15.5.3.3.4, vehicle collisions with grizzly bear may still occur. The number is expected to be very small. Wildlife sightings and wildlife-vehicle collisions

will be recorded and monitored. Further mitigations will be implemented to further minimize the risk of collision if required.

The Project will involve loading of 120 trains per year. Trains will not be travelling at high speeds within the rail loadout and train-wildlife collisions in this area are unlikely. There will be an incremental increase in rail traffic on the main rail lines as a result of the Project (one additional train every three days on average) where the risk of wildlife-train collisions is higher. The extent to which the Project will contribute to an incremental increase in grizzly bear mortalities from train collisions is unknown.

The upgraded Grave Creek Road will remain open post-closure and may provide increased access to hunters. Though there is no open hunting season for grizzly bear, there is the potential for poaching. The current condition of the road is rough, though is currently accessed by 4x4 vehicles, snowmobiles, and all-terrain vehicles. Access up from Grave Creek Road to the mine site will be open to the public. The road to the explosives factory will decommissioned and reclaimed. The potential for increased poaching of grizzly bear as a result of increased access is difficult to predict but is assumed to be very low.

The residual effect to grizzly bear from increased mortality risk is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Low*, as grizzly mortalities as a result of the Project are expected to be uncommon.
- Geographic Extent: *Discrete*, as the effect will be within the Project footprint.
- Frequency: *Intermittent*, as grizzly bear mortalities may be at sporadic intervals during any phase of the Project.
- Reversibility: *Reversible long-term*, as the potential for increased mortality risk will end after Reclamation and Closure.
- Context: *Low*, as the grizzly bear population is very sensitive to change in mortality rates.

Determination of Significance

In the South Rockies Grizzly Bear Population Unit, there are an estimated 239 grizzly bears, corresponding to a population density of approximately 2.9 individuals/100 km^2 (Lamb et al., 2020). Current population density estimates in southeast B.C. are considerably lower than during the 1980s, when grizzly bear population density was approximately 6.4 individuals/100 km^2 (McLellan, 1989). The grizzly bear population north of Highway 3 within the Elk, Bull, and White River valleys declined by 40% between 2006 and 2013, indicating a doubling of mortality rate between those years (Mowat and Lamb, 2016). A preliminary analysis of very recent data suggests there has been a very recent population increase in the Elk Valley since 2012 (Mowat et al., 2018).

Direct habitat loss as a result of the Project is of low magnitude and is partly reversible, though the quality of reclaimed areas to grizzly bear will be variable. The indirect habitat loss and degradation from potential impact to the avalanche chutes on the east side of Crown Mountain (if it occurs) may be much more important to grizzly bear, as avalanche chutes rank among the most important habitats for grizzly bear. Sensory disturbance will further degrade habitat in the West Alexander Creek valley. The West Alexander Creek valley will be partially blocked to grizzly bear movements (by the pits and Mine Rock Storage Facility before they are reclaimed); other portions of the Project footprint will represent a semi-permeable barrier.

Based on the characterization of the residual effects and recent trends in local grizzly bear population levels, the Project is unlikely to contribute to limiting the ability of grizzly bear to recover from past declines and maintain a stable population in the Terrestrial LSA. The combined residual effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk on grizzly bear are therefore considered not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of grizzly bear ecology, their habitat availability and distribution, known occurrences, and abundance in the Terrestrial LSA. There is, however, uncertainty in the grizzly bear population trend in the Elk Valley and the factors that may most contribute to grizzly bear population stability. Furthermore, the loss of additional avalanche chutes on the east site of Crown Mountain is uncertain. The confidence in the significance determination of residual effects to grizzly bear is therefore moderate.

15.5.3.4.3 Wolverine

Wolverine was assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk. Mitigation measures will contribute to avoidance, mitigation, and restoration of these effects, but residual effects will remain for habitat loss and degradation, sensory disturbance, and disruption to movement. These three effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation, sensory disturbance, and disruption to movement.

Characterization of Residual Effects

Habitat Loss and Degradation

The Project footprint overlaps with high-quality wolverine habitat (Figure 15.5-23 and summarized in Table 15.5-30). The wolverine model predicts that high-quality habitat is predominantly at mid and high elevations and east of Erickson Ridge. The Project will result in a predicted loss of up to 351 ha of high-quality wolverine habitat, representing a loss of 13.1% of the total amount of high-quality wolverine habitat available in the Terrestrial LSA (2,683 ha). Loss of high-quality habitat will primarily be in the mine site footprint. On a proportional basis, the availability of high-quality wolverine habitat is higher within the Project footprint compared to the Terrestrial LSA as whole (27% for the Project footprint and 11% for the Terrestrial LSA), meaning high-quality habitat is more common inside the footprint than it is outside.

Table 15.5-30: Change in High-Quality Wolverine Habitat in the Project Footprint and Relative to the Terrestrial LSA

Season	Area (ha) of High-Quality Habitat in Project Footprint	% of Project Footprint	Area (ha) of High-Quality Habitat in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
Year-round	351	27	2,683	11	-13.1%

Crown Mountain Coking Coal Project

Figure 15.5-23
High-Quality Wolverine Year-round Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality Wolverine Year-round Habitat
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Kilometres

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

Map Created By: PR
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-14

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Clearing will begin in Construction and Pre-Production with initial portions of the 1,283 ha footprint (including the buffer) prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline and the rail loadout. During Operations, progressive clearing of the pits, Mine Rock Storage Facility, and Main Sediment Pond will continue through to Year 15. Habitat loss will have a continuous adverse effect until progressive reclamation begins in Year 10 of Operations. With progressive reclamation between Years 10 and 15 and continued reclamation in the Reclamation and Closure phase, the effect of habitat loss will begin to decline.

The service corridor with the 138 kV powerline will be cleared during Construction and Pre-Production. The area beneath the powerlines and between power poles will naturally revegetate over time and will be accessible to wolverine (though may be avoided due to sensory disturbance). The majority of the service corridor is not considered high-quality wolverine habitat.

A 100 m wide corridor has been allocated for construction of the 2.7 km long overland coal conveyor. Not all portions of the corridor will require clearing and temporary construction areas will rapidly revegetate and provide habitat for wolverine (though may be avoided due to sensory disturbance).

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands, and riparian areas (described in Section 15.5.3.3.1 and in the Ecological Restoration Plan, Chapter 33, Section 33.4.1.3). Most of the restored ecosystems will provide habitat for wolverine over time as prey species begin to use reclaimed areas. Reclamation will begin in Year 10 of Operations for limited areas and then accelerating at the end of Operations. The Project footprint is ultimately expected to be a landscape similar in structure and composition to the pre-Project landscape.

Habitat degradation of areas outside the Project footprint can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Mitigation for each of these effects was described in Chapter 13 and found to have no residual effects to each of the ecosystem VCs.

The Project footprint includes a buffer area intended to account for uncertainty in precise boundaries of disturbance. Not all of the buffer area will be disturbed, and the calculations of habitat loss are therefore conservative and may be overestimated.

The residual effect to wolverine from habitat loss and degradation is characterized as follows:

- Duration: *Long-term*, as lost habitat will begin to be reclaimed prior to the Post-Closure phase.
- Magnitude: *Moderate*, there will be up to a 13.1% loss of high-quality wolverine habitat in the Terrestrial LSA.
- Geographic Extent: *Discrete*, as the effect of habitat loss will be within the Project footprint only.
- Frequency: *Continuous*, the effect of habitat loss is expected to be continuous until lost habitat is reclaimed.
- Reversibility: *Reversible long-term*, the effect of habitat loss is anticipated to be reversible once the Project footprint is reclaimed.

- Context: *Low,* as wolverine has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Sensory Disturbance

Wolverine habitat will be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for wolverine includes behavioural responses to Project-related noise, vibration, light, dust, and human presence. Sensory disturbance from noise has the potential to extend furthest and is the focus of the residual effects assessment. Potential effects arising from vibration, light, dust, and human presence would be expected to be less than those arising from noise.

Continuous Project-related noise at ≥ 45 dBA (nighttime threshold) will affect up to 1,118 ha outside the Project footprint. This overlaps with up to 89 ha of high-quality wolverine habitat (Figure 15.5-24 and Table 15.5-31) when Project-related noise is at its peak in Year 10 of Operations. This represents up to 3.3% of high-quality wolverine habitat in the Terrestrial LSA. A much smaller amount of high-quality habitat may be affected in daytime using the ≥ 55 dBA daytime threshold.

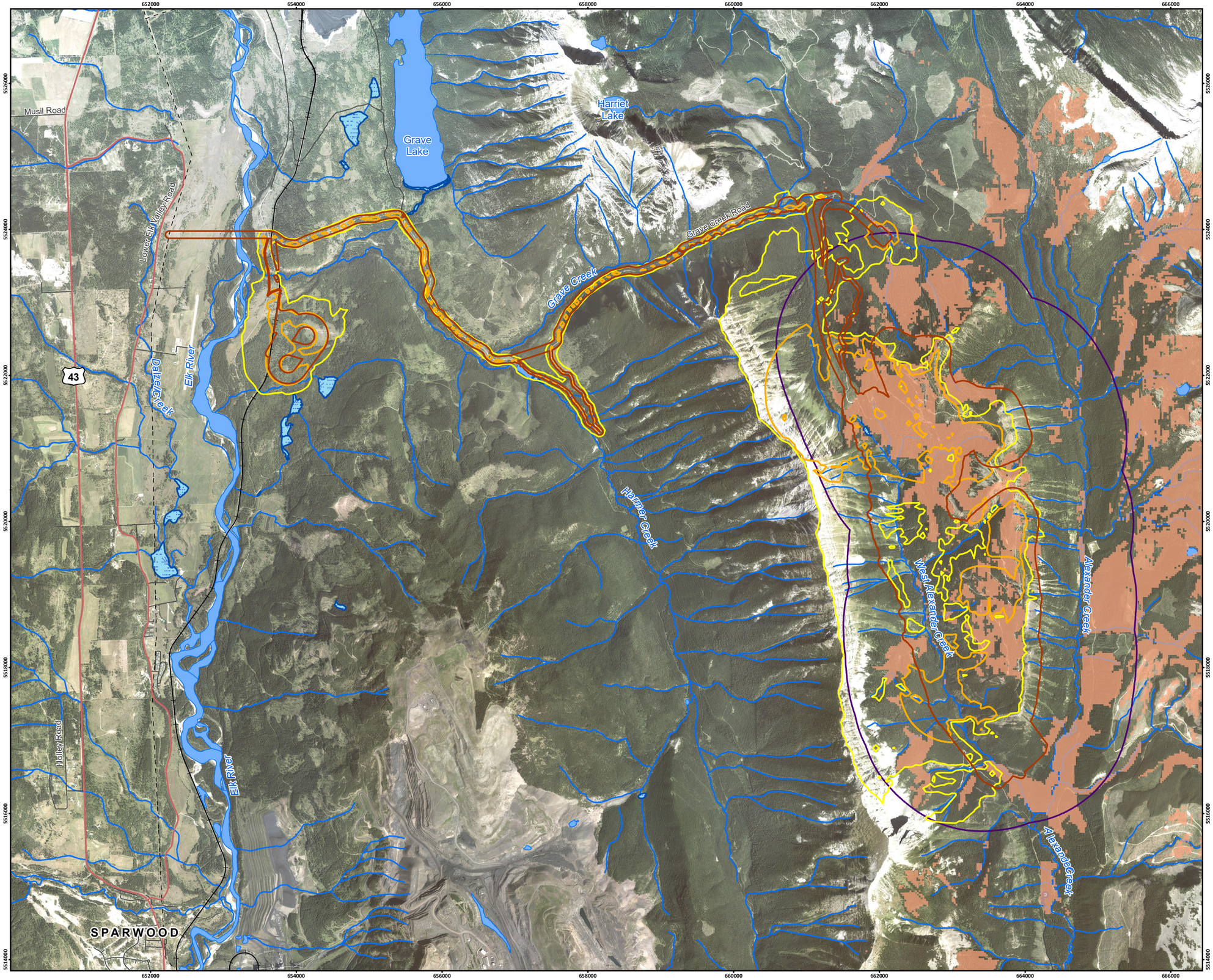
Peak noise from blasting could affect up to 407 ha of high-quality habitat (Figure 15.5-24 and Table 15.5-31). This represents up to 15.2% of high-quality wolverine habitat available in the Terrestrial LSA.

Table 15.5-31: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality Wolverine Habitat

Season	Zone of Influence Area (ha)	Area (ha) of High-Quality Habitat Affected Outside Project Footprint	Area Affected as Proportion of High-Quality Habitat in Terrestrial LSA
Continuous Project-related noise ≥ 55 dBA (daytime threshold)			
Year-round	242	27	1.0%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Year-round	1,118	89	3.3%
Peak noise ≥ 108 dB from blasting			
Year-round	1,955	407	15.2%

Wolverines are sensitive to human activities and may be displaced within the noise zones of influence. Habitat is not lost, but wolverine may spend less time in areas affected by noise, effectively degrading the quality of habitat or eliminating availability completely. The zone of influence from noise is largest at the pit where the CHPP and most heavy equipment is located. This also corresponds to where most high-quality habitat is located adjacent to the Project footprint.

Once the Operations phase is complete, noise will substantially decrease and noise from blasting will cease. Noise during Reclamation and Closure will be from decommissioning and removal of infrastructure and reclamation activities, though to a lesser extent than during Operations.



Crown Mountain Coking Coal Project

Figure 15.5-24
High-Quality Wolverine Year-round Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality Wolverine Year-round Habitat
- Continuous Project Related Noise - 45 dBA Contours
- Continuous Project Related Noise - 55 dBA Contours
- Offsite Peak Noise Levels From Blasting >108 dB
- Project Footprint
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

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Scale 1:50,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By GeoBC OrthoImagery (Aug 2016).

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Date: 2022-01-14

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The residual effect to wolverine from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Moderate*, up to 15.2% of high-quality wolverine habitat in the Terrestrial LSA will be affected by noise.
- Geographic Extent: *Local*, as the effect of habitat loss will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying levels till the end of Operations, peaking at Year 10 of Operations. Noise from blasting will be intermittent.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as wolverine has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Disruption to Movement

The Project has the potential to block wolverine daily and seasonal movements. Wolverine were found to regularly utilize mid- to high-elevation rugged terrain and closed canopy, dense coniferous forest for movement, and avoided areas with greater human influence, including large valley bottoms (primary rivers). Movement habitats included the Grave Creek Canyon (within the Project footprint) and the Alexander Creek drainage. Studies of wolverine have identified several key corridors in the Terrestrial RSA that maintain connectivity between populations. One of these is within the Terrestrial LSA: a north-south corridor that connects Alexander Creek and Michel Creek. This corridor is to the east of the Project footprint.

When the Project is at its largest extent and prior to any large areas of reclamation (around Year 10 of Operations), the mine site footprint will occupy a large portion of the West Alexander Creek valley and will be an impermeable barrier in the area that it occupies. The upper slopes of the west side of the valley will remain intact but will be degraded by sensory disturbance and use for connectivity between daily or seasonal habitats may be reduced.

Along the conveyor, underpasses will be created by elevating the conveyor to at least 2.4 m above ground (or higher where terrain can be used to create more clearance) at intervals of two per 1,000 m. Use of the conveyor underpasses and habitats adjacent to the conveyor will be dependent on their sensitivity to the physical presence of the conveyor and the noise that is generated. The conveyor is expected to represent a semi-permeable barrier to wolverine.

Wolverine generally avoid areas with high road density. The explosives factory will be accessed by 900 m of new road. All other access roads are pre-existing (aside from those in the pits and dump areas). Access roads will be upgraded and will have higher levels of daily traffic relative to existing conditions. The predicted traffic level of 140 vehicles per day is unlikely to affect crossing success, especially with speed reductions in areas known to have frequent wildlife (e.g., Grave Creek Canyon) and that wildlife have the right-of-way. Traffic levels between 300 and 500 vehicles per day have been suggested as a threshold for highways acting as a barrier to carnivore movements based on a multi-species study in the Canadian Rocky Mountains (Alexander et al., 2005).

The utility corridor is primarily composed of the powerline and the buried gas line. Suitable habitat will be present beneath the powerline after construction. The powerline may not be a barrier to movement on its own but since it parallels the road, it may be avoided due to proximity and function as a semi-permeable barrier in combination with the road.

The residual effect to wolverine from disruption to movement is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Low*, given semi-permeable nature of the linear infrastructure.
- Geographic Extent: *Local*, as the effect will extend outside the Project footprint but within the Terrestrial LSA.
- Frequency: *Continuous,* as the effect will continue through Operations to Reclamation and Closure.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Low,* as wolverine has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Determination of Significance

In the southeast Kootenay region, wolverine density averages 0.2 wolverines/100 km^2 (Mowat et al., 2020a). Due to their low reproductive potential and large spatial requirements, wolverines are considered to have low resilience in the Elk Valley region (Apps et al., 2007). Population trends are not well understood. Direct habitat loss as a result of the Project is of moderate magnitude and is partly reversible, though the quality of reclaimed areas to wolverine may be low. Additional wolverine habitat in the West Alexander Creek valley will be degraded by noise and may be avoided by wolverine. Local wolverine movements will be affected by the presence of the Project footprint. There will be only a small amount of new road created as a result of the Project.

Based on the characterization of the residual effects, despite their low population densities, the Project would not limit the ability of wolverine to persist and maintain self-sustaining populations in the Terrestrial LSA. The residual effects of habitat loss and degradation, sensory disturbance, and disruption to movement on wolverine are therefore considered not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

There is a moderate understanding of wolverine ecology, their habitat availability and distribution, and known occurrences and abundance in the Terrestrial LSA. Little is known about wolverine population trends in the Elk Valley and the factors that may most contribute to wolverine population stability; however, the confidence in the significance determination of residual effects to wolverine is high.

15.5.3.4.4 American Badger

American badger was assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk. Mitigation measures will

contribute to avoidance, mitigation, and restoration of these effects, but residual effects will remain. All four effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk.

Characterization of Residual Effects

Habitat Loss and Degradation

The Project footprint overlaps with high-quality American badger habitat (Figure 15.5-25 and summarized in Table 15.5-32). The American badger model predicts that high-quality habitat is predominantly at low elevations west of Erickson Ridge. The Project will result in a predicted loss of up to 98 ha of high-quality American badger habitat, representing a loss of 3.9% of the total amount of high-quality American badger habitat available in the Terrestrial LSA (2,526 ha). Loss of high-quality habitat will primarily be in the area of the rail loadout and the lower portions of the upgraded Grave Creek Road and the utility corridor. On a proportional basis, the availability of high-quality American badger habitat is lower within the Project footprint compared to the Terrestrial LSA as a whole (8% for the Project footprint and 10% for the Terrestrial LSA), meaning high-quality habitat is more common outside the footprint than it is within.

Table 15.5-32: Change in High-Quality American Badger Habitat in the Project Footprint and Relative to the Terrestrial LSA

Season	Area (ha) of High-Quality Habitat in Project Footprint	% of Project Footprint	Area (ha) of High-Quality Habitat in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
Year-round	98	8	2,526	10	-3.9%

Clearing will begin in Construction and Pre-Production with initial portions of the 1,283 ha footprint (including the buffer) prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline, and the rail loadout. Habitat loss will have a continuous adverse effect until progressive reclamation begins in Year 10 of Operations. All loss of badger habitat will be within the Construction and the Pre-Production phase.

The service corridor with the 138 kV powerline will be cleared during Construction and Pre-Production. The area beneath the powerlines and between power poles will naturally revegetate over time and will be accessible to American badger.

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands and riparian areas (described in Section 15.5.3.3.1 and in the Ecological Restoration Plan, Chapter 33, Section 33.4.1.3). Approximately 181 ha of grassland composed of graminoids and dry shrubs, with few scattered trees, will be restored at lower elevations. Restoration of these areas will begin after Operations. Within five years of closure, a sparse grassland is expected to be established and will progressively include a shrub component in the following years and decades. The Project footprint is ultimately expected to be a landscape similar in structure and composition to the pre-Project landscape.

Crown Mountain Coking Coal Project

Figure 15.5-25
High-Quality American Badger Spring-Summer Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality American Badger Spring-Summer Habitat
- Terrestrial Local Study Area
- Project Footprint
- Highway
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- British Columbia/Alberta Border

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Kilometres

Scale 1:85,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By Landsat 8 (Aug 2018), and GeoBC Ortho Imagery (Aug 2016).

Map Created By: PR
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-14

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Within the Elk Valley, American badgers are known to utilize landscapes impacted by mining, including clearings adjacent to process facilities and coarse-coal reject dumps where soils have low to moderate coarse fragments with friable textures (Teck Coal Limited, 2014). Mines also have the potential to create loss of habitat and prey availability for American badgers, and reduce movement corridors (*Jeffersonii* Badger Recovery Team, 2008). In addition, soil compaction from mining activities may limit the burrowing abilities of American badger and prey (Trans Mountain Pipeline ULC, 2017).

Habitat degradation of areas outside the Project footprint can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Mitigation for each of these effects was described in Chapter 13 and found to have no residual effects to each of the ecosystem VCs.

The Project footprint includes a buffer area intended to account for uncertainty in precise boundaries of disturbance. Not all of the buffer area will be disturbed, and the calculations of habitat loss are therefore conservative and may be overestimated.

The residual effect to American badger from habitat loss and degradation is characterized as follows:

- Duration: *Long-term*, as lost habitat will begin to be reclaimed prior to the Post-Closure phase.
- Magnitude: *Low*, as there will be up to 3.9% high-quality American badger habitat lost in the Terrestrial LSA.
- Geographic Extent: *Discrete*, as the effect of habitat loss will be within the Project footprint only.
- Frequency: *Continuous*, the effect of habitat loss is expected to be continuous until lost habitat is reclaimed.
- Reversibility: *Reversible long-term*, the effect of any habitat loss is anticipated to be reversible once the Project footprint is reclaimed.
- Context: *Moderate,* as American badger has moderate resilience to disruption in the receiving environment and may adapt to effects.

Sensory Disturbance

American badger habitat may be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for American badger could include behavioural responses to Project-related noise, vibration, light, dust, and human presence. Sensory disturbance from noise has the potential to extend furthest and is the focus of the residual effects assessment. Potential effects arising from vibration, light, dust, and human presence would be expected to be less than those arising from noise.

Continuous Project-related noise at ≥ 45 dBA (nighttime threshold) will affect up to 1,118 ha outside the Project footprint. This overlaps with up to 115 ha of high-quality habitat (Figure 15.5-26 and Table 15.5-33) when Project-related noise is at its peak in Year 10 of Operations. This represents up to 4.7% of high-quality American badger habitat in the Terrestrial LSA. A much smaller amount of high-quality habitat may be affected in daytime using the ≥ 55 dBA daytime threshold.

Table 15.5-33: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality American Badger Habitat

Season	Zone of Influence Area (ha)	Area (ha) of High-Quality Habitat Affected Outside Project Footprint	Area Affected as Proportion of High-Quality Habitat in Terrestrial LSA
Continuous Project-related noise ≥ 55 dBA (daytime threshold)			
Year-round	242	7	0.3%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Year-round	1,118	115	4.6%
Peak noise ≥ 108 dB from blasting			
Year-round	1,955	1	0.02%

Providing there is sufficient prey available, American badgers can inhabit human-modified habitats and are generally tolerant of human presence. Once the Operations phase is complete, noise will substantially decrease and noise from blasting will cease. Noise during Reclamation and Closure will be from decommissioning and removal of infrastructure and reclamation activities, though to a lesser extent than during Operations.

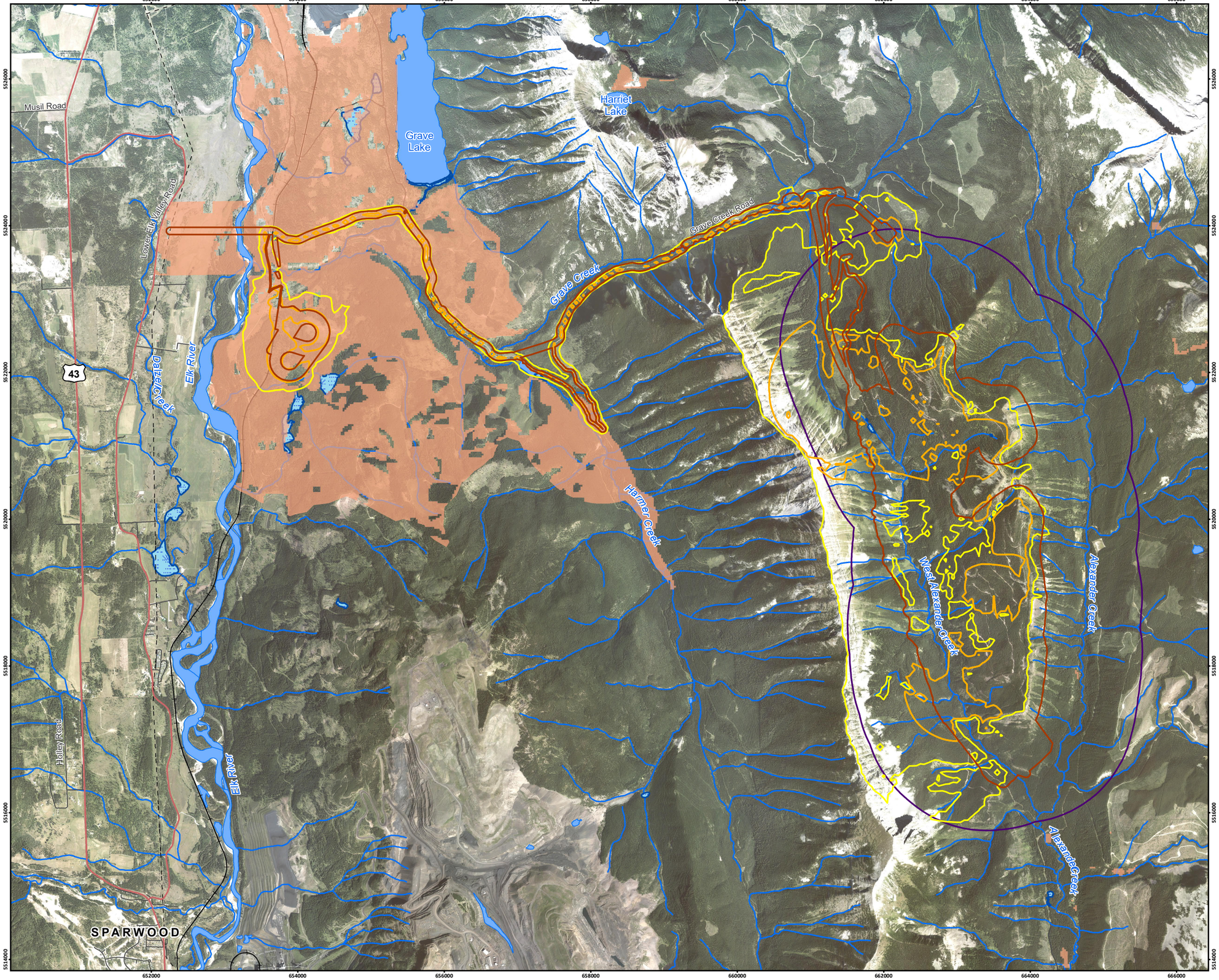
The residual effect to American badger from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Low*, up to 4.6% of high-quality American badger habitat in the Terrestrial LSA will be affected by noise.
- Geographic Extent: *Local*, as the effect of habitat loss will be outside the Project footprint and within the Terrestrial LSA.
- Frequency: *Continuous,* though at varying levels till the end of Operations, peaking at Year 10 of Operations. Noise from blasting will be intermittent.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *High,* as American badger has high resilience to sensory disturbance and will adapt to effects.

Disruption to Movement

The Project has the potential to block American badger daily movements. Disruption to American badger movement patterns can result in reduced body condition and reduced gene flow between populations, which has implications for species population viability and long-term persistence. Disruption to movement may be particularly high when Project activities and components are within restricted terrain features, including narrow valleys or canyons.

The baseline assessment showed that American badger regularly utilize grassland habitats, open forest habitats, mountain passes, and roads within the Terrestrial LSA for movement. Movement habitats included the Grave Creek Canyon (within the Project footprint), Alexander Creek drainages, and primary roadways. When the Project is at its largest extent and prior to any large areas of reclamation (around Year 10 of Operations), the mine site footprint will occupy a large portion of West Alexander Creek valley and will be an impermeable barrier in the area that it occupies. The upper slopes of the west side of the valley will remain intact, but will be degraded by sensory disturbance and use for connectivity between daily or seasonal habitats may be reduced.



Crown Mountain Coking Coal Project

Figure 15.5-26
High-Quality American Badger Spring-Summer Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality American Badger Spring-Summer Habitat
- Continuous Project Related Noise - 45 dBA Contours
- Continuous Project Related Noise - 55 dBA Contours
- Offsite Peak Noise Levels From Blasting >108 dB
- Project Footprint
- Arterial/Collector Road
- Local/Resource Road
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- British Columbia/Alberta Border

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Scale 1:50,000

Map Drawing Information:
Data Provided By NWP Coal Canada Ltd, Dillon Consulting Limited, Keefer Ecological Services Ltd, Province of British Columbia GeoBC Open Data, Government of Alberta Open Data, Natural Resource Canada.
Imagery Provided By GeoBC OrthoImagery (Aug 2016).

Map Created By: PR
Map Checked By: JM
Map Coordinate System: NAD 1983 UTM Zone 11N

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-14

American badger generally avoid areas with high road density. The explosives factory will be accessed by 900 m of new road. All other access roads are pre-existing (aside from those in the pits and dump areas). Access roads will be upgraded and will have higher levels of daily traffic relative to existing conditions. The predicted traffic level of 140 vehicles per day is unlikely to affect crossing success, especially with speed reductions in areas known to have frequent wildlife (e.g., Grave Creek Canyon) and that wildlife have the right-of-way.

The utility corridor is primarily composed of the powerline and the buried gas line. Suitable habitat will be present beneath the powerline after construction.

The residual effect to American badger from disruption to movement is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Low*, given the semi-permeable nature of the linear infrastructure.
- Geographic Extent: *Local*, as the effect will extend outside the Project footprint but within the Terrestrial LSA.
- Frequency: *Continuous,* as the effect will continue through Operations to Reclamation and Closure.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of Operations and continue at lower levels during Reclamation and Closure.
- Context: *Moderate,* as American badger have moderate resilience to disruption in the receiving environment and may adapt to effects.

Increased Mortality Risk

Pathways of increased risk of mortality (described in Sections 15.5.3.2.3) that are unlikely to be fully mitigated are collisions with Project-related traffic on access or mine roads and collisions with trains. Collisions with vehicles is the leading cause of mortality for American badger in the East Kootenay (Kinley and Newhouse, 2008; B.C. Badger Recovery Team, 2016).

Even with the traffic control mitigations described in Section 15.5.3.3.4, vehicle collisions with American badger may still occur. The number is expected to be small. Wildlife sightings and wildlife-vehicle collisions will be recorded and monitored. Further mitigations will be implemented to further minimize the risk of collision if required.

The Project will involve loading of 120 trains per year. Trains will not be travelling at high speeds within the rail loadout and train-wildlife collisions in this area are unlikely. There will be an incremental increase in rail traffic on the main rail lines as a result of the Project (one additional train every three days on average) where the risk of wildlife-train collisions is higher. The extent to which the Project will contribute to an incremental increase in American badger mortalities from train collisions is unknown.

The residual effect to American badger from increased mortality risk is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Low*, as American badger mortalities as a result of the Project are expected to be uncommon.
- Geographic Extent: *Discrete*, as the effect will be within the Project footprint.

- Frequency: *Intermittent,* as American badger mortalities may be at sporadic intervals during any phase of the Project.
- Reversibility: *Reversible long-term*, as the potential for increased mortality risk will end after Reclamation and Closure.
- Context: *Low*, as the American badger population is very sensitive to change in mortality rates.

Determination of Significance

There are an estimated 250 to 405 mature American badgers of the sub-species *Taxidea taxus jeffersonii,* which occur in south-central (*Jeffersonii* West) and southeastern B.C. (*Jeffersonii* East; B.C. Badger Recovery Team, 2016; COSEWIC, 2012b). Although there is limited historical population data in B.C. for American badgers, historical trapping records between 1919 and 1977 infer a likely long-term decline (*Jeffersonii* Badger Recovery Team 2008). In addition, there have been lower reported female and juvenile captures in certain regions, as well as less anecdotal American badger sightings in B.C. over the last two decades (*jeffersonii* Badger Recovery Team 2008). The East Kootenay American badger population (*jeffersonii* East) is comprised of an estimated 100 to 160 mature individuals (B.C. Badger Recovery Team, 2016; COSEWIC, 2012b). The *Jeffersonii* East population are likely overall stable with declines in certain areas (COSEWIC, 2012b).

There were no active or recently used burrows, or burrows indicative of maternal denning found within the Project footprint. American badgers are tolerant of human disturbance and noise and movements are not expected to be disrupted beyond existing levels. The residual effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk on American badger are therefore considered not significant.

Likelihood and Confidence

Effects from Project activities that are determined to be not significant do not require a characterization of likelihood.

There is a good understanding of American badger ecology, their habitat availability and distribution, known occurrences, and abundance in the Terrestrial LSA. The confidence in the significance determination of residual effects to American badger is high.

15.5.3.4.5 American Marten

American marten was assessed for potential Project-related effects on habitat loss and degradation, sensory disturbance, and disruption to movement, and increased mortality risk. Mitigation measures will contribute to avoidance, mitigation, and restoration of these effects, but residual effects will remain for habitat loss and degradation, sensory disturbance, and disruption to movement. These three effects were therefore carried forward and a residual effects assessment is presented below. The determination of significance of adverse residual effects was completed for the combined effects of habitat loss and degradation, sensory disturbance, and disruption to movement.

Characterization of Residual Effects

Habitat Loss and Degradation

The Project footprint overlaps with high-quality American marten habitat (Figure 15.5-27 and summarized in Table 15.5-34). The habitat model indicates that the best American marten habitats are in mid to high elevational, old coniferous forests with relatively low road density. The Project will result in a predicted loss of up to 490 ha of high-quality American marten habitat, representing a loss of 10.3% of the total amount of high-quality American marten habitat available in the Terrestrial LSA (4,736 ha). Loss of high-quality habitat will primarily be in the mine site footprint, the upper access road, and the conveyor. On a proportional basis, the availability of high-quality American marten habitat is higher within the Project footprint compared to the Terrestrial LSA as whole (38% for the Project footprint and 20% for the Terrestrial LSA), meaning high-quality habitat is more common within the footprint than it is outside.

Table 15.5-34: Change in High-Quality American Marten Habitat in the Project Footprint and Relative to the Terrestrial LSA

Season	Area (ha) of High-Quality Habitat in Project Footprint	% of Project Footprint	Area (ha) of High-Quality Habitat in Terrestrial LSA	% of Terrestrial LSA	Change as Proportion of Terrestrial LSA
Year-round	490	38%	4,736	20%	-10.3%

Clearing will begin in Construction and Pre-Production with initial portions of the 1,283 ha footprint (including the buffer) prepared for the mine site facilities, a portion of the North Pit, the Interim Sediment Pond, roads, the conveyor, the powerline, and the rail loadout. During Operations, progressive clearing of the pits, Mine Rock Storage Facility, and Main Sediment Pond will continue through to Year 15. Habitat loss will have a continuous adverse effect until progressive reclamation begins in Year 10 of Operations. With progressive reclamation between Years 10 and 15 and continued reclamation in the Reclamation and Closure phase, the effect of habitat loss will begin to decline, though high-quality American marten habitat will not be established for many decades.

A 100 m wide corridor has been allocated for construction of the 2.7 km long overland coal conveyor. Not all portions of the corridor will require clearing, and temporary construction areas will rapidly revegetate, though will not represent American marten habitat for many decades.

Post mine reclamation will restore a mosaic of coniferous forest, open alpine tundra, rock outcrops, shrub and graminoid dominated brushland, talus slopes, wetlands, and riparian areas (described in Section 15.5.3.3.1 and in the Ecological Restoration Plan, Chapter 33, Section 33.4.1.3). Reclamation will begin in Year 10 of Operations for limited areas and then accelerating at the end of Operations. Forest will begin to become established at 50 years post-closure onward and begin to provide some habitat for American marten, though of low quality. High-quality habitat may become established and available to American marten starting at about 100 years post-closure.

Habitat degradation of areas outside the Project footprint can occur from potential introduction and spread of invasive species, changes in vegetation vigour from dust deposition, and surface water runoff from the Project footprint that can contain suspended solids and affect vegetation. Mitigation for each of these effects was described in Chapter 13 and found to have no residual effects to each of the ecosystem VCs.