Crown Mountain Coking Coal Project

Figure 15.5-27
High-Quality American Marten Year-round Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality American Marten 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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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

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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 marten from habitat loss and degradation is characterized as follows:

- Duration: *Permanent*, as lost high-quality habitat will not be restored prior to the end of the Post-Closure phase.
- Magnitude: *Moderate*, there will be up 10.3% loss of high-quality American marten 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: *Permanent*, as lost high-quality habitat will not be restored prior to the end of reclamation.
- Context: *Low,* as American marten has low resilience to habitat loss and will not easily adapt.

Sensory Disturbance

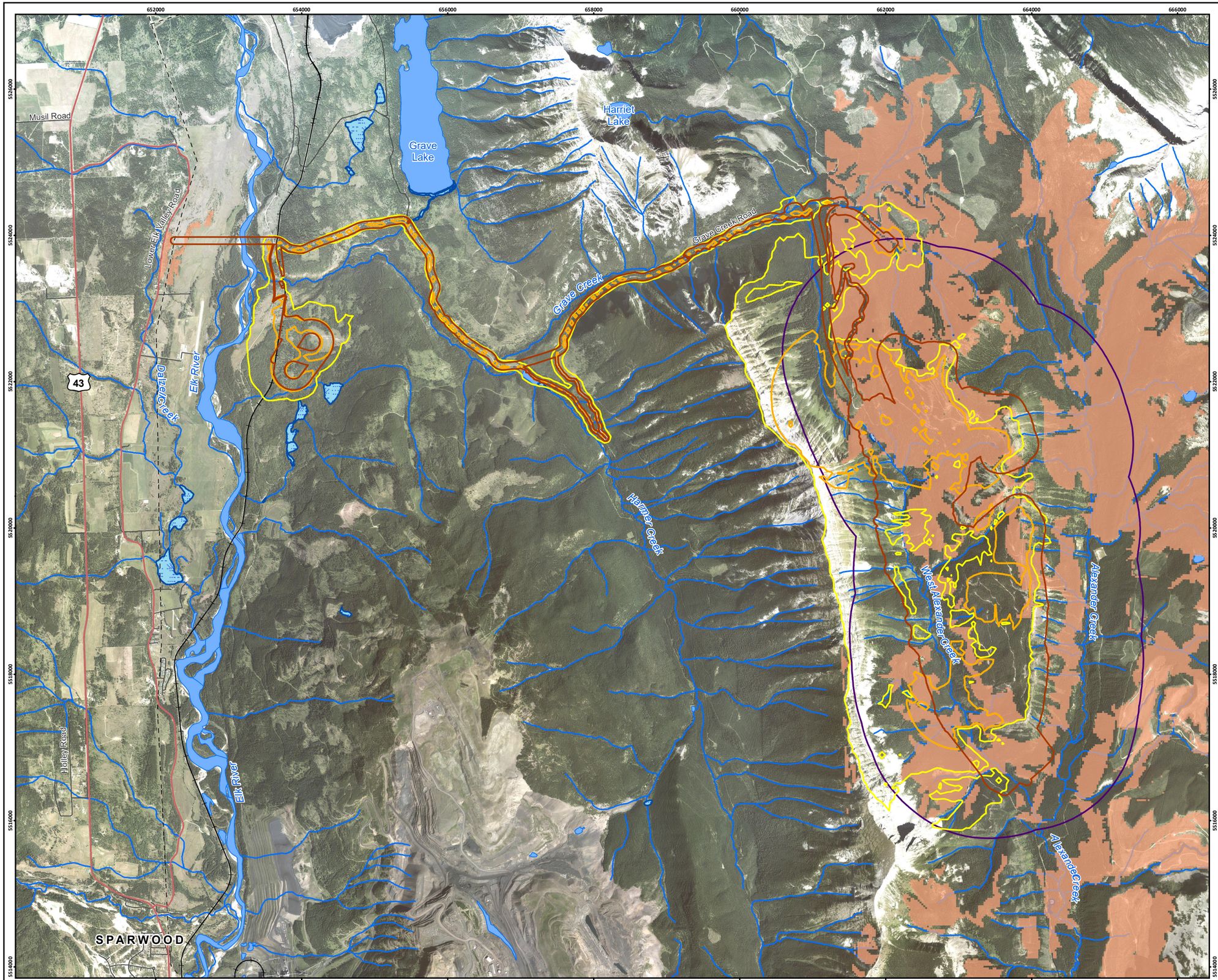
American marten habitat may be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for badger could include behavioural responses to Project-related noise, vibration, light, dust, and human presence. Sensory disturbance 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 214 ha of high-quality American marten habitat in nighttime (Figure 15.5-28 and Table 15.5-35) when Project-related noise is at its peak in Year 10 of Operations. This represents up to 4.5% of high-quality American marten habitat in the Terrestrial LSA. A much smaller amount of high-quality habitat may be affected in daytime using the ≥ 55 dBA daytime threshold.

The noise modelling indicated that the threshold peak sound level from blasting of 108 dB would be surpassed at a distance of up to approximately 1,500 m from the pit. Peak noise from blasting could therefore affect up to 794 ha of high-quality American marten habitat (Table 15.5-35). This represents 16.8% of high-quality American marten habitat in the Terrestrial LSA.

Table 15.5-35: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality American Marten 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	68	1.4%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Year-round	1,118	213	4.5%
Peak noise ≥ 108 dB from blasting			
Year-round	1,955	794	16.8%



Crown Mountain Coking Coal Project

Figure 15.5-28
High-Quality American Marten Year-round Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality American Marten 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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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 marten from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *High*, 16.8% of high-quality American marten 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 American marten has low resilience to sensory disturbance and may not adapt to effects.

Disruption to Movement

The Project has the potential to block American marten daily and seasonal movements. Studies have identified several areas in the Terrestrial RSA that may maintain connectivity between populations of American marten. Some of these are within the Terrestrial LSA, including:

- A north-south corridor that connects Alexander Creek and Michel Creek; and
- A north-south corridor linking Michel Creek and Erickson Creek.

Neither of these intersect with 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 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 American marten 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 American marten.

American marten 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. 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 American marten 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: *Low,* as American marten have low resilience to disruption in the receiving environment and may not adapt to effects.

Determination of Significance

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 (47.4 km^2) can support from 16 to 95 individuals during late winter. Population trends are not well understood.

Based on the characterization of the residual effects, the Project would not limit the ability of American marten 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 American marten 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 marten 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 marten is high.

15.5.3.4.6 Canada Lynx

Canada lynx 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 Canada lynx habitat (Figure 15.5-29 and summarized in Table 15.5-36). Most high-quality habitat is east of Erickson Ridge at mid to high elevations. The Project will result in a predicted loss of up to 1,159 ha of high-quality Canada lynx habitat, representing a loss of 6.5% of the total amount of high-quality Canada lynx habitat available in the Terrestrial LSA (17,721 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 Canada lynx habitat is higher within the Project footprint compared to the Terrestrial LSA as whole (90% for the Project footprint and 73% for the Terrestrial LSA).

Table 15.5-36: Change in High-Quality Canada Lynx 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 LSA	Change as Proportion of Terrestrial LSA
Year-round	1,159	90%	17,721	73%	-6.5%

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.

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, providing suitable prey habitat. These areas may be used by Canada lynx where there is adjacent forest cover for security.

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. Graminoids and shrubs will become established at five years post-closure and will begin to provide habitat for snowshoe hare, an important prey species. Shrubs and trees will continue to develop for the next 25 to 50 years, especially at lower elevations, incrementally improving Canada lynx habitat.

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.

Crown Mountain Coking Coal Project

Figure 15.5-29
High-Quality Canada Lynx Year-round Habitat in the Terrestrial Local Study Area

LEGEND

- High-Quality Canada Lynx 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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Scale 1:85,000

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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 Canada lynx from habitat loss and degradation is characterized as follows:

- Duration: *Long-term*, as lost habitat will begin to be restored prior to the Post-Closure phase.
- Magnitude: *Moderate*, there will be up to a 6.5% loss of high-quality Canada lynx 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 (partly)*, the effect of habitat loss is anticipated to be partially reversible once the Project footprint is reclaimed.
- Context: *High,* as Canada lynx utilize a variety of landscapes, and have moderate resilience to habitat loss and may adapt to effects.

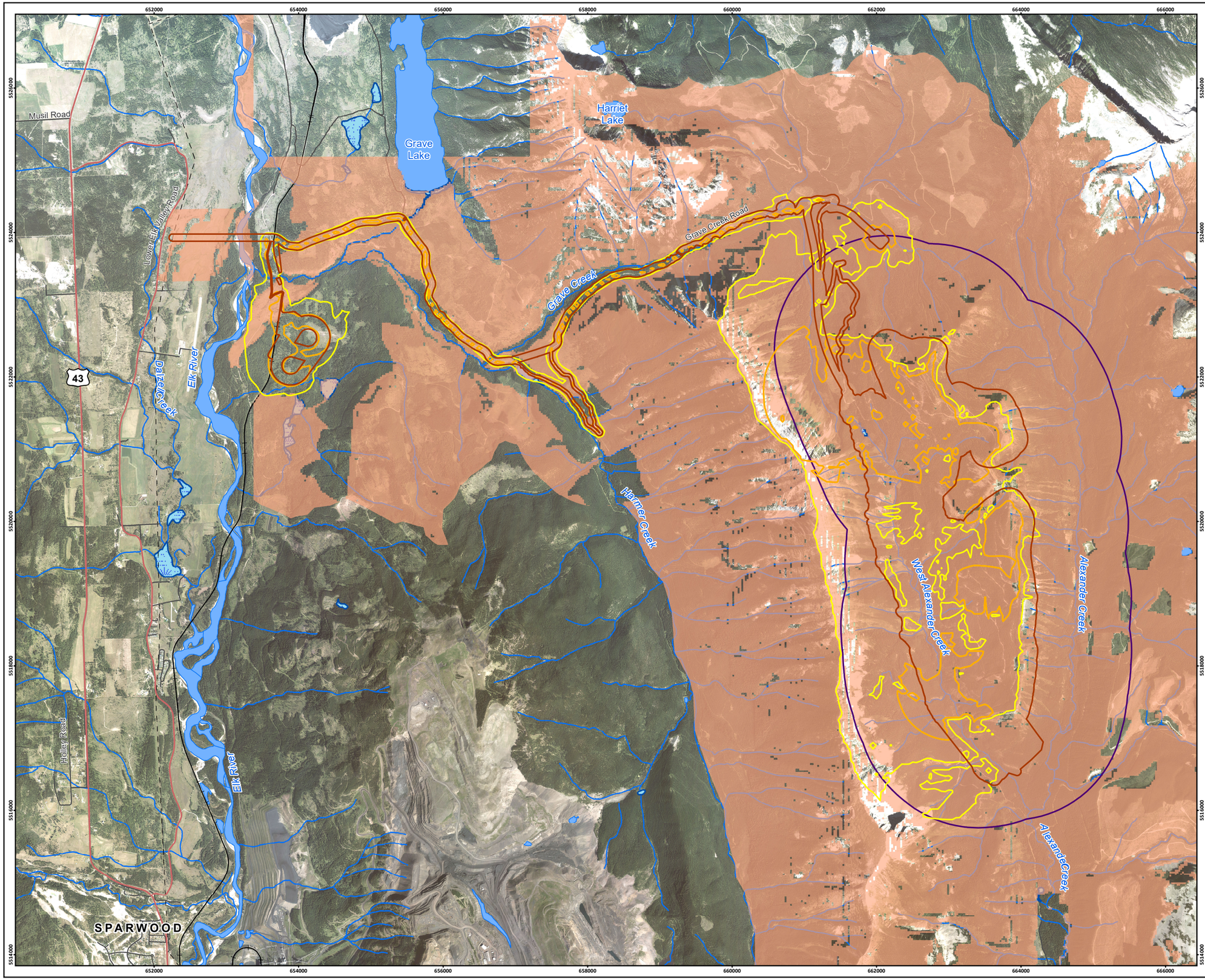
Sensory Disturbance

Canada lynx habitat may be functionally lost or disturbed due to sensory disturbance. This is in addition to direct habitat loss from clearing. Sensory disturbance for Canada lynx 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 927 ha of high-quality Canada lynx habitat in nighttime (Figure 15.5-30 and Table 15.5-37) when Project-related noise is at its peak in Year 10 of Operations. This represents 5.2% of high-quality Canada lynx habitat in the Terrestrial LSA.

Table 15.5-37: Area of Sensory Disturbance Outside the Project Footprint and Overlapping with High-Quality Canada Lynx 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	207	1.2%
Continuous Project-related noise ≥ 45 dBA (nighttime threshold)			
Year-round	1,118	927	5.2%
Peak noise ≥ 108 dB from blasting			
Year-round	1,954	1,879	10.6%



Crown Mountain Coking Coal Project

Figure 15.5-30
High-Quality Canada Lynx Year-round Habitat in Relation to the Project Footprint and Noise Contours

LEGEND

- High-Quality Canada Lynx 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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The noise modelling indicated that the threshold peak sound level from blasting of 108 dB would be surpassed at a distance of up to approximately 1,500 m from the pit. Peak noise from blasting could therefore affect up to 1,879 ha of high-quality Canada lynx habitat (Table 15.5-37). This represents 10.6% of high-quality Canada lynx habitat in the Terrestrial LSA.

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 Canada lynx from sensory disturbance is characterized as follows:

- Duration: *Long-term*, as the effect of noise will extend through the Operations phase.
- Magnitude: *Moderate*, 10.6% of high-quality Canada lynx 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: *Moderate,* as Canada lynx has moderate resilience to habitat loss and may adapt to effects.

Disruption to Movement

The Project has the potential to block Canada lynx daily and seasonal movements. Disruption to Canada lynx 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 Canada lynx regularly utilize riparian 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. Other studies have identified several areas in the Terrestrial RSA that may maintain connectivity between populations of Canada lynx. Some of these are within the Terrestrial LSA, including:

- A north-south corridor that connects Alexander Creek and Michel Creek; and
- A north-south corridor linking Michel Creek and Erickson Creek.

Neither of these intersect with 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 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 Canada lynx 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 Canada lynx.

Canada lynx generally avoid roads. 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. 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 Canada lynx 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 Canada lynx has moderate resilience and may adapt to effects.

Determination of Significance

There is limited data on Canada lynx population trends in the region, though a minimum population density from hair snagging found 0.74 Canada lynx per 100 km^2 in the Elk Valley. The majority of the Project footprint provides high-quality habitat for Canada lynx, though it is also widespread in the remainder of the Terrestrial LSA.

Based on the characterization of the residual effects, the Project would not limit the ability of Canada lynx 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 Canada lynx 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 Canada lynx ecology, their habitat availability and distribution, known occurrences, and abundance in the Terrestrial LSA. The confidence in the significance determination of residual effects to Canada lynx is high.

15.5.3.4.7 Summary of Residual Effects Assessment

Residual effects and the selected mitigation measures, characterization criteria, likelihood, significance determination, and confidence are summarized in Table 15.5-38. There are no significant residual effects to carnivore VCs anticipated as a result of the Project.

15.5.4 Cumulative Effects Assessment

Cumulative environmental effects are the result of Project residual environmental effects interacting with the effects of other past, present, and reasonably foreseeable future projects or activities to produce a combined/overlapping effect. The objective of the cumulative effects assessment is to consider overlapping effects for all residual adverse effects, not only those predicted to be significant (EAO, 2013). The assessment of cumulative effects on carnivore VCs requires that:

- The Project results in a residual adverse environmental effect on the carnivore VC;
- A residual Project effect interacts cumulatively with effects from other projects or activities (i.e., an effect of the Project overlaps spatially and temporally with those of other projects or activities that have been or will be carried out);
- The other projects or activities have been or will be carried out and are not hypothetical; and
- The cumulative effect is likely to occur.

Further information regarding the cumulative effects assessment methodology is provided in Chapter 5, Section 5.3.5.4.

An assessment of cumulative effects is required for carnivore VCs due to the possibility that potential Project residual effects on carnivore VCs may remain after implementation of proposed mitigation measures. Habitat loss and degradation, sensory disturbance, and disruption to movement were found to have residual (but not significant) Project effects for grizzly bear, wolverine, American badger, American marten, and Canada lynx, and increased mortality risk was found to have residual (though not significant) Project effects for grizzly bear and American badger.

15.5.4.1 Assessment Boundaries

15.5.4.1.1 Spatial Boundaries

The assessment of cumulative effects for carnivore VCs, with the exception of grizzly bear, was conducted for the Terrestrial RSA, as defined in Section 15.2.3.1. The Terrestrial RSA is approximately 18,760 km^2. It includes all operating and proposed mines within the Elk Valley and several developed areas including the municipal boundaries of Sparwood, Elkford, Cranbrook, and Kimberley. The assessment of cumulative effects for grizzly bear was conducted for the Grizzly Bear RSA, which is approximately 15,805 km^2 and includes both the South Rockies and Flathead grizzly bear population units, WMUs 404, 402, 303, 400, and Waterton Lakes National Park in Alberta.

15.5.4.1.2 Temporal Boundaries

The temporal boundaries for the Project include periods of Construction and Pre-Production, Operations, Reclamation and Closure, and Post-Closure, as identified in Section 15.2.3.2.

Table 15.5-38: Summary of Residual Effects on Carnivore VCs

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
Grizzly Bear	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Conduct den surveys in high potential habitat. If dens present avoid active dens during vegetation removal and clearing	Duration: Long-term Magnitude: Low Geographic Extent: Discrete Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Not Applicable	Moderate

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
Grizzly Bear	Sensory Disturbance	• Construction and Pre-Production • Operations • Reclamation and Closure	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Implementation of the Noise and Vibration Management Plan • Directed/focused lighting will be used where possible • Implementation of the Air Quality and Greenhouse Gas Management Plan • Deactivate roads wherever possible	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low			
Grizzly Bear	Disruption to Movement	• Construction and Pre-Production • Operations • Reclamation and Closure	• The overland conveyor will be elevated to 3 m at 500 m intervals (to be confirmed) to allow wildlife crossing • Management of vehicle traffic and access as described in Traffic Control Plan contributes to reducing barrier effect of roads • Progressive reclamation • Minimize sensory disturbance (measure describe above) • Create gaps in snowbanks to remove physical barriers	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
Grizzly Bear	Increased Mortality Risk	• Construction and Pre-Production • Operations • Reclamation and Closure	• 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	Duration: Long-term Magnitude: Low Geographic Extent: Discrete Frequency: Intermittent Reversibility: Reversible long-term Context: Low			
Wolverine	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Conduct dens surveys in high potential habitat. If dens	Duration: Long-term Magnitude: Moderate Geographic Extent: Discrete Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Not Applicable	High

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			present avoid active dens during vegetation removal and clearing				
Wolverine	Sensory Disturbance	• Construction and Pre-Production • Operations • Reclamation and Closure	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Implementation of the Noise and Vibration Management Plan. • Directed/focused lighting will be used where possible. • Implementation of the Air Quality and Greenhouse Gas Management Plan • Deactivate roads wherever possible	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low			
Wolverine	Disruption to Movement	• Construction and Pre-Production • Operations • Reclamation and Closure	• The overland conveyor will be elevated to 3 m at 500 m intervals to allow wildlife crossing • Management of vehicle traffic and access as described in Traffic Control Plan contributes to reducing barrier effect of roads • Progressive reclamation • Minimize sensory disturbance (measure describe above)	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			• Create gaps in snowbanks to remove physical barriers				
American Badger	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation. • Clearing vegetation only in the year in which the area will be required for construction or operation. • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Conduct dens surveys in high potential habitat. If dens present avoid active dens during vegetation removal and clearing	Duration: Long-term Magnitude: Low Geographic Extent: Discrete Frequency: Continuous Reversibility: Reversible long-term Context: Moderate	Not Significant	Not Applicable	High

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
American Badger	Sensory Disturbance	• Construction and Pre-Production • Operations • Reclamation and Closure	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Implementation of the Noise and Vibration Management Plan • Directed/focused lighting will be used where possible • Implementation of the Air Quality and Greenhouse Gas Management Plan • Deactivate roads wherever possible	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: High			
American Badger	Disruption to Movement	• Construction and Pre-Production • Operations • Reclamation and Closure	• The overland conveyor will be elevated to 3 m at 500 m intervals (to be confirmed) to allow wildlife crossing • Management of vehicle traffic and access as described in Traffic Control Plan contributes to reducing barrier effect of roads • Progressive reclamation • Minimize sensory disturbance (measure describe above) • Create gaps in snowbanks to remove physical barriers	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Moderate			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
American Badger	Increased Mortality Risk	• Construction and Pre-Production • Operations • Reclamation and Closure	• 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	Duration: Long-term Magnitude: Low Geographic Extent: Discrete Frequency: Intermittent Reversibility: Reversible long-term Context: Low			
American Marten	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Conduct dens surveys in high potential habitat. If dens	Duration: Permanent Magnitude: Moderate Geographic Extent: Discrete Frequency: Continuous Reversibility: Reversible long-term Context: Low	Not Significant	Not Applicable	High

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			present avoid active dens during vegetation removal and clearing				
American Marten	Sensory Disturbance	• Construction and Pre-Production • Operations • Reclamation and Closure	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Implementation of the Noise and Vibration Management Plan • Directed/focused lighting will be used where possible. • Implementation of the Air Quality and Greenhouse Gas Management Plan • Deactivate roads wherever possible	Duration: Long-term Magnitude: High Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low			
American Marten	Disruption to Movement	• Construction and Pre-Production • Operations • Reclamation and Closure	• The overland conveyor will be elevated to 3 m at 500 m intervals (to be confirmed) to allow wildlife crossing • Management of vehicle traffic and access as described in Traffic Control Plan contributes to reducing barrier effect of roads • Progressive reclamation • Minimize sensory disturbance (measure describe above)	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Low			

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
			• Create gaps in snowbanks to remove physical barriers				
Canada Lynx	Habitat Loss and Degradation	• Construction and Pre-Production • Operations	• Minimizing disturbance and encroachment into natural vegetation • Clearing vegetation only in the year in which the area will be required for construction or operation • Sequencing the development of pits and Mine Rock Storage Facility areas to limit total disturbance during any one period and maximize progressive reclamation opportunities • Progressive reclamation • Implementation of the Erosion and Sediment Control Plan • Implementation of the Air Quality and Greenhouse Gas Management Plan • Conduct dens surveys in high potential habitat. If dens present avoid active dens during vegetation removal and clearing	Duration: Long-term Magnitude: Moderate Geographic Extent: Discrete Frequency: Continuous Reversibility: Reversible long-term (partly) Context: High	Not Significant	Not Applicable	High

Valued Component	Residual Effect	Project Phases	Mitigation Measures	Summary of Residual Effects Characterization	Significance (Significant, Not Significant)	Likelihood (High, Moderate, Low)	Confidence (High, Moderate, Low)
Canada Lynx	Sensory Disturbance	• Construction and Pre-Production • Operations • Reclamation and Closure	• Implement wildlife education program (as described in the Wildlife Management and Monitoring Plan) • Implementation of the Noise and Vibration Management Plan. • Directed/focused lighting will be used where possible • Implementation of the Air Quality and Greenhouse Gas Management Plan • Deactivate roads wherever possible	Duration: Long-term Magnitude: Moderate Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Moderate			
Canada Lynx	Disruption to Movement	• Construction and Pre-Production • Operations • Reclamation and Closure	• The overland conveyor will be elevated to 3 m at 500 m intervals (to be confirmed) to allow wildlife crossing • Management of vehicle traffic and access as described in Traffic Control Plan contributes to reducing barrier effect of roads • Progressive reclamation • Minimize sensory disturbance (measure describe above) • Create gaps in snowbanks to remove physical barriers	Duration: Long-term Magnitude: Low Geographic Extent: Local Frequency: Continuous Reversibility: Reversible long-term Context: Moderate			

Temporal cases used in the assessment of cumulative effects includes the following:

1. Base Case – The current status of the VC prior to the start of the Project, including all appropriate past and present projects or activities – generally represented by existing conditions;
2. Project Case – Status of the VC with the Project in place, over and above the Base Case – generally represented by the Project effects assessment; and
3. Future Case – The status of the VC as a result of the Project Case in combination with all reasonably foreseeable future projects and/or activities that could be carried out.

The comparison of the Project Case with the Future Case allows the Project contribution to cumulative effects of other past, present, and reasonably foreseeable future projects and/or activities to be determined.

15.5.4.1.3 Technical Boundaries

In addition to those presented in Section 15.2.3.4, technical boundaries or constraints imposed on the assessment due to limitations in the ability to predict the cumulative effects of the Project in combination with those of other past, present, or reasonably foreseeable future projects or activities include the following:

- Information on species ranges and population numbers in the region is variable and, in some cases, limited;
- Habitat availability (including habitat suitability, resource selection, and habitat use) was assessed from occupancy and habitat modelling. The models have inherent uncertainty and are an imperfect representation;
- There is limited knowledge of the precise scope and extent of potential effects of past, present, and reasonably foreseeable future projects, aside from the Project. The geographic extents of footprints for these projects are from publicly available sources and their accuracy cannot be guaranteed; and
- There is limited knowledge of species and individual responses to disturbance and the relationship to potential population-level effects is not well understood.

15.5.4.2 Identifying Past, Present, and Reasonably Foreseeable Projects and/or Activities

Descriptions of the past, present, and reasonably foreseeable projects and/or activities for consideration in the cumulative effects assessment are provided in Chapter 5, Section 5.3.5.3.

Several past, present, and reasonably foreseeable future projects or activities are expected to interact with the carnivore VCs, which may result in a potential for adverse cumulative effects (Table 15.5-39). Maps showing the location of the past, present, and reasonably foreseeable future projects or activities are presented in Figure 5.3-4 to Figure 5.3-6 (Chapter 5).

As noted in Chapter 5, Section 5.3.5.3, the following projects were considered as past, present, or reasonably foreseeable future projects or activities in the cumulative effects assessment but were not included:

- Coal Mountain Phase 2, as the environmental assessment was placed on hold by Teck Coal Limited in 2016;
- Mount Brussilof (Baymag Mine) by Baymag, due to no temporal overlap;

- Barnes Lake Phosphate Exploration Project by Fertoz International Inc., given that the project is in exploration phase and no project has been proposed; and
- Cabin Ridge Coal by Warburton Group is in exploration and no project has been proposed.

15.5.4.3 Mitigation for Cumulative Effects

Cumulative effects can be reduced through minimizing local Project-related effects using the mitigation measures described for the Project (Section 15.5.3.3). It is assumed that other projects or activities in the region will also adopt similar measures.

Addressing cumulative effects often requires regional stakeholder involvement and government-led initiatives to implement effective management plans and monitoring programs. NWP will participate in regional initiatives, where relevant and appropriate, and will adopt new management practices and measures to meet regional planning objectives, where possible.

15.5.4.4 Potential Residual Cumulative Effects

15.5.4.4.1 Assessment Methods

The assessment of potential cumulative 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. Qualitative discussions are based on scientific literature, baseline studies, habitat models, and professional judgment and were used to characterize sensory disturbance, disruption to movement, and increased mortality risk.

Habitat loss and degradation was measured by calculating the loss of high-quality habitat within the Terrestrial RSA and Grizzly Bear RSA for the Base Case, the Project Case, and the Future Case. High-quality habitat was defined as areas with high and very high habitat suitability.

The habitat suitability mapping for each species used for the Project Case and Future Case is the same as used for the Base Case. Ecosystems change over time through natural successional processes (e.g., forest regrowth) and natural disturbance regimes (e.g., fire). Habitat suitability for any given wildlife species will therefore also change over time. For the purposes of the assessment of cumulative effects, the assumption is that while ecosystems are dynamic, the general amount and distribution of ecosystems (and therefore suitable habitat for any given wildlife species) in the Terrestrial RSA and Grizzly Bear RSA is approximately the same for the Base, Project, and Future Cases, aside from habitat losses from the reasonably foreseeable future projects and activities that are included in the Future Case. Reasonably foreseeable future projects and activities were assumed to result in complete removal of suitable wildlife habitat. This is a conservative approach as some activities will not result in complete loss of habitat (e.g., cutblocks provide food resources for some species) and some physical disturbance footprints are restored over time (e.g., mine reclamation).

For sensory disturbance, ground vibration from rail was not expected to have a significant impact on wildlife (see Chapter 7) and vibration from blasting greater than the threshold level of 10 mm/s is not expected to extend beyond the pits. For the remaining types of sensory disturbance, the effect of noise extends greater distances than the effect of dust, light and human presence. The focus of the assessment of residual cumulative effects of sensory disturbance is therefore on noise.

Table 15.5-39: Project-Carnivore VC Interactions Matrix for Potential Cumulative Effects

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect					Justification / Rationale
	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx	
Past or Present Projects and/or Activities that Have Been Carried Out						
Natural Resource Extraction – Mining (past)	I	I	I	I	I	Has occurred within the range of carnivore VCs and their habitat though occurs in the past.
Coal Mountain Operations	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Elkview Operations	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Line Creek Operations	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Fording River Operations	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Greenhills Operations	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Kootenay West Mine	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Elkhorn Quarry West (Windermere Mining Operations)	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Marten Phosphate Project	III	III	III	III	III	Currently operating and occurs within the range of carnivore VCs and their habitat.
Energy - Elko Dam	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.
Koocanusa Reservoir	III	III	III	III	III	Occurs within the range of moose and elk and their habitat.
Forestry	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect					Justification / Rationale
	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx	
Energy - Pipelines	II	II	II	II	II	Occurs within the range of carnivore VCs and their habitat.
Energy - Electrical Transmission	II	II	II	II	II	Occurs within the range of carnivore VCs and their habitat.
Transportation	II	II	II	II	II	Habitat loss and increased mortality risk
Recreation and Tourism	I	I	I	I	I	Occurs within the range of carnivore VCs and their habitat, though adverse effects are expected to be minimal or absent.
Commercial, Residential, and Industrial Use	II	II	II	II	II	Occurs within the range of carnivore VCs and their habitat.
Parks and Protected Areas	I	I	I	I	I	Occurs within the range of carnivore VCs and their habitat, though adverse effects are expected to be minimal or absent.
Agriculture	I	I	I	I	I	Occurs within the range of carnivore VCs.
Natural Processes or Events	I	I	I	I	I	Magnitude of effect on carnivore VCs likely very small.
Reasonably Foreseeable Future Projects and/or Activities That Will Be Carried Out						
Michel Coal Project	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.
Grassy Mountain Coal Project	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.
Tent Mountain Mine	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.
Fording River Extension Project	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.
Bingay Main Project	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.

Past, Present, or Reasonably Foreseeable Future Projects or Activities	Ranking of Potential Cumulative Effect					Justification / Rationale
	Grizzly Bear	Wolverine	American Badger	American Marten	Canada Lynx	
Elan Hard Coking Coal Project	III	III	III	III	III	Occurs within the range of carnivore VCs and their habitat.
Climate Change	III	III	II	II	II	May affect habitat availability of all carnivore VCs
Natural Processes or Events	I	I	I	I	I	Magnitude of effect on carnivore VCs likely very small.

Notes (after EAO, 2013):
I – Residual Project effects do not act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities. Not carried forward in the assessment.
II – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, but are unlikely to result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects but the Project will not measurably contribute to these cumulative effects on the VC. Carried forward in the assessment.
III – Residual Project effects act cumulatively with those of other past, present, or reasonably foreseeable future projects and/or activities, and may result in significant cumulative effects; or residual Project effects act cumulatively with existing significant cumulative effects and the Project may measurably contribute to adverse changes in the state of the VC. Carried forward in the assessment.

For the assessment of Project effects of noise, a quantitative approach was used. A fully quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects or activities when design details are not available. A qualitative approach was therefore used.

Road density was used as an index of the degree to which the risk of mortality to carnivore VCs from vehicle collisions may change. The estimate of Future Case road density includes reasonably foreseeable future projects and activities as well as simulated forestry, fire and insect outbreak (see Appendix 13-E for details).

The EV-CEMF is used to assess historic, current, and potential future conditions of selected VCs and to provide a framework that supports decisions related to the mitigation and management of these VCs in the Elk Valley. There are four VCs addressed in the EV-CEMF, one of which is grizzly bear. The background and approached to the EV-CEMF and to grizzly bear specifically are described in Elk Valley Cumulative Effects Management Framework Working Group (2018) and Mowat et al. (2018). The approach and methodology used in the EV-CEMF was used to further characterize cumulative effects of the Project on grizzly bear. Scenario analysis was conducted using ALCES Online to evaluate a range of potential future landscape scenarios in the Elk Valley and to assess the change in an indicator specifically developed for grizzly bear. The indicator is habitat suitability, which is a function of habitat availability and road density.

Three future development scenarios were simulated:

- Scenario 1 – Project Case: This scenario uses the Project footprint and sequence of development over the life of mine;
- Scenario 2 – Project Case with Cumulative Effects Scenario: The same allocations and assumptions described in Scenario 1 were carried forward, and all reasonably foreseeable future projects and activities (those listed in Section 15.5.4.2) were added to represent the cumulative foreseeable development within the Elk Valley; and
- Scenario 3 – Project Case with Cumulative Effects and Natural Disturbance Scenario: This scenario builds off Scenario 2, while also simulating fire and insect outbreak natural disturbances.

The indicator is rolled into a hazard rating or index. Hazard is the deviation of the current amount from the range of expected amounts that would have occurred historically through natural variation. The hazard rating for the three scenarios can be compared to current conditions to quantify potential cumulative effects to grizzly bear. A detailed description of the approach, methodology, and assumptions is provided in MacHydro (2021; included as Appendix 13-F).

15.5.4.4.2 Grizzly Bear

Many present and future projects and activities occur within the distributional range of grizzly bear and in suitable habitat. The residual effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk could potentially have a cumulative effect on grizzly bear.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

Most present and reasonably foreseeable future projects and activities occur within the range of grizzly bear and in potentially suitable habitat and thus may result in loss or alteration of grizzly bear habitat

(Figure 15.5-31 to Figure 15.5-34). The Base Case incorporates the cumulative loss or alteration of grizzly bear habitat as a result of past and present projects and was the basis for the assessment of the Project Case. For the Future Case that includes both the Project and other reasonably foreseeable future projects and activities, approximately 3.0% of fall habitat, 1.8% of winter habitat, 2.1% of spring habitat, and 4.0% of summer habitat are predicted to be lost within the Grizzly Bear RSA (Table 15.5-40). The Project is predicted to contribute 0.05% of fall habitat loss, 0.00% of winter habitat loss, 0.04% of spring habitat loss, and 0.02% of spring habitat loss.

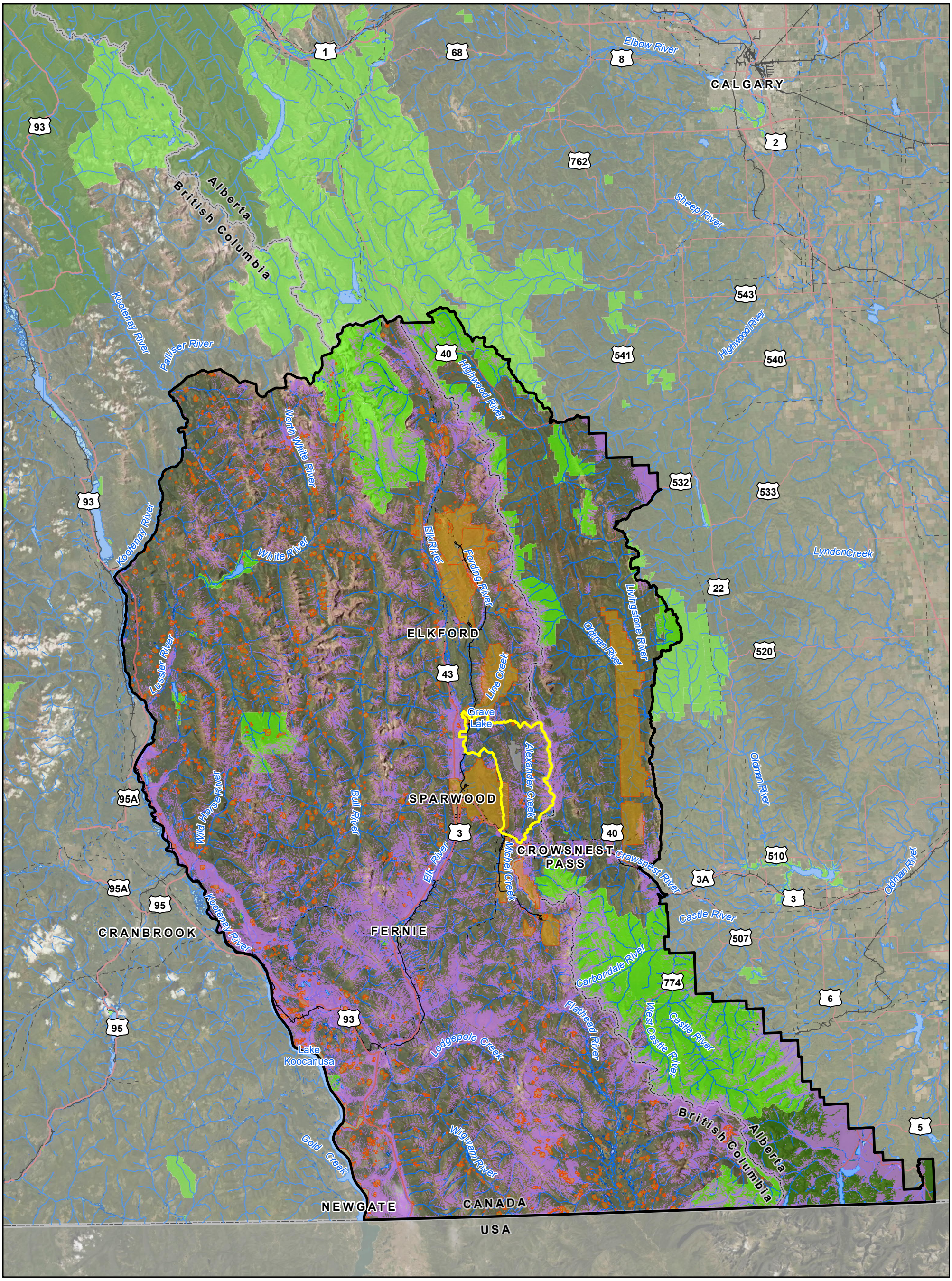
The effects of habitat loss and alteration due to forestry is a more complicated prediction. Logging can increase habitat quality for grizzly bear by removing overstory cover and creating early seral habitats that provide higher levels of forage than mature stands (described previously in Section 15.5.2.1.1). Harvested areas are often planted or seeding with conifers, and while habitat use may increase for the first 15 to 20 years post-harvest, this can ultimately lead to relatively lower quality habitat. Older regenerated coniferous forests are often associated with increased closed canopies and reduced vegetation (e.g., berry) production (Kearney et al., 2019; Larsen et al., 2019). Altogether, forestry practices have most likely result in a loss of grizzly bear habitat availability.

Table 15.5-40: Change in High-Quality Grizzly Bear Habitat for the Base Case, the Project Case, and the Future Case in the Grizzly Bear RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Grizzly Bear RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
Grizzly Bear	Fall	421,878	421,650 (-228)	409,107 (-12,771)	-0.05%	-3.0%
	Winter	201,460	201,460 (0)	197,895 (-3,565)	0.00%	-1.8%
	Spring	323,314	323,187 (-127)	316,606 (-6,708)	-0.04%	-2.1%
	Summer	600,278	600,136 (-142)	576,254 (-24,024)	-0.02%	-4.0%

The residual cumulative effect to grizzly bear from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Long-term and permanent*, as some lost habitat will be restored prior to the end of the Post-Closure phase and the remainder not restored until forest is established after the Post-Closure phase.
- Magnitude: *Low*, there will be an overall 3.0% loss of high-quality grizzly bear habitat in the fall, 1.8% loss in the winter, 2.1% loss in the spring, and 4.0% loss in the summer in the Grizzly Bear RSA due to the development of the Project and other reasonably foreseeable future projects and activities. The Proiect contribution to these losses is expected to be 0.05% of fall habitat loss, 0.00% of winter habitat loss, 0.04% of spring habitat loss, and 0.02% of spring habitat loss in the Grizzly Bear RSA.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Grizzly Bear RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.



Crown Mountain Coking Coal Project

Figure 15.5-31
High-Quality Grizzly Bear Fall Habitat and Reasonably Foreseeable Future Projects and Activities in the Grizzly Bear Regional Study Area

LEGEND

- High-Quality Grizzly Bear Fall Habitat
- Reasonably Foreseeable Future Projects and Activities
- Grizzly Bear Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Scale 1:700,000

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

NWP Coal Canada Ltd

Project: 12-6231
Status: FINAL
Date: 2022-01-18

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Crown Mountain Coking Coal Project

Figure 15.5-32
High-Quality Grizzly Bear Winter Habitat and Reasonably Foreseeable Future Projects and Activities in the Grizzly Bear Regional Study Area

LEGEND

- High-Quality Grizzly Bear Winter Habitat
- Reasonably Foreseeable Future Projects and Activities
- Grizzly Bear Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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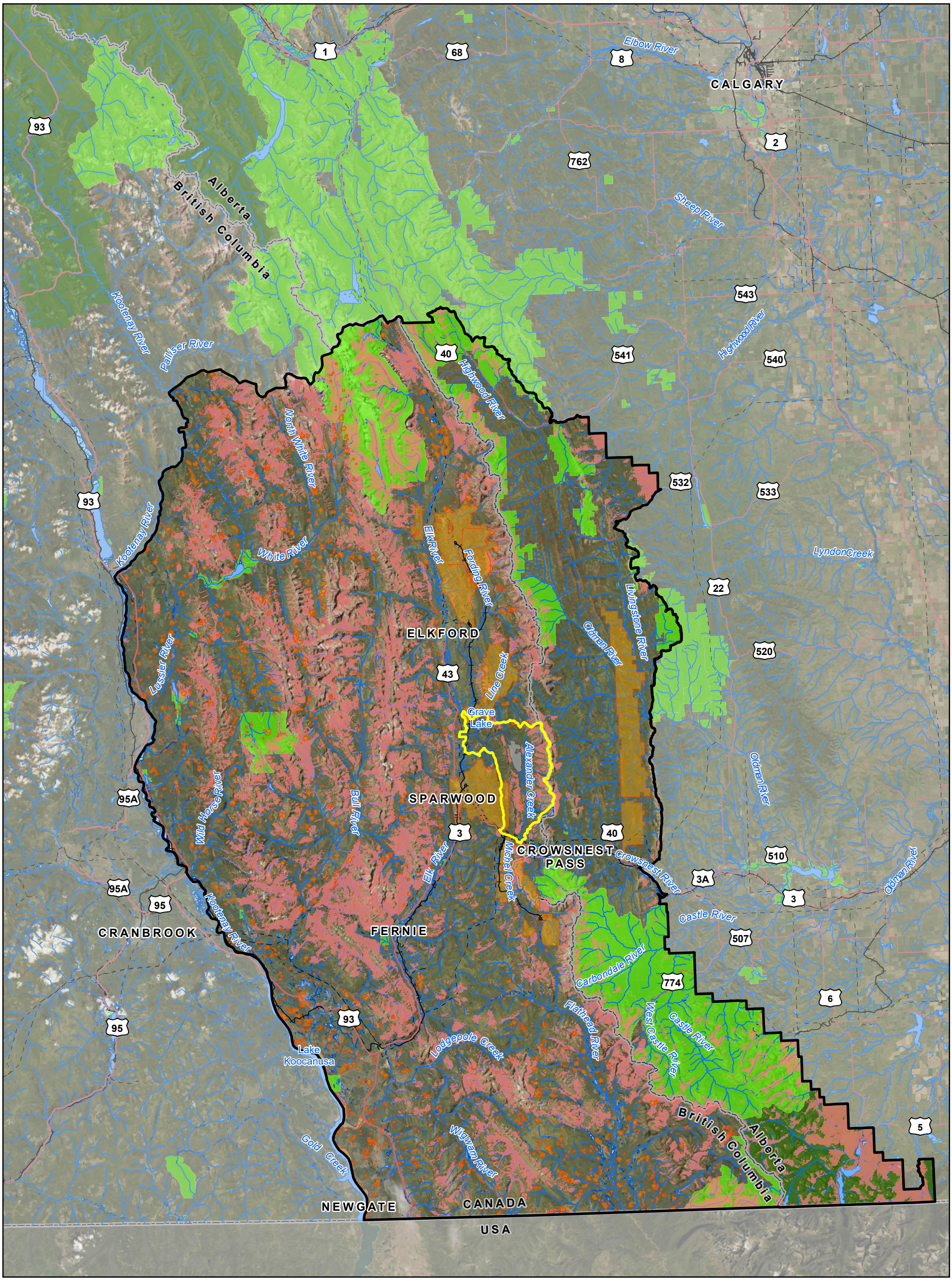

Crown Mountain Coking Coal Project

Figure 15.5-33
High-Quality Grizzly Bear Spring Habitat and Reasonably Foreseeable Future Projects and Activities in the Grizzly Bear Regional Study Area

LEGEND

- High-Quality Grizzly Bear Spring Habitat
- Reasonably Foreseeable Future Projects and Activities
- Grizzly Bear Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Scale 1:700,000

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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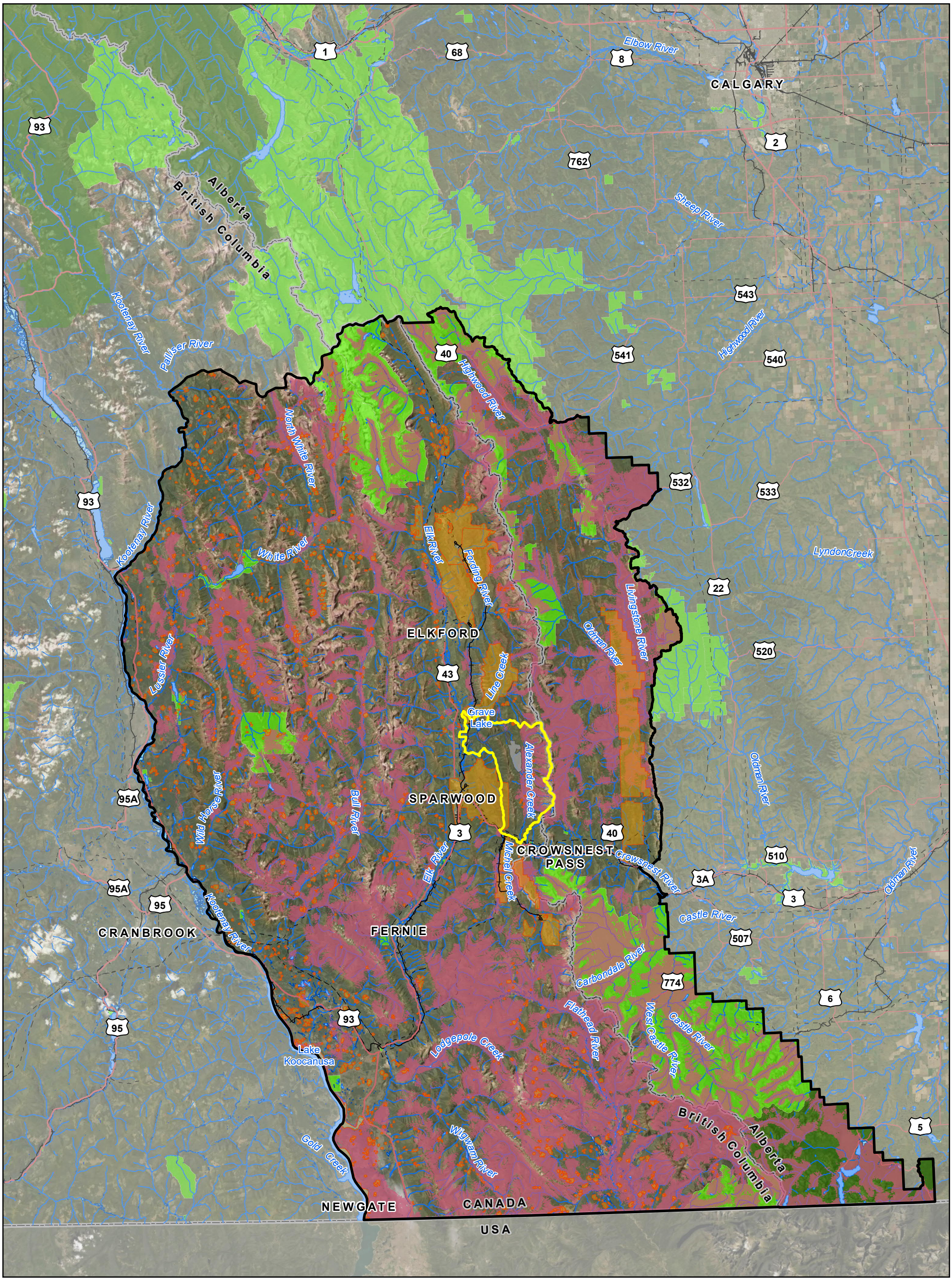

Crown Mountain Coking Coal Project

Figure 15.5-34
High-Quality Grizzly Bear Summer Habitat and Reasonably Foreseeable Future Projects and Activities in the Grizzly Bear Regional Study Area

LEGEND

- High-Quality Grizzly Bear Summer Habitat
- Reasonably Foreseeable Future Projects and Activities
- Grizzly Bear Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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- Reversibility: *Reversible long-term*, the effect of habitat loss is anticipated to be reversed, though not fully for many years after Post-Closure.
- Context: *Low,* as grizzly bear has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Sensory Disturbance

Many present and reasonably foreseeable future projects and activities generate noise, vibration, light, and dust which may affect suitable grizzly bear habitat. A quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects and activities when design details (and resulting noise, vibration, light, and dust) of those other projects or activities are not available. All other reasonably foreseeable future projects and activities included in the Future Case are either new coal mines or coal mine expansions. The effect of sensory disturbance is highly dependent on the distribution of grizzly bear habitat, project activities, and on topography and land cover; however, it may be reasonable to use the results of the Crown Mountain Coking Coal Project-level sensory disturbance analysis for grizzly bear (Section 15.5.3.4.2) as an indication of the amount of grizzly bear habitat that may be affected by noise from other reasonably foreseeable future projects or activities. The Project-level sensory disturbance analysis for grizzly bear found that the area potentially affected by continuous noise outside the Project footprint is up to 200% of the amount of high-quality grizzly bear habitat in spring, though lower in other seasons. If these proportional estimates are applied to the proportional loss of high-quality habitat for the Future Case (presented in the previous section in Table 15.5-29), then roughly 0.1 to 4.2% of high-quality grizzly bear habitat, depending on the season, will be affected by sensory disturbance outside of the project footprints. This may be an overestimate, as sensory disturbance is not generated continuously from all portions of any given project area, and not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to grizzly bear from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, as up to 4.2% of high-quality habitat will be affected in the Grizzly Bear RSA.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Grizzly Bear RSA.
- Frequency: *Continuous,* though at varying levels until the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Low*, as grizzly bear has low resilience to disruption in the receiving environment and may not easily adapt to effects.

Disruption to Movement

Many present and reasonably foreseeable future projects and activities create impermeable barriers (e.g., pits and dumps at mines) or semi-permeable barriers (e.g., roads, and other linear features) for wildlife. While each of the existing and reasonably foreseeable future projects and activities may block movements to varying degrees, they are geographically separated from the Crown Mountain Coking Coal Project such that additive barriers with the Project are limited (Figure 15.5-31 to Figure 15.5-34).

The residual cumulative effect to grizzly bear from disruption to movement arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as disruption to movement will continue through to the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, given the geographic distribution of current and reasonably foreseeable future projects and activities.
- Geographic Extent: *Regional*, as disruption to movement is limited to within the Grizzly Bear RSA.
- Frequency: *Continuous,* as the effect will continue through to the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Low,* as grizzly bear has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Increased Mortality Risk

The effect of the Project on increased risk of grizzly bear mortality may combine with those of other reasonably foreseeable future projects and activities to produce a cumulative increase in mortality risk. The main pathways are from increased vehicle traffic resulting in increased grizzly bear-vehicle collisions and increased hunter access. The change in road density between the Base Case and Future Case can be used as an index that reflects the degree to which the risk of mortality may change. Road density for the Base Case is 1.7 km/km^2 and estimated to be 1.4 km/km^2 in the Future Case, a decline of 18%.

The residual cumulative effect to grizzly bear from increased mortality risk arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Negligible*, as grizzly bear mortalities from vehicle collisions and hunter access are expected to decline due to a decline in road density in the Grizzly Bear RSA and are expected to be uncommon.
- Geographic Extent: *Regional*, as the effect will be within the footprint of the Project as well as those of other past, present, and reasonably foreseeable future projects or activities.
- Frequency: *Intermittent*, as grizzly bear mortalities may be at sporadic intervals during any phase of the Project or other projects or activities.

- 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.

EV-CEMF Analysis

Although grizzly bear hazard ranges across the Grizzly Bear RSA, most of the assessment watersheds demonstrate a high level of hazard, meaning there has been a high degree of change from historic conditions. Grizzly bears generally prefer natural land cover and are sensitive to high road density, as such, high hazard occurs as a combination of limited available habitat coupled with high road density.

At the scale of the Elk Valley, grizzly bear habitat availability is predicted to change by approximately -11%, -3%, and -9% by 2055, in Scenarios 1, 2, and 3, respectively. The density of roads, however, while still high, is predicted to decline by 2055. This reduction is due, at least in part, to the replacement of roads by mine footprints that are not part of the road density calculation. The end result is that grizzly bear hazard will decline by 2055 for all scenarios, relative to existing conditions, largely because of the decline in apparent road density. This pattern suggests that further development would be a benefit to grizzly bear, where that may not be the case.

A detailed description of the results is provided in MacHydro (2021; included as Appendix 13-F).

Determination of Significance

In the South Rockies Grizzly Bear Population Unit, there are an estimated 239 grizzly bears (Lamb et al., 2020). A preliminary analysis of recent data suggests there has been a very recent population increase in the Elk Valley since 2012 (Mowat et al., 2018). Based on the characterization of the residual cumulative effects and regional grizzly bear population levels, the Project in combination with reasonably foreseeable future projects and activities would not limit the ability of grizzly bear to persist and maintain self-sustaining populations in the Grizzly Bear RSA, including within Alberta and on federal lands located within the RSA. The residual cumulative effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk on grizzly bear arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

Effects 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 Grizzly Bear RSA. 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. The confidence in the determination of the significance of residual cumulative effects to grizzly bear is therefore moderate.

15.5.4.4.3 Wolverine

Many present and future projects and activities occur within the distributional range of wolverine and in suitable habitat. The residual effects of habitat loss and degradation, sensory disturbance, and disruption to movement could potentially have a cumulative effect on wolverine.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

Several present and reasonably foreseeable future projects and activities occur within the range of wolverine and in potentially suitable habitat and thus may result in loss or alteration of wolverine habitat (Figure 15.5-35). The Base Case incorporates the cumulative loss or alteration of wolverine habitat as a result of past and present projects and was the basis for the assessment of the Project Case. For the Future Case that includes both the Project and other reasonably foreseeable future projects and activities, approximately 3% of year-round high-quality wolverine habitat is predicted to be lost within the Terrestrial RSA (Table 15.5-41). The Project is predicted to contribute 0.17% of that loss.

Table 15.5-41: Change in High-Quality Wolverine Habitat for the Base Case, the Project Case, and the Future Case in the Terrestrial RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Terrestrial RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
Wolverine	Year-round	212,578	212,227 (-351)	206,164 (-6,414)	-0.17%	-3.0%

The residual cumulative effect to wolverine from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Long-term and permanent*, as some lost habitat will be restored prior to the end of the Post-Closure phase and the remainder not restored until forest is established after the Post-Closure phase.
- Magnitude: *Low*, there will be an overall 3.0% loss of high-quality year-round wolverine habitat in the Terrestrial RSA due to the development of the Project and other reasonably foreseeable future projects and activities. The Project is expected to contribute only 0.17% of this loss.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Terrestrial RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Reversible long-term*, the effect of habitat loss is anticipated to be reversed, though not fully for many years after Post-Closure.
- Context: *Low,* wolverine has low resilience to disruption in the receiving environment and will not easily adapt to effects.

Sensory Disturbance

Many present and reasonably foreseeable future projects and activities generate noise, vibration, light, and dust which may affect suitable wolverine habitat. A quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects and activities when design details (and resulting noise, vibration, light, and dust) of those other projects or activities are not available.

Crown Mountain Coking Coal Project

Figure 15.5-35
High-Quality Wolverine Year-round Habitat and Reasonably Foreseeable Future Projects and Activities in the Terrestrial Regional Study Area

LEGEND

- High-Quality Wolverine Year-round Habitat
- Reasonably Foreseeable Future Projects and Activities
- Terrestrial Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Scale 1:700,000

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

NWP Coal Canada Ltd

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All other reasonably foreseeable future projects and activities included in the Future Case are either new coal mines or coal mine expansions. The effect of sensory disturbance is highly dependent on the distribution of wolverine habitat, project activities and on topography and land cover; however, it may be reasonable to use the results of the Crown Mountain Coking Coal Project-level sensory disturbance analysis for wolverine (Section 15.5.3.4.3) as an indication of the amount of wolverine habitat that may be affected by noise from other reasonably foreseeable future projects or activities. The Project-level sensory disturbance analysis for wolverine found that the area potentially affected by continuous noise outside the Project footprint is up to 25% of the amount of high-quality wolverine habitat within the Project footprint. If these proportional estimates are applied to the proportional loss of high-quality habitat for the Future Case (presented in the previous section in Table 15.5-31), then roughly 1% of high-quality wolverine habitat will be affected by sensory disturbance outside of the project footprints. This may be an overestimate, as sensory disturbance is not generated continuously from all portions of any given project area, and not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to wolverine from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, as up to 1% of high-quality habitat will be affected in the Terrestrial RSA.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Terrestrial RSA.
- Frequency: *Continuous,* though at varying levels until the end of Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Low*, wolverine have low resilience to disruption from noise and may not be able to easily adapt to effects.

Disruption to Movement

Many present and reasonably foreseeable future projects and activities create impermeable barriers (e.g., pits and dumps at mines) or semi-permeable barriers (e.g., roads, and other linear features) for wildlife. While each of the existing and reasonably foreseeable future projects and activities may block movements to varying degrees, they are geographically separated from the Crown Mountain Coking Coal Project such that additive barriers with the Project are limited (Figure 15.5-35).

The residual cumulative effect to wolverine from disruption to movement arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as disruption to movement will continue through to the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.

- Magnitude: *Low*, given the geographic distribution of current and reasonably foreseeable future projects and activities.
- Geographic Extent: *Regional*, as disruption to movement is limited to within the Terrestrial RSA.
- Frequency: *Continuous,* as the effect will continue through to the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Low,* 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 (Apps et al., 2007). Population trends are not well understood. However, based on the characterization of the residual cumulative effects and regional wolverine density estimates, the Project in combination with reasonably foreseeable future projects and activities would not limit the ability of wolverine to persist and maintain self-sustaining populations in the Terrestrial RSA, including within Alberta and on federal lands located within the RSA. The residual cumulative effects of habitat loss and degradation, sensory disturbance, and disruption to movement on wolverine arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

Effects 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, known occurrences, and abundance in the Terrestrial RSA; however, little is known about wolverine population trends in the Elk Valley and the factors that may most contribute to wolverine population stability. The confidence in the determination of the significance of residual cumulative effects to wolverine is therefore moderate.

15.5.4.4.4 American Badger

Many present and future projects and activities occur within the distributional range of American badger and in suitable habitat. The residual effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk could potentially have a cumulative effect on American badger.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

Most present and reasonably foreseeable future projects and activities occur within the range of American badger and in potentially suitable habitat and thus may result in loss or alteration of habitat

(Figure 15.5-36). The Base Case incorporates the cumulative loss or alteration of American badger habitat as a result of past and present projects and was the basis for the assessment of the Project Case. For the Future Case that includes both the Project and other reasonably foreseeable future projects and activities, approximately 6.8% of year-round high-quality American badger habitat is predicted to be lost within the Terrestrial RSA (Table 15.5-42). The Project is predicted to contribute 0.02% of that loss.

Table 15.5-42: Change in High-Quality American Badger Habitat for the Base Case, the Project Case, and the Future Case in the Terrestrial RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Terrestrial RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
American Badger	Year-round	395,613	395,515 (-98)	368,891 (-26,722)	-0.02%	-6.8%

The residual cumulative effect to American badger from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Long-term*, as lost habitat will be restored prior to the end of the Post-Closure phase.
- Magnitude: *Moderate*, there will be an overall 6.8% loss of high-quality year-round American badger habitat in the Terrestrial RSA due to the development of the Project and other reasonably foreseeable future projects and activities. The Project will contribute only 0.02% of that loss.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Terrestrial RSA.
- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Reversible long-term*, the effect of habitat loss is anticipated to be reversed, though not fully for many years after Post-Closure.
- Context: *Moderate,* American badger has moderate resilience to disruption in the receiving environment and may adapt to effects.

Sensory Disturbance

Many present and reasonably foreseeable future projects and activities generate noise, vibration, light, and dust which may affect suitable American badger habitat. A quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects and activities when design details (and resulting noise, vibration, light, and dust) of those other projects or activities are not available. All other reasonably foreseeable future projects and activities included in the Future Case are either new coal mines or coal mine expansions. The effect of sensory disturbance is highly dependent on the distribution of American badger habitat, project activities, and on topography and land cover; however, it may be reasonable to use the results of the Crown Mountain Coking Coal Project-level sensory disturbance analysis for American badger (Section 15.5.3.4.4) as an indication of the amount of American badger habitat that may be affected by noise from other reasonably foreseeable future projects or activities. The Project-level sensory disturbance analysis for American badger found that the area potentially affected

Crown Mountain Coking Coal Project

Figure 15.5-36
High-Quality American Badger Spring-Summer Habitat and Reasonably Foreseeable Future Projects and Activities in the Terrestrial Regional Study Area

LEGEND

- High-Quality American Badger Spring-Summer Habitat
- Reasonably Foreseeable Future Projects and Activities
- Terrestrial Regional Study Area
- Terrestrial Local Study Area
- Crown Mountain Coking Coal Project
- Highway
- Railway
- Transmission Line
- Watercourse
- Waterbody
- Wetland
- Provincial Park/Protected Area
- National Park
- British Columbia/Alberta Border

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Kilometres

N W E S

Scale 1:700,000

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

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by continuous noise outside the Project footprint is up to 117% of the amount of high-quality American badger habitat within the Project footprint. If these proportional estimates are applied to the proportional loss of high-quality habitat for the Future Case (presented in the previous section in Table 15.5-33), then roughly up to 8% of high-quality American badger habitat may be affected by sensory disturbance outside of the project footprints. This may be an overestimate as sensory disturbance is not generated continuously from all portions of any given project area and furthermore, not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to American badger from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Moderate*, as up to 8% of high-quality habitat will be affected in the Terrestrial RSA.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Terrestrial RSA.
- Frequency: *Continuous,* though at varying levels until the end of Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *High*, as American badger has high resilience to sensory disturbance and will adapt to effects.

Disruption to Movement

Many present and reasonably foreseeable future projects and activities create impermeable barriers (e.g., pits and dumps at mines) or semi-permeable barriers (e.g., roads, and other linear features) for wildlife. While each of the existing and reasonably foreseeable future projects and activities may block movements to varying degrees, they are geographically separated from the Crown Mountain Coking Coal Project such that additive barriers with the Project are limited (Figure 15.5-36).

The residual cumulative effect to American badger from disruption to movement arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as disruption to movement will continue through to the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, given the geographic distribution of current and reasonably foreseeable future projects and activities.
- Geographic Extent: *Regional*, as disruption to movement is limited to within the Terrestrial RSA.
- Frequency: *Continuous,* as the effect will continue through to the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.

- Reversibility: *Reversible long-term*, the effect will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Moderate*, American badger have moderate resilience to disruption in the receiving environment and may adapt to effects.

Increased Mortality Risk

The effect of the Project on increased risk of American badger mortality may combine with those of other reasonably foreseeable future projects and activities to produce a cumulative increase in mortality risk. The main pathways are from increased vehicle traffic resulting in increased American badger-vehicle collisions and increased hunter access. The change in road density between the Base Case and Future Case can be used as an index that reflects the degree to which the risk of mortality may change. Road density for the Base Case is 1.7 km/km^2 and estimated to be 1.4 km/km^2 in the Future Case, a decline of 18%.

The residual cumulative effect to American badger from increased mortality risk arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as some effects will continue to the end of Reclamation and Closure.
- Magnitude: *Negligible*, as American badger mortalities from vehicle collisions are expected to decline due to a decline in road density.
- Geographic Extent: *Regional*, as the effect will be within the Project footprint of the Project as well as those of other past, present, and reasonably foreseeable future projects or activities.
- Frequency: *Intermittent*, as American badger mortalities may be at sporadic intervals during any phase of the Project or other projects or activities.
- 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. (COSEWIC, 2012b; *Jeffersonii* East; B.C. Badger Recovery Team, 2016). The East Kootenay American badger population (*jeffersonii* East) is comprised of an estimated 100 to 160 mature individuals (COSEWIC, 2012b; B.C. Badger Recovery Team, 2016). The East population are likely overall stable with declines in certain areas (COSEWIC, 2012b). Based on the characterization of the residual cumulative effects and regional American badger population estimates, the Project in combination with reasonably foreseeable future projects and activities would not limit the ability of American badger to persist and maintain self-sustaining populations in the Terrestrial RSA, including within Alberta and the federal Dominion Coal Block Parcels 73 and 82. The residual cumulative effects of habitat loss and degradation, sensory disturbance, disruption to movement, and increased mortality risk on American badger arising from the Project in combination with other past, present, and reasonably foreseeable future projects and activities during all phases are therefore considered not significant.

Likelihood and Confidence

Effects 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 RSA. The confidence in the determination of the significance of residual cumulative effects to American badger is therefore high.

15.5.4.4.5 American Marten

Many present and future projects and activities occur within the distributional range of American marten and in suitable habitat. The residual effects of habitat loss and degradation, sensory disturbance, and disruption to movement could potentially have a cumulative effect on American marten.

Characterization of Residual Cumulative Effects

Habitat Loss and Degradation

Most present and reasonably foreseeable future projects and activities occur within the range of American marten and in potentially suitable habitat and thus may result in loss or alteration of American marten habitat (Figure 15.5-37). The Base Case incorporates the cumulative loss or alteration of American marten habitat as a result of past and present projects and was the basis for the assessment of the Project Case. For the Future Case that includes both the Project and other reasonably foreseeable future projects and activities, approximately 5.5% of year-round high-quality American marten habitat is predicted to be lost within the Terrestrial RSA (Figure 15.5-37; Table 15.5-43). The Project is predicted to contribute 0.12% of that loss.

Table 15.5-43: Change in High-Quality American Marten Habitat for the Base Case, the Project Case, and the Future Case in the Terrestrial RSA

VC	Season	Amount (ha) of High-Quality Habitat (Change from Base Case in Brackets)			Change as Proportion of Terrestrial RSA	
		Base Case	Project Case	Future Case	Base Case to Project Case	Base Case to Future Case
American Marten	Year-round	408,850	408,360 (-490)	386,438 (-22,412)	-0.12%	-5.5%

The residual cumulative effect to American marten from habitat loss and degradation arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects and activities is characterized as follows:

- Duration: *Permanent*, as lost high-quality habitat will not be restored prior to the end of the Post-Closure phase.
- Magnitude: *Moderate*, there will be an overall 5.5% loss of high-quality year-round American marten habitat in the Terrestrial RSA due to the development of the Project and other reasonably foreseeable future projects and activities. The Project will contribute only 0.12% of that loss.
- Geographic Extent: *Regional*, as the effect of habitat loss of the Future Case will be in the Terrestrial RSA.

- Frequency: *Continuous*, the effect of habitat loss and degradation is expected to be continuous until lost habitat is restored.
- Reversibility: *Permanent*, as lost high-quality will not be restored prior to the end of reclamation.
- Context: *Low,* American marten has low resilience to habitat loss and will not easily adapt.

Sensory Disturbance

Many present and reasonably foreseeable future projects and activities generate noise, vibration, light, and dust which may affect suitable American marten habitat. A quantitative approach could not be used for the cumulative effects of sensory disturbance because of the difficulty in assigning zones of influence or avoidance to other reasonably foreseeable future projects and activities when design details (and resulting noise, vibration, light, and dust) of those other projects or activities are not available. All other reasonably foreseeable future projects and activities included in the Future Case are either new coal mines or coal mine expansions. The effect of sensory disturbance is highly dependent on the distribution of American marten habitat, project activities, and on topography and land cover; however, it may be reasonable to use the results of the Crown Mountain Coking Coal Project-level sensory disturbance analysis for American marten (Section 15.5.3.4.5) as an indication of the amount of American marten habitat that may be affected by noise from other reasonably foreseeable future projects or activities. The Project-level sensory disturbance analysis for American marten found that the area potentially affected by continuous noise outside the Project footprint is up to 44% of the amount of high-quality American marten habitat within the Project footprint. If these proportional estimates are applied to the proportional loss of high-quality habitat for the Future Case (presented in the previous section in Table 15.5-35), then roughly up to 4% of high-quality American marten habitat may be affected by sensory disturbance outside of the project footprints. This may be an overestimate, as sensory disturbance is not generated continuously from all portions of any given project area, and not all projects are likely to be generating noise in overlapping time periods.

The residual cumulative effect to American marten from sensory disturbance arising from the effects of the Project in combination with those of other past, present, and reasonably foreseeable future projects or activities is characterized as follows:

- Duration: *Long-term*, as sensory disturbance will continue through to the end of the Operations phases of both the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Magnitude: *Low*, as up to 4% of high-quality habitat will be affected in the Terrestrial RSA.
- Geographic Extent: *Regional*, as the effect of sensory disturbance will be within the Terrestrial RSA.
- Frequency: *Continuous,* though at varying levels until the end of Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities
- Reversibility: *Reversible long-term*, the effect of noise will decline substantially at the end of the Operations phases of the Crown Mountain Coking Coal Project and those of other reasonably foreseeable future projects and activities.
- Context: *Low,* as American marten has low resilience to sensory disturbance and may not adapt to effects.