5.0 APPLICATION CASE ASSESSMENT

The following section describes the predicted changes of Project development on wildlife species selected as VCs. The Application Case includes the Baseline Case plus the Grassy Mountain Coal Project and assesses the significance of residual effects after mitigation (Year 27). Mitigations for impacts are comprehensively captured in the Conservation and Reclamation Plan (Section F).

5.1 Changes in Wildlife Habitat

The Project footprint will occupy 1,520.7 ha of land over the lifetime of the Project, comprising 26.9% of the WLSA, 2.1% of the WRSA, and 0.5% of the GBRSA. Wildlife habitat maps for the WLSA at Year 14 and Year 27 are provided in Figures 5.1-1 and 5.1-2, and those for the GBRSA are provided in Figures 5.1-3 and 5.1-4.

The largest change in areal extent of habitat types in the WLSA at Year 14 is expected to be associated with the loss of moderate mixed coniferous (387 ha or 28%) and closed mixedwood habitats (309 ha or 31%) (Table 5.1-1). The availability of closed mixed coniferous and grassland habitats are also expected to decline by 148 ha (35%) and 151 ha (52%), respectively, because of Project development at Year 14. Most habitat types that would be directly affected by the Project are relatively common in the region (Table 5.1-2). At Year 27, the largest habitat losses are still associated with the moderate mixed coniferous and closed mixedwood types, although there is expected to be a net gain in grassland in the WLSA as the landscape is progressively reclaimed (Table 5.1-1). At Year 27, the areas reclaimed to forested types will resemble early seral stage cutblocks, which were classed as anthropogenic disturbances (*i.e.* cutblocks) in Table 5.1-2.

At the GBRSA scale, the largest change in areal extent of wildlife habitat resulting from Project development will occur in Year 14, with a reduction in the mature conifer forest habitat types (941.4 ha, 4.1%) which are composed of closed conifer mature forest, dense conifer mature forest, moderate conifer mature forest, and open conifer mature forest (Table 5.1-2). Collectively, the loss of these mature coniferous forest types only accounts for 0.3% of the GBRSA at Year 14. Overall, only 0.6% of the natural habitats occurring in the GBRSA will be affected by Project development at Year 14. At Year 27, the largest habitat losses remain associated with the mature coniferous forest types (Table 5.1-2). However, regional increases in closed conifer young forest, natural upland herb, and open water are expected in Year 27 in the GBRSA as progressive reclamation of the Project footprint occurs.

Table 5.1-1 Change in Wildlife Habitat Between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Type	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
Open Pine	516.7	455.1	-61.6	-11.9	455.1	-61.6	-11.9
Open Deciduous	51.6	48.4	-3.2	-6.3	48.4	-3.2	-6.3
Open Mixedwood	291.2	254.4	-36.8	-12.6	254.4	-36.8	-12.6
Open Mixed Coniferous	440.5	380.9	-59.6	-13.5	413.10	-27.4	-6.2
Moderate Mixed Coniferous	1,375.8	988.8	-387.0	-28.1	934.0	-441.8	-32.1
Closed Deciduous	27.6	27.6	0.0	0.1	27.6	0.0	0.1
Closed Mixedwood	991.2	682.3	-308.9	-31.2	682.3	-308.9	-31.2
Closed Spruce	79.4	74.7	-4.7	-6.0	74.7	-4.7	-6.0
Closed Mixed Coniferous	419.5	271.8	-147.7	-35.2	266.3	-153.2	-36.5
Grassland	290.3	139.6	-150.7	-51.9	349.1	58.8	20.2
Upland Shrub	0.2	0.2	0.0	-24.2	0.2	0.0	-24.2
Shrubby Wetland	17.9	1.6	-16.3	-91.1	1.6	-16.3	-91.1
Treed Wetland	4.8	4.8	0.0	0.0	4.8	0.0	0.0
Rock Barren	48.6	16.8	-31.8	-65.5	57.5	8.9	18.3
Waterbody	63.9	63.8	-0.1	-0.1	82.2	18.3	28.6
Anthropogenic Disturbance	1,027.3	2,235.7	1,208.4	117.6	1,995.2	967.9	94.2
Totals	**5,646.4**	**5,646.4**	**-**	**-**	**5,646.4**	**-**	**-**

Table 5.1-2 Change in Wildlife Habitat Between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Habitat Type	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
Agriculture	27,010.6	27,010.6	0.0	0.0	27,010.6	0.0	0.0

Table 5.1-2 Change in Wildlife Habitat Between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Habitat Type	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
Barren Land	18,650.5	18,647.4	-3.1	0.0	18,679.5	29.0	0.2
Closed Broadleaf Mature Forest	4,921.0	4,921.0	0.0	0.0	4,921.0	0.0	0.0
Closed Broadleaf Old Forest	287.3	287.3	0.0	0.0	287.3	0.0	0.0
Closed Broadleaf Young Forest	900.0	900.0	0.0	0.0	900.0	0.0	0.0
Closed Conifer Mature Forest	34,268.2	33,958.5	-309.7	-0.9	33,919.2	-349.0	-1.0
Closed Conifer Old Forest	2,774.2	2,774.2	0.0	0.0	2,774.2	0.0	0.0
Closed Conifer Young Forest	2,249.8	2,249.8	0.0	0.0	3,380.9	1,131.1	50.3
Closed Mixed Mature Forest	824.2	807.5	-16.7	-2.0	807.5	-16.7	-2.0
Closed Mixed Old Forest	79.6	73.7	-5.9	-7.4	73.7	-5.9	-7.4
Closed Mixed Young Forest	81.5	81.5	0.0	0.1	81.5	0.0	0.1
Closed Regen Treed	2,253.7	2,253.7	0.0	0.0	2,253.7	0.0	0.0
Dense Broadleaf Mature Forest	1,144.3	1,144.3	0.0	0.0	1,144.3	0.0	0.0
Dense Broadleaf Old Forest	6.9	6.9	0.0	0.3	6.9	0.0	0.3
Dense Broadleaf Young Forest	79.2	79.2	0.0	0.0	79.2	0.0	0.0
Dense Conifer Mature Forest	14,883.8	14,682.0	-201.8	-1.4	14,671.0	-212.8	-1.4
Dense Conifer Old Forest	438.5	438.5	0.0	0.0	438.5	0.0	0.0
Dense Conifer Young Forest	528.5	528.5	0.0	0.0	528.5	0.0	0.0
Dense Mixed Mature Forest	101.4	101.4	0.0	0.0	101.4	0.0	0.0
Dense Mixed Young Forest	3.7	3.7	0.0	-1.1	3.7	0.0	-1.1
Industrial (*e.g.* Mining)	3,183.6	4,418.0	1,234.4	38.8	2,967.5	-216.1	-6.8
Linear Anthropogenic Disturbance	7,626.0	7,630.0	4.0	0.1	7,571.2	-54.8	-0.7
Lush Herb	352.0	352.0	0.0	0.0	352.0	0.0	0.0
Moderate Broadleaf Mature	3,167.4	3,167.4	0.0	0.0	3,167.4	0.0	0.0

Table 5.1-2 Change in Wildlife Habitat Between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Habitat Type	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
Forest							
Moderate Broadleaf Old Forest	437.3	437.3	0.0	0.0	437.3	0.0	0.0
Moderate Broadleaf Young Forest	465.6	465.6	0.0	0.0	465.6	0.0	0.0
Moderate Conifer Mature Forest	21,595.9	21,333.8	-262.1	-1.2	21,326.5	-269.4	-1.2
Moderate Conifer Old Forest	4,223.7	4,222.5	-1.2	0.0	4,222.5	-1.2	0.0
Moderate Conifer Young Forest	2,940.1	2,928.4	-11.7	-0.4	2,928.4	-11.7	-0.4
Moderate Mixed Mature Forest	3,496.6	3,463.1	-33.5	-1.0	3,463.1	-33.5	-1.0
Moderate Mixed Old Forest	297.9	296.7	-1.2	-0.4	296.7	-1.2	-0.4
Moderate Mixed Young Forest	172.1	172.1	0.0	0.0	311.9	139.8	81.2
Natural Graminoid Wetland	158.5	158.5	0.0	0.0	158.5	0.0	0.0
Natural Shrubby	7,555.5	7,555.2	-0.3	0.0	7,555.2	-0.3	0.0
Natural Shrubby Wetland	762.7	762.7	0.0	0.0	762.7	0.0	0.0
Natural Upland Herb	38,513.7	38,471.3	-42.4	-0.1	38,690.2	176.5	0.5
Open Water	1,544.0	1,542.6	-1.4	-0.1	1,595.9	51.9	3.4
Open Broadleaf Mature Forest	1,546.4	1,538.3	-8.1	-0.5	1,538.3	-8.1	-0.5
Open Broadleaf Old Forest	378.8	378.8	0.0	0.0	378.8	0.0	0.0
Open Broadleaf Young Forest	421.5	421.5	0.0	0.0	421.5	0.0	0.0
Open Conifer Mature Forest	26,698.2	26,530.4	-167.8	-0.6	26,524.9	-173.3	-0.6
Open Conifer Old Forest	4,403.4	4,403.4	0.0	0.0	4,403.4	0.0	0.0
Open Conifer Young Forest	4,066.2	4,066.2	0.0	0.0	4,066.2	0.0	0.0
Open Mixed Mature Forest	1,581.4	1,579.3	-2.1	-0.1	1,570.5	-10.9	-0.7
Open Mixed Old Forest	133.1	133.1	0.0	0.0	133.1	0.0	0.0

Table 5.1-2 Change in Wildlife Habitat Between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Habitat Type	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
Open Mixed Young Forest	471.0	471.0	0.0	0.0	471.0	0.0	0.0
Open Regen Herb	17,991.2	17,922.7	-68.5	-0.4	17,922.7	-68.5	-0.4
Open Regen Shrub	17,631.8	17,551.3	-80.5	-0.5	17,551.3	-80.5	-0.5
Settlement	595.5	586.1	-9.4	-1.6	586.1	-9.4	-1.6
Treed Wetland	126.5	115.7	-10.8	-8.5	121.7	-4.8	-3.8
Total	**284,024.7**	**284,024.7**	**-**	**-**	**284,024.7**	**-**	**-**

5.2 Changes in Wildlife Diversity

Areas of moderate to high wildlife diversity in the WLSA are expected to be reduced by 15.1% (794.1 ha) following Project development in Year 14 and to increase by 2.9% (153.5 ha) in Year 27 as progressive reclamation of the Project footprint occurs (Table 5.2-1). Moderate to high diversity areas are expected to be widely distributed at both time steps in the WLSA (Figures 5.2-1 and 5.2-2). Overall, high diversity habitats are expected to decline by 22.1% (404.9 ha) at both Year 14 and Year 27 because of Project development. The overall increase in moderate to high diversity habitats in the WLSA between baseline and Year 27 was predicted to result from an increase in moderate diversity habitats following mine reclamation. In contrast, the Project footprint will increase low diversity habitats in the WLSA by 495.3% (819.2 ha) at Year 14 but at Year 27, low diversity habitats in the WLSA are expected to be reduced by 74.0% compared to baseline. This represents a conversion of 122.4 ha of low diversity habitat to moderate diversity habitat in the WLSA over the life of the Project (Table 5.2-1, Figures 5.2-3 and 5.2.4).

Table 5.2-1 Change in Wildlife Diversity Between the Baseline and Application Cases in the Wildlife Local Study Area

Diversity Rating	No. of Species	Baseline (ha)	Year 14			Year 27		
			Application (ha)	Change		Application (ha)	Change	
				ha	%		ha	%
Low	0-19	165.4	984.6	819.2	495.3	43.0	-122.4	-74.0
Moderate-Low	20-44	238.6	213.5	-25.1	-10.5	207.5	-31.1	-13.0
Moderate	45-70	340.9	779.9	439.0	128.8	1,450.8	1,109.9	325.6
Moderate-High	71-90	3,069.8	2,241.7	-828.1	-27.0	2,518.4	-551.4	-18.0
High	≥91	1,831.7	1,426.8	-404.9	-22.1	1,426.8	-404.9	-22.1

Areas of moderate to high wildlife diversity habitats in the GBRSA are expected to decline by 0.2% (451.2 ha) at Year 14, while low diversity habitats are expected to increase by 16.9% (538.5 ha, Table 5.2-2). These spatial alterations are considered negligible at the GBRSA scale. With mitigation and progressive mine reclamation, the distribution of all habitat diversity types will remain similar to baseline conditions at Year 27. Low diversity habitats are expected to decrease overall by 431.9 ha (13.6%), while moderate to high diversity habitats are expected to increase by 496.5 ha (0.2%). The spatial distribution of the wildlife diversity does not appear to differ appreciably in the GBRSA from baseline (Figures 5.2-3 and 5.2-4).

Table 5.2-2 Change in Wildlife Diversity Between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Diversity Rating	No. of Species	Baseline (ha)	Year 14			Year 27		
			Application (ha)	Change		Application (ha)	Change	
				ha	%		ha	%
Low	0-19	3,183.6	3,722.1	538.5	16.9	2,751.7	-431.9	-13.6
Moderate-Low	20-44	26,276.5	26,189.2	-87.3	-0.3	26,212.0	-64.5	-0.2
Moderate	45-70	3,232.9	3,232.9	0.0	0.0	3,232.9	0.0	0.0
Moderate-High	71-90	112,817.4	112,928.2	110.8	0.1	113,675.6	858.2	0.8
High	≥91	138,514.2	137,952.2	-562.0	-0.4	138,152.5	-361.7	-0.3

5.3 Wildlife Valued Components

Ten VCs were selected for the wildlife assessment (Section 3.2.3). The following sections (Sections 5.3.1 to 5.3.10) describe the predicted effects of Project development on the wildlife VCs with regard to change in habitat availability, change in movement, change in mortality risk, and change in abundance relative to baseline conditions after mitigation is applied (Year 27). The Application Cases include the Baseline Case plus the Project and assess the significance of residual effects after mitigation.

5.3.1 Columbia Spotted Frog

5.3.1.1 Change in Habitat Availability

Approximately 46 ha (27%) of effective Columbia spotted frog habitat in the WLSA, which includes the high and moderate suitability classes, will be lost by Year 14 of Project development (Table 5.3-1, Figure 5.3-1). Four potential or confirmed breeding ponds will be affected. Breeding ponds suitable for amphibians are limited in the WLSA, so the loss of these ponds may affect the local amphibian population during the life of the Project. According to Andrén (1994), most species are not necessarily at risk of regional extirpation even when at least 30% of the landscape remains as effective habitat, although these species may be affected by the loss of habitat through reduced body condition, reduced reproductive potential, and declining populations/abundance. Habitat loss is among the largest threats to amphibian populations; however, most studies have not provided clear insights into population-level implications for habitat loss. By Year 27, it is expected that the WLSA will contain 18 ha (10.5%) less effective habitat compared to baseline conditions (Table 5.3-1, Figure 5.3-2). Losses of effective habitat for Columbia spotted frog will be offset by reclamation and mitigation by Year 27, which includes construction of wetlands (Section F - Conservation and Reclamation Plan, Figure F.3.6-8).

Table 5.3-1 Changes in Columbia Spotted Frog Habitat Availability between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
High	49.6	31.6	-18	-36.3	35.1	-14.5	-29.2
Moderate	123.3	95.3	-28	-22.7	119.6	-3.7	-3.0
Low	194.0	150.9	-43.1	-22.2	158.9	-35.1	-18.1
Nil	5,279.5	5,368.60	89.1	1.7	5,332.80	53.3	1.0
Effective Habitat[1]	**172.9**	**126.9**	**-46**	**-26.6**	**154.7**	**-18.2**	**-10.5**

[1] Effective Habitat = High plus Moderate habitat suitability classes.

Reclamation of disturbed areas will occur progressively through the life of the Project. One of the reclamation goals is to restore wildlife habitat to pre-disturbance baseline conditions. The loss of Columbia spotted frog habitat is therefore expected to be temporary since efforts to reclaim amphibian habitat at abandoned coal mines have frequently been successful (Brown *et al.* 2012). Sedimentation ponds and ditches can often be reclaimed into effective amphibian habitat provided that they are treated for any water quality issues such as low pH or high concentrations of heavy metals (Lacki *et al.* 1992, Carrozzino 2009). Additionally, ponds and wetlands suitable for amphibians can be reconstructed in areas where they did not previously exist, and amphibians frequently recolonize created or restored wetlands (Brown *et al.* 2012). Amphibian salvage has also been successfully implemented for other coal mines and industrial projects (Hab-Tech Environmental 2012), wherein amphibians are captured and relocated to other suitable breeding ponds in the area prior to disturbance activities.

Amphibians such as Columbia spotted frogs may be affected by sensory disturbance associated with Project development. Sources of sensory disturbance include increases in noise, vibration, and artificial night lighting in land surrounding the Project area. The effects of artificial lights and noise on the behaviour and physiology of Columbia spotted frogs have not been investigated. Other anuran species alter their reproductive and foraging behavior in response to anthropogenic sources of light and noise (Buchanan, 1993; Sun and Narins, 2005; Bee and Swanson, 2007; Lengagne, 2008; Eigenbrod *et al.,* 2009; Parris *et al.,* 2009). The effective quality of breeding and summer foraging habitats may be locally reduced by Project noise and artificial lighting.

With mitigation (Section 7.0), the effects of Project development on Columbia spotted frog breeding habitat availability in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to Columbia spotted frog habitat availability is predicted to be negative, the confidence rating for this prediction is moderate, and the probability of effect occurrence is high.

5.3.1.2 Change in Movement

Columbia spotted frogs frequently move among their overwintering, breeding, and summer habitats by travelling along streams. They will move through upland habitats, particularly during rainy nights. At Year 14, Columbia spotted frog movements will be affected by the presence of the active mine site. Increased traffic on the mine access road may also increase mortality in frogs that attempt to cross it, and may therefore reduce habitat permeability in the southern portion of the WLSA. Streams that would facilitate Columbia spotted frog movement will still be present in the east and west portions of the WLSA (Figure 5.3-1) and in Year 27, permeability of the WLSA should improve over Year 14 conditions (Figure 5.3-2).

With mitigation (Section 7.0), the effects of Project development on Columbia spotted frog movement in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to changes in Columbia spotted frog movement is predicted to be negative, the confidence rating for this prediction is high, and the probability is moderate. The effects are predicted to be reversible in the long term because of the time needed for upland vegetation to regrow at reclaimed sites.

5.3.1.3 Change in Mortality Risk

Increased Columbia spotted frog mortality may result from increased traffic on the access road associated with Project development. Dewatering and removal of the four ponds in the centre of the Project footprint will result in amphibian larvae mortality, if present. Mortality of Columbia spotted frogs and their larvae may be reduced by conducting a pre-disturbance salvage of any adults and larvae and translocating captured individuals to suitable ponds/wetlands in the vicinity of the WLSA.

Increased levels of selenium in water bodies in the Project footprint have the potential to negatively affect Columbia spotted frogs and other amphibians. Amphibians can bioaccumulate selenium and increased concentrations of selenium in amphibian larvae tissues have been associated with a variety of deformities (Janz *et al.*, 2010). Adult amphibians with high levels of selenium in their tissues have also displayed hormonal abnormalities, and females can pass high levels of selenium on to their eggs (Janz *et al.*, 2010).

There are frequently increases in nitrate and nitrite concentrations in waterways downstream of coal mines (Hauer and Sexton, 2013) which can negatively affect amphibian populations. Marco *et al.* (2009) found high levels of larval mortality in five amphibian species (including a close relative of the Columbia spotted frog) when exposed to 1 mg/L NO2-N, which is the United States Environmental Protection Agency's (EPA) recommended upper limit for nitrites in drinking water. Additionally, the EPA's recommended maximum levels of nitrates to protect warm water fishes (90 mg /L NO3-N) has been found to be highly toxic to amphibian larvae. In other studies on nitrate toxicity to amphibians, nitrate concentrations of 13-40 ppm were required to kill 50% of the larvae in a study population, while sub-lethal effects (*i.e.* reduced feeding, deformities) were seen at nitrate concentrations of 2-5 ppm (CWS, 2005). Sublethal effects can increase mortality in wild populations if they lead to starvation or increased susceptibility to predation.

Since the potential exists for increased selenium and other pollutants in water within and downstream of the Project, a surface water management plan has been developed to mitigate potential effects. A selenium management program has been developed to treat and remove selenium to ensure that water quality parameters do not have significant effects on wildlife health (Section C.8 – Geochemistry and Selenium Management). The proposed selenium management plan is designed to mitigate potential selenium impacts, and, until mine closure, selenium-contaminated water bodies in the footprint will be designed and managed such that they are not attractive to amphibians.

With mitigation (Section 7.0), the effects of Project development on Columbia spotted frog mortality in the WLSA are predicted to be local in extent, extended in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project contribution to changes in Columbia spotted frog mortality is predicted to be neutral, the confidence rating for this prediction is moderate, and the probability is moderate.

5.3.1.4 Change in Abundance

Because of a loss in breeding habitat and the potential for increased mortality, Project development is expected to result in a decrease in Columbia spotted frog abundance in the WLSA during the construction and operations phases of the Project. With mitigation (Section 7.0), effects of Project development on Columbia spotted frog abundance in the WLSA are predicted to be local in extent, extended in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project contribution to changes in Columbia spotted frog abundance is predicted to be negative, the confidence rating for this prediction is high, and the probability is moderate.

5.3.2 Western Toad

5.3.2.1 Change in Habitat Availability

Effective breeding habitat for western toads will be reduced by 53 ha (19.8%) at Year 14 of Project development. Low-quality habitat (which is most likely to be used as summering habitat by western toads) will be reduced by 500.6 ha (30.4%) by Year 14 (Table 5.3-2, Figure 5.3-3). Four potential breeding ponds located in the center of the WLSA will be lost with Project development (Figures 5.3-3 and 5.3-4). By Year 27, it is expected that there will be 23 ha (8.3%) less effective habitat available (particularly high-quality habitat) than was present under baseline conditions (Table 5.3-2, Figure 5.3-4). Losses of effective habitat for western toad will be offset by reclamation and mitigation, which includes construction of wetlands (Section F - Conservation and Reclamation Plan, Figure F.3.6-8).

Table 5.3-2 Change in Western Toad Habitat Availability Between Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
High	50.4	32	-18.4	-36.5	35.6	-14.8	-29.4
Moderate	219.3	184.3	-35	-16.0	211.6	-7.7	-3.5
Low	1,645.4	1,144.8	-500.6	-30.4	1,133.7	-511.7	-31.1
Nil	3,731.4	4,285.30	553.9	14.8	4,265.50	534.1	14.3
Effective Habitat[1]	**269.7**	**216.3**	**-53.4**	**-19.8**	**247.2**	**-22.5**	**-8.3**

[1] Effective Habitat = High plus Moderate habitat suitability classes.

Reclamation of disturbed areas will occur progressively through the life of the Project. One of the reclamation goals is to restore wildlife habitat to pre-disturbance baseline conditions. The loss of western toad habitat will therefore be temporary, as efforts to reclaim amphibian habitat at abandoned coal mines is frequently successful (Brown *et al.*, 2012). Sedimentation ponds and ditches can often be reclaimed into effective amphibian habitat following provided that they are treated for any water quality issues such as low pH or high concentrations of heavy metals (Lacki *et al.*, 1992; Carrozzino, 2009). Additionally, ponds and wetlands suitable for amphibians can be reconstructed in areas where they did not previously exist, and amphibians frequently recolonize created or restored wetlands (Brown *et al.*, 2012). Amphibian salvage has also been successfully implemented for other coal mines and industrial projects (Hab-Tech Environmental, 2012), wherein amphibians are captured and relocated to other suitable breeding ponds in the area prior to disturbance activities.

Amphibians such as western toads may be affected by sensory disturbance associated with Project development. Sources of sensory disturbance include increases in noise, vibration, and artificial night lighting in land surrounding the Project area. The effects of artificial lights and noise on the behaviour and physiology of western toads have not been investigated; however, other toad species alter their distribution and foraging behaviour in response to anthropogenic sources of light and noise (Baker, 1990). As such, the effective quality of breeding and summer foraging habitats may be reduced by Project noise and artificial lighting.

With mitigation (Section 7.0), the effects of Project development on western toad breeding habitat availability in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to western toad habitat availability is predicted to be negative, the confidence rating for this prediction is moderate, and the probability of occurrence is high.

5.3.2.2 Change in Movement

As with Columbia spotted frogs, long-distance western toad movements are likely to occur along streams. Western toads will also travel through upland habitats, although they will avoid crossing large expanses of barren, rocky habitat. Therefore, the active coal mine and waste rock piles will present a major barrier to movement for western toads. By Year 14, western toads will still be able to move along streams located along the west and east of the WLSA (Figure 5.3-3). Increased traffic along the access road may also kill some dispersing toads and therefore act as a barrier to movement. However, since western toads often move at night when traffic levels are low, road-related mortality at this time may be lower.

With mitigation (Section 7.0), the effects of Project development on western toad movement in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to changes in western toad movement is predicted to be negative, the confidence rating for this prediction is moderate, and the probability is high.

5.3.2.3 Change in Mortality Risk

Increased western toad mortality may result from increased traffic on the access road. The removal of four ponds located within the Project footprint may impact amphibian larvae present in them. Additionally, because western toads spend a significant amount of time in terrestrial habitats, some mortality may occur by equipment used to clear vegetation. However, mortality of western toads and their larvae may be reduced by conducting a pre-disturbance salvage of any adults and larvae and translocating captured individuals to suitable ponds/wetlands in the vicinity of the WLSA.

Increased concentrations of selenium, nitrates, and nitrites in waterways downstream from the mine have the potential to cause mortality or deformities in western toad larvae (Macro *et al.*, 2009; Janz *et al.*, 2010, also see Section 5.3.1.3). Strategies to minimize changes in water quality from the mine have been developed. A water management program has been developed to treat and remove selenium from surface waters (Section C.8 – Geochemistry and Selenium Management).

With mitigation (Section 7.0), the effects of Project development on western toad mortality in the WLSA are predicted to be local in extent, extended in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project's contribution to changes in western toad mortality is predicted to be negative, the confidence rating for this prediction is moderate, and the probability is moderate.

5.3.2.4 Change in Abundance

Because of the loss in breeding habitat and the potential for increased, Project development is expected to result in a decrease in western toad abundance in the WLSA. With mitigation (Section 7.0), effects of Project development on western toad abundance in the WLSA are predicted to be local in extent, residual in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project contribution to changes in western toad abundance is predicted to be neutral, the confidence rating for this prediction is moderate, and the probability is moderate.

5.3.3 Olive-sided Flycatcher

5.3.3.1 Change in Habitat Availability

By Year 14, Project development will result in a loss of 369.4 ha of high-quality and 463.1 ha of moderate-quality olive-sided flycatcher habitat, for a total loss of 832.9 ha (27.8%) of effective habitat relative to baseline conditions (Table 5.3-3; Figure 5.3-5). A net loss in effective habitat availability for the olive-sided flycatcher is predicted to occur in Year 27 (729.1 ha or 24.3%) compared to that available at baseline (Table 5.3-3; Figure 5.3-6).

Table 5.3-3 Change in Olive-sided Flycatcher Habitat Availability Between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change (ha)	Change %	Application (ha)	Change (ha)	Change %
High	1,066.4	696.9	-369.5	-34.6	781.4	-285.0	-26.7
Moderate	1,934.8	1,471.4	-463.4	-24.0	1,490.7	-444.1	-23.0
Low	1,386.3	1,084.7	-301.6	-21.8	2,230.3	844.0	60.9
Nil	1,258.8	2,393.5	1,134.7	90.1	1,144.1	-114.7	-9.1
Effective Habitat[1]	**3,001.2**	**2,168.3**	**-832.9**	**-27.8**	**2,272.1**	**-729.1**	**-24.3**

[1] Effective Habitat = High plus Moderate habitat suitability classes.

Habitat will be progressively reclaimed throughout the lifespan of the Project, making the loss of olive-sided flycatcher habitat temporary but long-term. Olive-sided flycatchers frequently use young forests; however, they prefer mature coniferous and mixedwood forests in previously-burned or partially cut areas, which can contain residual tree snags they use to forage and sing from

(Environment Canada, 2015a). Several decades will be required before reclaimed areas become suitable as breeding habitat for olive-sided flycatchers.

The federal recovery strategy for olive-sided flycatcher (Environment Canada, 2015a) acknowledges habitat loss and degradation as key threats to the species, but does not specify sensory disturbances as contributing factors. The effects of sensory disturbance on olive-sided flycatchers have not been investigated; however, other studies have demonstrated that songbirds may either avoid noisy habitats or experience reduced reproductive success in them (Habib *et al.*, 2007; Bayne *et al.*, 2008) (Section 5.5.1). Artificial lighting can also alter songbird behaviour (Kempenaers *et al.*, 2010), although its effects on survival and reproductive rates are not known.

Olive-sided flycatchers are likely to persist in the WLSA during the lifespan of the Project, although this effect prediction will be verified with the development and implementation of a Beneficial Management Plan for migratory birds and a wildlife monitoring program in consultation with provincial and federal regulators (Sections 7.1 and 7.2). Reclaimed habitats will eventually mature to the point where they will provide effective breeding habitat for olive-sided flycatchers, although this may take several decades.

With mitigation (Section 7.0), the effects of Project development on olive-sided flycatcher habitat availability in the WLSA are predicted to be local in extent, extended in duration, continuous in frequency, reversible in the long term, moderate in magnitude, and not significant. The Project contribution to olive-sided flycatcher habitat availability is predicted to be negative, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.3.2 Change in Movement

Project development will not likely result in large changes to the movement of olive-sided flycatchers in the WLSA once suitable flycatcher habitat within the Project footprint is cleared. Birds are likely to be reluctant to cross the active mine area while breeding since the average size of olive-sided flycatcher territories is only 10-45 ha (Environment Canada, 2015). However, flycatcher movements in territories established adjacent to the Project footprint may be affected to some extent.

With mitigation (Section 7.0), the effects of Project development on olive-sided flycatcher movements in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to olive-sided flycatcher habitat availability is predicted to be negative, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.3.3 Change in Mortality Risk

The primary source of potential olive-sided flycatcher mortality will be associated with the destruction of nests from vegetation clearing. However, this can be avoided or minimized by timing vegetation site clearing activities to occur outside the active breeding period from April 15 to August 25 to avoid disrupting nesting migratory and resident songbirds and raptors, in accordance with Canada's *Migratory Birds Convention Act* (Regulation 12:1) and SARA. Avoidance guidelines developed by Environment Canada (2015) will be followed to reduce the risk of disrupting or destroying migratory birds, nests, and eggs. In the event that vegetation clearing must occur within the restricted activity period, pre-disturbance nesting surveys will be conducted by experienced avian biologists according to established sensitive species inventory guidelines (GoA, 2013b). Any active nest sites encountered will be buffered with the recommended setback distances based on specific species requirements (GoA, 2013a; Environment Canada, 2015). Environment Canada (2013) encourages the voluntary development and implementation of a non-regulated Beneficial Management Practices guide to minimize Project-specific effects on migratory birds while allowing the development to remain economically feasible and practical. Benga will develop a Beneficial Management Practices guide that describes the best ways to reduce Project effects on migratory birds (including olive-sided flycatcher), and that provides a measure of environmental performance over the life of the Project (Section 7.0). Such a plan will assist Benga with regulatory compliance.

Other sources of olive-sided flycatcher mortality associated with Project development include vehicle collisions on the access road and bird collisions with Project infrastructure, such as buildings and transmission lines. Vehicle collisions with wildlife can be reduced by establishing and enforcing a low speed limit on the access road. Bird collisions with buildings can be reduced by placing visual markers on windows, and collisions with the proposed power line can be reduced by placing large 'floats' or other markers on it (APLIC, 2012). Mortality of birds will be monitored around Project facilities and mitigations will be corrected if required.

With mitigation (Section 7.0), the effects of Project development on olive-sided flycatcher mortality in the WLSA are predicted to be local in extent, long in duration, isolated in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to olive-sided flycatcher mortality is predicted to be neutral, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.3.4 Change in Abundance

Mortality is not expected to have a significant effect on the abundance of olive-sided flycatchers; however, habitat loss will affect the relative abundance of olive-sided flycatchers by displacing individuals to other suitable habitats in the WLSA. With mitigation, the effects of Project development on olive-sided flycatcher abundance in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project contribution to olive-sided flycatcher habitat availability is predicted to be negative, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.3.5 Effects of the Project on the Federal Recovery Strategy

The 2016 final recovery strategy for olive-sided flycatcher (Environment Canada, 2016a) indicates that there is currently little understanding of what comprises critical habitat for the species in Canada. Additionally, there is a lack of presence and abundance data for most of the species' range in Canada. Thus, little is currently known about the relative importance of suitable habitat types and portions of the species' range, or relationships between anthropogenic disturbance and habitat quality and use. No action plan has yet been developed for this species; however, planning to eliminate or reduce knowledge gaps about the species, including habitat use and local population trends, is a priority of the recovery strategy.

The objectives of the recovery strategy include reducing the decline of the species across its Canadian range (abundance and distribution), halting the national decline of the species by 2025, and subsequently ensuring a 10-year increase in abundance across the country. A loss of suitable breeding habitat and reduced population density resulting from potential Project effects in the WLSA may affect local olive-sided flycatcher populations, which is an issue identified in the initial 10-year plan.

Working in consultation with the olive-side flycatcher recovery team to monitor olive-sided flycatcher presence, abundance, habitat use, fidelity to breeding sites, and factors affecting survival and reproductive output within the WLSA would provide valuable information required for the conservation of this species in both the short-term and long-term and at the local and regional scales. A monitoring program such as this, which includes a Beneficial Management Practices guide, would assist with adaptive management, improving breeding and foraging habitats and reducing risks to the species in the WLSA and the broader regional scale.

5.3.4 Great Grey Owl

5.3.4.1 Change in Habitat Availability

Great gray owls using habitats within the Project footprint will be displaced to other areas of the WLSA and surrounding area during the life of the Project because of direct and indirect habitat losses, although they may use residual habitats within the Project footprint to some extent. However, great gray owls are very likely to persist elsewhere in the WLSA over the life of the Project.

By Year 14 of Project development, 1,147 ha (34.6%) of effective habitat in the WLSA for great gray owls will be lost relative to baseline (Table 5.3-4, Figure 5.3-7). Most of this habitat loss is located in the northern portion of the WLSA (Figure 5.3-7). This effect is expected to be temporary because at Year 27, a 12% increase in effective great gray owl habitat is predicted to occur relative to baseline conditions (Table 5.3-4, Figure 5.3-8). Although there may be a temporary decrease in the abundance of great gray owls in the WLSA during the operation of the Project, sufficient habitat will be present in the WLSA at Year 27 to allow for population recovery.

Table 5.3-4 Change in Great Gray Owl Habitat Availability between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
High	26.0	24.6	-1.4	-5.4	26.0	0.03	0.1
Moderate	3,286.7	2,141.4	-1,145.3	-34.8	3690.9	404.2	12.3
Low	1,188.1	1,197.3	9.2	0.8	1016.5	-171.6	-14.4
Nil	1,145.6	2,283.2	1,137.6	99.3	913.1	-232.5	-20.3
Effective Habitat[1]	**3,312.7**	**2,166.0**	**-1,146.7**	**-34.6**	**3,716.9**	**404.2**	**12.2**

[1] Effective Habitat = High plus Moderate habitat suitability classes.

This loss of habitat will be reversible as habitat will be progressively reclaimed throughout the life of the Project. Most of the great gray owl habitat that will be lost up to Year 14 is moderate-quality and comprised of mature forests that may be used for breeding and foraging habitat. Mature forests will take several decades to become established following reclamation. However, reclaimed sites will initially provide foraging habitat for great gray owls using adjacent undisturbed habitats, as they often hunt in open habitats.

Sensory disturbance in the form of increased anthropogenic noise may affect the hunting success of great gray owls, which frequently hunt by sound and rely on acoustic communication to defend territories (Bull and Duncan, 1993).

With mitigation (Section 7.0), the effects of Project development on great gray owl habitat availability in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project contribution to great gray owl habitat availability is predicted to be neutral, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.4.2 Change in Movement

Project development is expected to fragment forested habitat that could be potentially used by great grey owls, as owls are likely to avoid crossing the active mine area during the breeding season. This may cause great gray owls to avoid nesting in potentially suitable habitats adjacent to the Project. Great gray owls may also avoid the access road when traffic levels are high.

With mitigation (Section 7.0), the effects of Project development on great gray owl movement in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to great gray owl movement is predicted to be neutral, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.4.3 Change in Mortality Risk

The primary source of great gray owl mortality associated with Project development may be nest and nestling destruction from vegetation clearing. Great gray owls (as well as great horned owls) often begin nesting earlier than other bird species. In Alberta, great gray owls often begin breeding in March (McGillivray and Semenchuk, 1998; FAN, 2007). However, this mortality can be avoided or minimized by timing vegetation site clearing activities to occur outside the March 1 – July 15period to avoid disrupting nesting raptors in accordance with the Alberta's *Wildlife Act*. Avoidance guidelines developed by the Government of Alberta (GoA, 2013a) will be followed to reduce the risk of disrupting or destroying birds, nests, and eggs. In the event that vegetation clearing must occur within the restricted activity period, pre-disturbance nesting surveys will be conducted by experienced avian biologists according to established sensitive species inventory guidelines (GoA, 2013b). Any active nest sites encountered will be buffered with the recommended setback distances based on specific species requirements (GoA, 2013a).

Other sources of great gray owl mortality associated with Project development may include vehicle collisions on the access road and bird collisions with Project infrastructure, such as buildings and transmission lines. Vehicle collisions can be reduced by establishing and enforcing a low speed limit on the access road. Bird collisions with buildings can be reduced by placing visual markers on windows, and collisions with the proposed power line can be reduced by placing large 'floats' or other markers on it (APLIC, 2012). Mortality of birds will be monitored around Project facilities and mitigations will be corrected if required.

With mitigation (Section 7.0), the effects of Project development on great gray owl mortality in the WLSA are predicted to be local in extent, long in duration, occasional in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to great grey owl mortality is predicted to be neutral, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.3.4.4 Change in Abundance

Based on the results of the wildlife surveys conducted in 2014 and 2015, great gray owls appear to be relatively uncommon in the WLSA. However, densities of great gray owls in an area can fluctuate depending on vole density. With Project development, the relative abundance of great gray owls in the WLSA will likely remain low since any owls affected by Project development will be displaced to suitable habitat located adjacent to the Project footprint.

With mitigation (Section 7.0), Project effects on great gray owl abundance in the WLS Aare expected to be local, long-term in duration, continuous, reversible in the short term, low in magnitude, and not significant. Project contribution will be negative, the confidence rating for this prediction is moderate, and the probability of occurrence is moderate.

5.3.5 Little Brown Myotis

5.3.5.1 Change in Habitat Availability

Approximately 325.8 ha (30%) of effective little brown myotis roosting habitat will be lost by Year 14 of Project development (Table 5.3-5, Figure 5.3-9). In addition, because bats frequently roost in abandoned buildings, disturbance and/or removal of any old or abandoned buildings within the Project footprint may result in colony loss and additional roosting habitat loss. To address this potential concern, Benga will confirm the presence/absence of bats in such high quality habitats located within the Project footprint at least one year prior to the initiation of any clearing activities. In the event that any maternal colonies and/or roosting sites are identified, Benga will develop a mitigation plan in consultation with AEP and EC personnel.

By Year 27, effective habitat availability for the little brown myotis is expected to be greater than at Year 14, but still 238.1 ha (20.4%) lower than at baseline (Table 5.3-5, Figure 5.3-10). Since disturbed habitats will be progressively reclaimed throughout the life of the Project, the effects of bat roosting habitat availability will be temporary and reversible. Although old or mature trees are most likely to provide suitable roosting cavities for bats in habitats adjacent to the Project footprint, Benga will assess the potential for creating roosting sites for bats by constructing and erecting bat houses in habitats adjacent to the Project footprint and in reclaimed areas.

Table 5.3-5 Change in Little Brown Myotis Habitat Availability Between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
High	37.8	32.5	-5.3	-14.0	38.4	0.6	1.5
Moderate	1,128.7	808.2	-320.5	-28.4	890.0	-238.7	-21.1
Low	2,638.7	1,801.1	-837.6	-31.7	1,883.7	-754.9	-28.6
Nil	1,841.3	3,004.6	1,163.3	63.2	2,834.3	993.1	53.9
Effective Habitat[1]	**1,166.5**	**840.7**	**-325.8**	**-27.9**	**928.4**	**-238.1**	**-20.4**

[1] Effective Habitat = High plus Moderate habitat suitability classes.

Sensory disturbances in the form of increased noise or the presence of artificial lighting may affect foraging behaviour of little brown myotis in the WLSA. Anthropogenic noise can reduce the foraging efficiency of bat species that rely on sound to hunt (Siemers and Schaub, 2010). Bats may also change their behaviour in response to artificial light, such that they may benefit from the increased density of flying insect prey attracted to artificial lighting (Stone, 2015). Overall, the presence of artificial lights combined with anthropogenic noise may delay emergence in nocturnal species (Stone, 2015), which may result in reduced foraging time.

With mitigation (Section 7.0), the effects of the Project on little brown myotis roosting habitat availability in the WLSA are expected to be local in extent, extended in duration, continuous in frequency, reversible in the long term, moderate in magnitude, and not significant. The Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is high.

5.3.5.2 Change in Movement

Commuting or foraging little brown myotis are unlikely to cross the active mine area and will likely travel around it. The access road is not expected to represent a major barrier to the movements of little brown myotis, as they are active at night when traffic levels on the road are lower (Hatch Mott MacDonald, 2015). Noise and sensory disturbance will likely present the greatest barrier to movement. Noise from the active mine site will be mitigated through the use of mufflers on all internal combustion engines, installing berms around the southern dump to absorb noise, utilizing mine pit topography to shield noise generated from haul trucks, and conducting blasting during daylight hours (refer to CR #2 - Noise Impact Assessment).

With mitigation (Section 7.0), the effects of the Project on little brown myotis movements in the WLSA are expected to be local in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The Project contributions are expected to be neutral, the confidence rating of these predictions is high, and the probability of occurrence is moderate.

5.3.5.3 Change in Mortality Risk

Potential collisions of bats with Project-related infrastructure are expected to be minimal, particularly if the use of artificial lighting is minimized to the extent possible. Significant increases in mortality from vehicle collisions are also unlikely to occur as little brown myotis are generally active when traffic levels are low (Hatch Mott MacDonald, 2015). The potential for increased wildlife mortality on the access road will be mitigated through enforcing a low speed limit and employee education. Additionally, approximately 80% of employees will be bussed to the mine site, which will reduce the overall level of traffic on the access road (Hatch Mott MacDonald, 2015).

Disturbing or destroying a bat hibernaculum could potentially result in the mortality of hundreds or thousands of bats. However, while there are no known bat hibernacula in the WLSA or the WRSA, the Crowsnest Pass area does contain caves. If a cave containing hibernating bats is encountered during the pre-disturbance roost site survey, Benga will contact AEP and EC personnel immediately to discuss potential mitigation measures.

With mitigation (Section 7.0), the effects of the Project on little brown myotis mortality risk in the WLSA are expected to be local in extent, long term in duration, occasional in frequency, reversible in the short term, low in magnitude, and not significant. Project contributions are expected to be neutral, the confidence rating of these predictions is high, and the probability of occurrence is low.

5.3.5.4 Change in Abundance

Little brown myotis abundance in the WLSA may decline during the lifespan of the Project because of habitat loss. With mitigation (Section 7.0), Project effects are predicted to be local in extent, long term in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is moderate.

5.3.6 American Marten

5.3.6.1 Change in Habitat Availability

By Year 14 of Project development, effective habitat for American marten will be reduced by 927.5 ha (24.8%), most of which is moderate-high quality habitat (542.9 ha) (Table 5.3-6, Figure 5.3-11). Habitat quality rated as "nil" at this time will have increased by 1,095.5 ha (92.0%) because of the presence of the Project footprint (Table 5.3-6).

By Year 27, effective habitat loss, relative to the Baseline Case, is still projected to be 25% (Table 5.3-6, Figure 5.3-12). However, a trend in increasing habitat quality can be noted with the significant decrease in habitat with a nil rating. This loss of habitat will be temporary but long term. Reclamation of disturbed areas will occur throughout and after the life of the Project; however, American martens prefer mature to old-growth coniferous forests, which will take many decades to become re-established.

American martens will avoid habitat near areas with high levels of human disturbance, such as busy roads (Robitaille and Aubry, 2000). Thus, martens may avoid the habitat adjacent to the Project footprint during construction and during mining operations (*e.g.* haul trucks, blasting). However, noise levels will generally be lower at night (CR #2 - Noise Impact Assessment) when martens are most active, which may somewhat offset the effects of noise. Additionally, noise from the active mine site will be mitigated through the use of mufflers on all internal combustion engines, installing berms around the southern dump to absorb noise, utilizing mine pit topography to shield noise generated from haul trucks, and conducting blasting during daylight hours (CR #2 - Noise Impact Assessment).

Table 5.3-6 Change in American Marten Habitat Availability Between the Baseline and Application Cases in the WLSA

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application (ha)	Change		Application (ha)	Change	
			ha	%		ha	%
High	511.4	383.9	-127.5	-24.9	376.2	-135.2	-26.4
Moderate-High	1,658.8	1,115.9	-542.9	-32.7	1,143.0	-515.8	-31.1
Moderate	1,570.1	1,313.0	-257.1	-16.4	1,296.0	-274.1	-17.5
Moderate-Low	349.8	232.9	-116.9	-33.4	218.8	-131.0	-37.4
Low	365.2	314.2	-51.0	-14.0	1,514.7	1,149.5	314.8
Nil	1,191.1	2,286.6	1,095.5	92.0	1,097.7	-93.4	-7.8
Effective Habitat[1]	**3,740.3**	**2,812.8**	**-927.5**	**-24.8**	**2,815.2**	**-925.1**	**-24.7**

[1] Effective Habitat = High plus Moderate habitat suitability classes.

With mitigation (Section 7.0), Project effects on American marten habitat availability in the WLSA are expected to be local in extent, extended in duration, continuous in frequency, reversible in the long term, moderate in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is high.

5.3.6.2 Change in Movement

East-west movements of American marten will likely be affected by the Project footprint since they tend to avoid open landscapes. The access road and coal conveyor will also likely affect marten movements, although they still may move east or west when traffic volumes are lower (*e.g.* nighttime and weekends). North-south marten movements along Blairmore Creek and Gold Creek should be relatively unaffected by Project development. Enforcing lower traffic speeds (*i.e.* ≤50 km/hr) should allow marten and other mustelids to safely cross roads.

With mitigation (Section 7.0), Project effects on American marten movement in the WRSA are expected to be local in extent, extended in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is high.

5.3.6.3 Change in Mortality Risk

Potential sources of increased mortality for American martens associated with Project development include construction-related mortality, mortality resulting from vehicle collisions, and increased trapping related to improved access. Construction-related mortality is expected to be the primary mortality risk mechanism for marten. While marten are mobile and will likely be able to avoid construction areas, some animals may climb trees to avoid vegetation clearing making them difficult to see. These mortality risk factors can be avoided or minimized by scheduling these activities outside of the natal period (March - July) where possible and clearing areas of larger mammals prior to any vegetation clearing activities.

American martens generally avoid roads, which decreases their susceptibility to being hit by cars. Even so, they are occasionally hit by vehicles (*e.g.* Belant, 2007). The potential for increased wildlife mortality on the access road will be mitigated through enforcing a low speed limit, use of signage to indicate the presence of crossing wildlife, and increasing Project personnel and contractor wildlife awareness. Approximately 80% of the Project personnel will be bussed to the mine site, which will reduce the overall traffic volumes on the access road (Hatch Mott MacDonald, 2015).

Increases in hunting, poaching, and trapping frequently occur when development increases the number of access roads into a previously inaccessible wilderness area. However, this is unlikely to occur as no new access roads are being constructed and the WLSA already has an extensive system of existing trails from previous coal mining, forestry, and recreational activities.

With mitigation (Section 7.0), Project effects on American marten mortality in the WLSA are expected to be local in extent, long-term in duration, occasional in frequency, reversible in the short term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is low.

5.3.6.4 Change in Abundance

Predicted levels of effective marten habitat at Year 27 were still expected to be approximately 25% less than at baseline, and therefore marten abundance in the WLSA is expected to be lower because of displacement to adjacent habitats. However, as reclaimed sites mature, marten abundance is expected to increase to levels similar to baseline over time.

Although re-establishment of mature to old-growth forests will occur over a long time, individuals within the Project footprint will be displaced to suitable habitat located elsewhere in the WLSA which should minimize Project effects on the relative abundance of marten. With mitigation, Project effects on the abundance of American marten in the WLSA are predicted to be local in extent, extended in duration, continuous in frequency, reversible in the long-term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate.

5.3.7 Canada Lynx

5.3.7.1 Change in Habitat Availability

By Year 14 of Project development, 772.8 ha (30.1%) of effective lynx habitat will be lost, most of which is moderate-high-quality habitat (535.5 ha) (Table 5.3-7, Figure 5.3-13). Similarly, there will still be 1,771.6 ha (31.1%) less effective lynx habitat at Year 27 compared to baseline (Table 5.3-7, Figure 5.3-14). The loss of effective habitat, along with sensory disturbances associated with the Project (particularly the active mine site), will likely displace lynx to other more suitable undisturbed habitats located west, north and east of the WLSA.

At the WRSA scale, a slight decline of 2.7% and 2.8% of effective lynx habitat is predicted to be lost by Year 14 and Year 27, respectively, with Project development (Table 5.3-8, Figures 5.3-15 and 5.3-16), which is well below the 20% threshold set for regional habitat loss.

Table 5.3-7 Changes in Canada Lynx Habitat Availability between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application Case (ha)	Change from Baseline		Application Case (ha)	Change from Baseline	
			ha	%		ha	%
High	88.2	51.0	-37.2	-42.2	48.2	-40.0	-45.4
Moderate-high	1,640.3	1,086.8	-553.5	-33.7	1,102.5	-537.8	-32.8

Table 5.3-7 Changes in Canada Lynx Habitat Availability between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application Case (ha)	Change from Baseline		Application Case (ha)	Change from Baseline	
			ha	%		ha	%
Moderate	841.1	659.0	-182.1	-21.7	620.9	-220.2	-26.2
Moderate-low	857.0	677.2	-179.8	-21.0	665.3	-191.7	-22.4
Low	678.5	566.3	-112.2	-16.5	591.8	-86.7	-12.8
Nil	1,541.4	2,606.1	1,064.7	69.1	2,617.7	1,076.3	69.8
Effective Habitat[1]	**2,569.6**	**1,796.8**	**-772.8**	**-30.1**	**1,771.6**	**-798.0**	**-31.1**

[1] Effective Habitat = High plus Moderate-High plus Moderate habitat suitability classes

Table 5.3-8 Changes in Canada Lynx Habitat Availability between the Baseline and Application Cases in the Wildlife Regional Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application Case (ha)	Change from Baseline		Application Case (ha)	Change from Baseline	
			ha	%		ha	%
High	19,827.9	19,250.0	-577.9	-2.9	19,268.5	-559.4	-2.8
Moderate-high	10,115.6	9,876.1	-239.5	-2.4	9,852.1	-263.5	-2.6
Moderate	1,087.3	1,061.6	-25.7	-2.4	1,046.6	-40.7	-3.7
Moderate-low	13,703.1	13,484.6	-218.5	-1.6	13,472.7	-230.4	-1.7
Low	5,511.1	5,480.3	-30.8	-0.6	5,447.5	-63.6	-1.2
Nil	23,301.9	24,394.3	1,092.4	4.7	24,459.7	1,157.8	5.0
Effective Habitat[1]	**31,030.8**	**30,187.8**	**-843.0**	**-2.7**	**30,167.1**	**-863.7**	**-2.8**

[1] Effective Habitat = High plus Moderate-High plus Moderate habitat suitability classes

Reclamation of disturbed areas will occur progressively throughout the life of the Project (see Application (Section F – Conservation and Reclamation Plan). Reclaimed areas will initially resemble open meadows and regenerating cutblocks. Some reclaimed areas will remain as open meadow grasslands while other areas will progress through various woody seral stages. Shrubby areas have some value to Canada lynx, as they can provide habitat for snowshoe hares, their preferred prey. Canada lynx also often use conifer-dominated stands of saplings to hunt snowshoe hare (Vashon *et al.*, 2008), so lynx are expected to begin to use reclaimed habitats relatively quickly, particularly once any sensory disturbances associated with Project operations cease.

Sensory disturbance throughout much of the WLSA was assumed to have little effect on Canada lynx habitat quality because lynx tend to be tolerant of human activity (McKelvey *et al.*, 2000; Ruediger *et al.*, 2000). However, intense noise from blasting may startle lynx, resulting in avoidance of the Project footprint. Noise from the active mine site will be mitigated through the use of mufflers on all internal combustion engines, installing berms around the southern dump to absorb noise, utilizing mine pit topography to shield noise generated from haul trucks, and conducting blasting during daylight hours (CR #2 – Noise Impact Assessment).

With mitigation (Section 7.0), the effects of the Project on Canada lynx habitat availability in the WLSA are expected to be regional in extent, extended in duration, continuous in frequency, reversible in the long term, moderate in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is high. All Project interactions with effective lynx habitat in the WRSA are expected to be below the 20% threshold used for wildlife VCs at the regional scale and were therefore considered not significant.

5.3.7.2 Change in Movement

The active mine site, waste rock areas and the CHPP are likely to be avoided by Canada lynx and will therefore affect lynx movements in the WLSA. Lynx are likely to be displaced to more suitable undisturbed habitats located west, north, and east, where human activity is less. Wildlife camera data collected in the WLSA and results from other studies indicate that lynx avoid the area within approximately 5 km of Highway 3 (Apps *et al.*, 2007). Because Canada lynx rarely use the area around the access road, it is not expected to have significant effects on lynx movement. Wildlife crossing structures associated with the coal conveyor may facilitate the movement of any lynx that may start to use the area. Any local lynx connectivity that is affected by Project development will likely improve with progressive reclamation and as reclaimed habitats mature.

With mitigation (Section 7.0), Project effects on lynx movements in the WLSA are expected to be regional in extent, long in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate. Lynx movements at the WRSA scale are not expected to be affected with Project development.

5.3.7.3 Change in Mortality Risk

Increased traffic on the mine access road (particularly during construction) has the potential to increase wildlife mortalities through collisions with vehicles. The potential for increased wildlife mortality on the access road will be mitigated through enforcing a low speed limit, use of signage to indicate the presence of crossing wildlife, and increasing Project personnel and contractor wildlife awareness. Approximately 80% of the Project personnel will be bussed to the mine site, which will reduce the overall traffic volumes on the access road (Hatch Mott MacDonald, 2015). Based on the wildlife camera trapping program conducted to date, lynx appear to be uncommon in the southern portion of the WLSA which will further decrease the potential for any vehicle-related lynx mortality.

Industrial development often results in increased trapping, hunting, and poaching because it can provide easier access to previously undisturbed areas. This is unlikely to result from the Project development since no new access roads will be constructed and firearm use by Project personnel and contractors will be strictly prohibited within the Mine Permit Boundary.

With mitigation (Section 7.0), the effects of the Project on Canada lynx mortality risk in the WLSA are expected to be local in extent, long in duration, occasional in frequency, reversible in the short term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is low. At the WRSA scale, Project-related mortality risk to lynx is predicted to be not significant.

5.3.7.4 Change in Abundance

Predicted levels of effective lynx habitat at Year 27 were still expected to be approximately 31% less than under baseline conditions, and therefore lynx abundance in the WLSA is expected to be lower because of displacement to adjacent habitats. As reclaimed sites mature, lynx abundance is expected to increase to levels similar to baseline over time.

With mitigation (Section 7.0), the effects of the Project on Canada lynx abundance in the WLSA are expected to be local in extent, extended in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is low. Project development is not expected to affect lynx abundance in the WRSA.

5.3.8 Grizzly Bear

5.3.8.1 Change in Habitat Availability and Habitat State

Average grizzly bear RSF values are forecast to increase from a mean of 6.16 at baseline to 6.34 at Year 14 (+2.9%) and 6.74 at Year 27 (+9.4%) in the WLSA (Table 5.3-9, Figures 5.3-17 – 5.3-22), indicating that average grizzly bear probability of resource use in the area is expected to increase slightly as a result of the Project and its proposed reclamation plan. The greatest increase in RSF values (and probability of resource use) between baseline and Year 27 in the WLSA will be during the summer season (Table 5.3-9, Figure 5.3-20).

Table 5.3-9 Change in Grizzly Bear Average Seasonal Resource Selection Function Values between the Baseline and Application Cases in the Wildlife Local Study Area

Season	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline (Area)		Application Case	Change from Baseline (Area)	
			ha	%		ha	%
Spring	6.50	6.63	0.1	2.0	7.14	0.6	9.8
Summer	6.04	6.27	0.2	3.8	6.99	1.0	15.7
Fall	5.93	6.11	0.2	3.0	6.10	0.2	2.9
Average RSF Value	6.16	6.34	0.2	2.9	6.74	0.6	9.4

[1] RSF is measured on a scale of 1 (lowest) to 10 (highest), with values proportional to the probability of resource use.

The total area of source habitat (low mortality risk) in the WLSA is expected to decline by 648.9 ha (40.1%) from baseline to Year 14, and total area of sink habitat (high mortality risk) is also expected to decline from baseline to Year 14 by 395.5 ha (30.1%) (Table 5.3-10, Figure 5.3-23). The lost source and sink habitats will be replaced by non-critical habitat). That is, moderate- and high-quality habitats previously attractive to grizzly bears, with low or high mortality risk, will become low-quality habitats that are not attractive to grizzlies. The Project footprint will have the greatest impact on secondary source (563.4 ha) and secondary sink (273.4 ha) habitats, which are moderate-quality habitats. Only 85.5 ha (10.4 %) of the primary source (high-quality) habitats at baseline will be lost at Year 14 as a result of the Project.

At Year 27, the non-critical habitat resulting from mine operations at Year 14 is predicted to be predominantly replaced by primary source (high-quality, low mortality risk) habitat through the reclamation program (Table 5.3-10, Figure 5.3-24). Primary source habitat is predicted to increase by 767.4 ha (92.9%) over baseline conditions. The Project will result in a negligible increase in primary sink (high-quality, high mortality risk) habitat of 12.6 ha (0.9%) from baseline to Year 27. Overall, attractive habitat with low mortality risk (source habitat) is predicted to increase by 215.3 ha (63.8%) and attractive habitat with high mortality risk (sink habitat) is predicted to decline by 293.9 ha (22.7%) between baseline and Year 27. This is anticipated to be beneficial to the reproduction and survival of grizzly bears occurring in the WLSA.

Table 5.3-10 Change in Grizzly Bear Habitat State between the Baseline and Application Cases in the Wildlife Local Study Area

Season	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline (Area)		Application Case	Change from Baseline (Area)	
			ha	%		ha	%
Primary Sink	1,348.6	1,226.6	-122.0	-9.1	1,361.2	12.6	0.9
Secondary Sink	1,297.1	1,023.7	-273.4	-21.1	990.5	-306.6	-23.6
Non-critical Habitat	279.8	1,324.2	1,044.4	373.3	358.4	78.6	28.1
Secondary Source	1,895.0	1,331.6	-563.4	-29.7	1,342.9	-552.1	-29.1
Primary Source	826.0	740.5	-85.5	-10.4	1,593.4	767.4	92.9

At the GBRSA scale, the Project is not expected to result in significant changes to the average RSF values across the three seasons or habitat states (Tables 5.3-11 and 5.3-12, Figures 5.3-25 to 5.3-32).

Table 5.3-11 Change in Grizzly Bear Average Seasonal Resource Selection Function Values between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Season	Baseline[1]	Year 14			Year 27		
		Application Case (RSF)[1]	Change from Baseline		Application Case (RSF)[1]	Change from Baseline	
			ha	%		ha	%
Spring	5.72	5.72	0.006	0.10	5.74	0.025	0.43
Summer	5.09	5.10	0.013	0.26	5.13	0.040	0.79
Fall	5.19	5.19	0.007	0.14	5.19	0.007	0.13
Average RSF Value	**5.33**	**5.34**	**0.009**	**0.16**	**5.36**	**0.024**	**0.45**

[1] RSF is measured on a scale of 1 (lowest) to 10 (highest), with values proportional to the probability of resource use.

The changes to habitat states in the GBRSA are projected to be well below the 20% threshold established for assessing significance of impacts to grizzly bears. The Project will result in a loss of 665.2 ha (0.9%) of source habitat in the GBRSA at Year 14 (Table 5.3-12, Figure 5.3-31), with a net gain of 197.5 ha (0.3%) of source habitat in Year 27 (Table 5.3-12, Figure 5.3-32). Likewise, sink habitat will be reduced by 383.3 ha (0.5%) in Year 14 and reduced by 268.4 ha (0.4%) in Year 27 in the GBRSA. Overall, this is expected to provide a very slight benefit to grizzly bears in the GBRSA.

Table 5.3-12 Changes in Grizzly Bear Habitat States between the Baseline and Application Cases in the Grizzly Bear Regional Study Area

Habitat State	Baseline (ha)	Year 14			Year 27		
		Application Case (ha)	Change from Baseline		Application Case (ha)	Change from Baseline	
			ha	%		ha	%
Primary Sink	22,883.0	22,779.8	-103.2	-0.5	22,919.0	35.9	0.2
Secondary Sink	18,683.9	18,403.8	-280.1	-1.5	18,379.6	-304.3	-1.6
Non-critical Habitat	33,486.0	34,548.8	1,062.7	3.2	33,557.0	70.9	0.2
Secondary Source	39,908.3	39,328.4	-580.0	-1.5	39,354.1	-554.2	-1.4
Primary Source	35,078.6	34,993.4	-85.2	-0.2	35,830.3	751.7	2.1

Progressive reclamation is the key mitigation measure and will return the Project footprint to conditions similar to a new harvest block or an open landscape resembling grassland (Section F – Conservation and Reclamation Plan). Reclaimed grasslands are typically dominated by non-native vegetation and low plant species richness (Cristescu *et al.,* 2013). Habitat states and RSF values for grizzly bears typically increase in mine reclamation and timber harvest scenarios, because of the increase in forage availability when older, closed-canopy stands or non-critical habitats (*i.e.* barren rock) are replaced by younger regenerating stands and energetic herbaceous plant material (*e.g.* clover, thistle) (FRIGBP, 2012; Cristescu *et al.,* 2012). Grizzly bears have been well-documented in their utilization of reclaimed mine areas in Alberta. Reclaimed mines can provide suitable habitat and forage for grizzly bears, particularly during the summer (Cristescu *et al.,* 2012). For instance, the reclaimed Luscar and Gregg River coal mines (which are comparable to the Project) in west-central Alberta have been found to act as primary source habitats for grizzly bears, with high rates of juvenile recruitment into the population and heavier adult bears compared to adjacent areas (Cristescu *et al.,* 2012). Grizzly bears are often heavier in reclaimed mine areas as a result of increased ungulate consumption (Kansas, 2005; Cristescu *et al.,* 2012). Reclaimed mines have been found to support larger populations of ungulates, such as deer and elk, because of the concentrated high-energy forage provided through mine reclamation (BWT, 2010).

The Luscar and Gregg River coal mines were primarily reclaimed to grassland (clover, alfalfa, milkvetch, dandelion, and graminoids) and forest habitats (Cristescu *et al.,* 2012). Pit walls were terraced and several undisturbed areas (*i.e.* forest islands) were retained during active mining. Hab-Tech Environmental Ltd (2012) states that mine reclamation to grassland and regenerating forest habitat types can be expected to have positive effects on grizzly bear habitat availability within 10 years. Similar reclamation measures will be deployed by Benga Mining, and the RSF and Habitat States modelling results indicate that impacts on grizzly bears from a habitat alteration perspective will be positive following reclamation.

Grizzly bears may use habitats next to low-intensity disturbances, such as low-traffic roads (Chruszcz *et al.*, 2003). However, they generally avoid areas with higher levels of anthropogenic sensory disturbance, such as roads with > 100 vehicles per day (Northrup *et al.*, 2012). They will also avoid trails that are frequently used by humans (Gibeau *et al.*, 2002). As grizzly bears are sensitive to anthropogenic sensory disturbances, they are likely to avoid areas surrounding the active mine area, the access road, and rail-load out facility.

With consideration of mitigation (Section 7.0), primarily effective reclamation, the effects of the Project on grizzly bear habitat availability and habitat states in the WLSA are expected to be regional in extent, extended in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be positive, the confidence rating of these predictions is high, and the probability of occurrence is moderate. In the GBRSA, Project effects on effective grizzly bear habitat (source habitat) are expected to be below the 20% threshold used for wildlife VCs at the regional scale and were therefore considered not significant.

5.3.8.2 Change in Movement

The active mine pits, dumps and haul roads are expected to obstruct and alter grizzly bear movements through direct loss of habitat and sensory disturbance, particularly east-west movements through the Project footprint. Extensive research on grizzly bear use of coal mine lands in Alberta suggests that grizzly bears routinely use habitat in the immediate vicinity of active coal mine operations, particularly remnant forest patches and reclaimed areas (Stenhouse and Graham, 2005; Stevens and Duval, 2005; Kansas and Charlebois, 2008; Cristescu, 2011). Grizzly bear home ranges also overlap with active mine areas and some grizzly bears become habituated to active mine operations over time (Cristescu, 2011). While most movement across mine areas occurs in reclaimed habitats, some observations of grizzly bears crossing active mine disturbances have also been noted at coal mines in west-central Alberta (Hab-Tech Environmental, 2012). During baseline studies for the Project, grizzly bears appeared to move more in a north-south direction along Blairmore Creek west of the proposed Project footprint, a south-north direction along the existing access road in the center of the WLSA, and in a west-east direction along a pipeline right-of-way located north of the proposed mine footprint. The movement corridor along Blairmore Creek will not be affected by Project-related mine operations as Benga has committed to not developing within 100 m of the creek. The access road and the coal conveyor have the potential to act as a barrier to grizzly bear movement. To mitigate this effect, wildlife crossing structures (underpasses and/or overpasses) placed in areas of suitable terrain and/or habitat and spaced at a minimum frequency of 1 crossing/km will be incorporated into the design of the coal conveyor (Section 7.1.4).

Grizzly bears are expected to be displaced from portions of the Project footprint during the active mining period, particularly areas of active construction, blasting and hauling. Lower disturbance areas within the Project footprint such as topsoil storage, access roads, coal conveyor, and reclaimed areas, are expected to be less of a barrier to grizzly bear movements than the active mine site. Following reclamation, grizzly bears are expected to be attracted to and readily move through reclaimed mine areas as has been observed at other mines in Alberta (*e.g.* Luscar, Gregg River and Coal Valley Mine; Cristescu, 2011; Hab-Tech Environmental, 2012).

No known important linkage landscapes or movement corridors exist within the WLSA for grizzly bears (Apps *et al.*, 2007). Grizzly bears are known to move across the Continental Divide within the GBRSA southwest and northwest of the Project footprint. Several other important linkages and movement corridors exist within the GBRSA (Apps *et al.*, 2007) but Project effects on grizzly bear movement are not expected to occur at the regional scale.

Benga will mitigate potential effects of the Project on grizzly bear movement, by (1) maintaining a minimum 100 m undisturbed forested zone around Blairmore Creek and other riparian corridors, (2) leaving patches of residual forest within and adjacent to the mine footprint to the extent possible, and (3) initiate reclamation early on in mine operations by seeding reclaimable areas with preferred forage species and plant shrub and tree species that provide suitable cover (*e.g.* willow, alder, coniferous trees) for grizzly bears.

With mitigation (Section 7.0), Project effects on grizzly bear movements in the WLSA are expected to be regional in extent, long in duration, isolated in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is moderate. Because Project effects on grizzly bear movements are expected to be highly localized and short-term in nature, regional movement corridors in the GBRSA should not be affected.

5.3.8.3 Change in Mortality Risk

Mean human-caused mortality risk remains moderate in the WLSA between Baseline, Year 14, and Year 27. Mortality risk is expected to increase from 5.48 at Baseline to 5.51 at Year 14 (with risk statistically estimated on a scale of 1 to 10) (Table 5.3-13, Figure 5.3-33). The access road and mine infrastructure will likely increase the potential for bear -human encounter. The potential for increased wildlife mortality on the access road will be mitigated through enforcing a low speed limit, use of signage to indicate the presence of crossing wildlife, and increasing Project personnel and contractor wildlife awareness. Approximately 80% of the Project personnel will be bussed to the mine site, which will reduce the overall traffic volumes on the access road (Hatch Mott MacDonald, 2015). The mortality risk for grizzly bears in the WLSA is predicted to decrease to 5.15 at Year 27 following progressive reclamation and mitigation (Table 5.3-13, Figure 5.3-34). With mine closure the likelihood of human-grizzly bear encounters will be reduced. In the GBRSA, grizzly bear mortality risk is not expected to be affected by Project development (Table 5.3-13, Figures 5.3-35 and 5.3-36).

Table 5.3-13 Change in Grizzly Bear Mortality Risk Between the Baseline and Application Cases in the Wildlife Local Study Area and Grizzly Bear Regional Study Area

Study Area	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			Mortality Risk	%		Mortality Risk	%
WLSA	5.48	5.51	0.03	0.5	5.15	-0.33	-6.0
GBRSA	4.61	4.61	0.0	0.0	4.60	-0.01	-0.25

[1] Mortality risk is measured on a scale of 1 (lowest) to 10 (highest), with values proportional to the probability of mortality.

Direct mortality of grizzly bears from the Project is expected to be unlikely. Over the past 40+ years of active mining in west-central Alberta, there have been no recorded mortality incidents involving grizzly bears on mine permit lands (Symbaluk, 2008). Given that hunting (legal and illegal) is the primary cause of grizzly bear mortality in Alberta and British Columbia, the lack of mortalities on mine permit lands is attributed to firearms restrictions, reduced access to mine lands, and a reduction in illegal activity in the vicinity of mine lands resulting from the constant presence of mine operations staff (Hab-Tech Environmental Ltd., 2012). Benga will ensure that hunting and firearms are not allowed on mine permit lands during the construction and operation phases of the mine. According to Symbaluk (2008), grizzly bears are most vulnerable to human-induced mortality resulting from mistaken identity kills, illegal hunting, and self-defence kills immediately following mine closure. Ownership of reclaimed mine lands reverts to the Province of Alberta and private landowners following closure, decommissioning and reclamation of the mine. Benga will work to ensure grizzly bears are adequately protected following mine closure through establishing appropriate land use plans.

Roads and railways are also an important source of grizzly bear mortality (Alberta Grizzly Bear Recovery Team, 2005), however mortalities are more common when vehicles are travelling at high speeds (>90 km/h) (Gunther *et al.,* 1998; Servheen *et al.,* 1998; Clevenger *et al.,* 2002; Kaczensky *et al.,* 2003). The majority of the Project coal haul will occur with the coal conveyor, thereby reducing the need for haul trucks. For the access road, Benga will enforce speed limits below 70 km/h. Over the life of the Project, road densities in the WLSA are estimated to decline from Baseline conditions (0.88 km/km^2) to 0.69 km/km^2 at Year 14 and 0.61 km/km^2 at Year 27. Grizzly bear habitat security can be maintained at road densities less than 0.6 km/km^2 (Salmo and Diversified, 2003; Hamilton and Austin, 2004; Nielsen *et al.,* 2009), while a maximum road density of 0.75 km/km^2 is required to ensure population viability (Boulanger and Stenhouse, 2014). The Project occurs within a core grizzly bear zone within which AEP has specified that open road density is to be kept below 0.6 km/km^2 (AEP, 2016a). Through progressive reclamation and appropriate end-of-mine land use planning, road densities in the WLSA can be maintained at levels approximating 0.6 km/km^2 which should maintain habitat security and population viability (AEP, 2016a). If road densities exceed 0.6 km/km^2 following reclamation, additional decommissioning of roads is recommended by AEP (2016a). Road densities in the GBRSA are not expected to be affected by Project development. The density of roads in the GBRSA was below any of the key established thresholds for road density outlined above at Baseline (0.53 km/km^2). Trains will not be travelling at high speeds in the proposed rail load out, however increased rail traffic in the Highway 3 corridor may result from the Project. According to the Government of Alberta (2013), grizzly bear mortalities related to rail in the Crowsnest Pass region are rare, possibly because grizzly bears tend to avoid the Highway 3 corridor which acts as a physical barrier to their movement (Apps *et al.,* 2007; Proctor *et al.,* 2012). As such, Project-related rail traffic is not expected to increase grizzly bear mortality risk.

Control kills of problem bears is another source of grizzly bear mortality. Problem bears at mines in west-central Alberta have been very rare (Hab-Tech Environmental Ltd., 2012). Bears may be attracted to garbage at the mine, and Benga Mining will ensure that garbage is stored in bear-resistant containers and that all sources of garbage are removed promptly from the mine facilities. All vehicles into the Project area will be routinely cleaned. Non-lethal deterrents, such as bangers and screamers, as well as electric fencing may also be effective in reducing bear-human conflicts around facilities. Benga Mining will also ensure that all staff members are provided with Bear Awareness training prior to entering the Project area. Benga Mining will adhere to Bear Smart best management practices (AESRD, 2011).

The disturbance of dens during hibernation through vegetation clearing and sensory disturbance (*i.e.* blasting) also has the potential to increase grizzly bear mortality risk. Grizzly bears prefer to den on steep slopes with dense coniferous forest and well-drained soil far away from roads and existing disturbances. If a hibernating bear is discovered during Project activities, the activity should be halted and an AEP wildlife biologist should be contacted immediately. Benga will conduct pre-disturbance den searches prior to any construction, vegetation clearing, or other high-disturbance activity (*i.e.* blasting) between October 1 and April 30. Any known grizzly bear dens will have a setback of at least 500 m from high-disturbance activities as per EAP Integrated Standards and Guidelines (GoA, 2013a). AEP wildlife biologists will be contacted immediately if a grizzly bear den is encountered.

With mitigation (Section 7.0), the effects of the Project on grizzly bear mortality risk in the WLSA are expected to be local in extent, residual in duration, occasional in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is moderate. Project effects on grizzly bear mortality risk in the GBRSA are also expected to be not significant.

5.3.8.4 Change in Abundance

Within the WLSA the Government of Alberta manages grizzly bear populations in the Livingstone GBPU. Within the GBRSA the Government of Alberta also manages grizzly bears in the Castle GBPU while the Government of British Columbia manages grizzly bears in the Flathead and South Rockies GBPUs. Demographic data in the Livingstone GBPU, estimated a grizzly bear population of approximately 90 bears in 2006, while Apps *et al.* (2007) reported that 38 individual grizzly bears were present in the Crowsnest Pass region of Alberta. The Castle GBPU had an estimated population of 51 bears in 2007 (AESRD and ACA, 2010). The South Rockies and Flathead GBPUs in British Columbia were deemed to have stable grizzly bear populations (Mowat *et al.*, 2013).

The Project footprint will affect 1,582.4 ha (15.8 km^2) of land over the lifespan of the Project. The loss of 15.8 km^2 represents between 5 and 9% of a typical female grizzly bear home range (179 – 336 km^2) in the central and southern Canadian Rockies. In a worst case scenario, <10% of a resident grizzly bears home range may be lost during the Project operations phase, however progressive reclamation should recover much of this habitat. The disturbance associated with the mine footprint may displace resident grizzly bears temporarily, but the effects are expected to local and short-term.

Increasing habitat states from Baseline to Year 27 indicate that grizzly bear abundance has the potential to increase over this time period because of progressive reclamation and decommissioning of roads. However, fully understanding the effects of mine reclamation and road decommissioning on grizzly bear abundance requires long-term monitoring of grizzly bear population trends and habitat conditions. FRIGBP (2012) recommends that as a management objective, habitat state values within an area of interest be maintained or increased through appropriate habitat restoration. It is expected that Benga will meet this objective through the reclamation program.

Grizzly bears are often attracted to reclaimed mine sites which can provide energetically-rich plant forage and a greater abundance of ungulate prey, particularly elk and deer (Cristescu *et al.*, 2015).

Grizzly bears with a higher proportion of animal protein in their diets are typically heavier, which can have important fitness consequences including increased reproductive success (Kansas 2005, Cristescu *et al.*, 2015). Grizzly bears on reclaimed mine sites are reported to be heavier than in adjacent undisturbed habitats and can function as a source for enhanced cub production (Kansas, 2005). These perceived increases in grizzly bear abundance will only be fully realized through progressive mine reclamation, road decommissioning, and an end-of-mine land use plan that restricts human access (particularly hunters and motorized vehicles).

With mitigation (Section 7.0), Project effects on grizzly bear abundance in the WLSA are expected to be local in extent, extended in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. Project contributions are expected to be positive, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate. Project effects on grizzly bear abundance in the GBRSA are also expected to be not significant.

5.3.9 Moose

5.3.9.1 Change in Habitat Availability

The estimated change in the availability of effective winter habitat for moose is based on direct (vegetation clearing) and indirect (sensory disturbance) habitat losses for the Project. Availability of effective habitat in the WLSA during winter, considered to be the most restrictive period for ungulates, is predicted to decrease by 27% (or 758 ha) at Year 14 and increase by 20% (or 541 ha) at Year 27 (Table 5.3-14, Figures 5.3-37 and 5.3-38) compared to baseline conditions. At Year 14, habitat loss and sensory disturbance may displace moose from the WLSA to other areas of effective habitat in the WRSA, however this effect is expected to be temporary as habitat losses are reversed in the WLSA by Year 27 through mitigation and progressive reclamation. Under predicted Year 14 and Year 27 scenarios, the WLSA is expected to be composed of 36% and 59% effective winter habitat for moose, respectively. In the WRSA, the Project is expected to reduce the amount of effective winter habitat for moose by 1.4% in Year 14 and increase effective winter habitat for moose by 2.3% in Year 27 following reclamation (Table 5.3-15, Figures 5.3-39 and 5.3-40). All Project interactions with effective moose habitat in the WRSA are expected to be below the 20% threshold used for wildlife VCs at the regional scale and were therefore considered not significant.

The distribution of effective core winter habitat in the WLSA is anticipated to change with Project development by fragmenting core moose winter habitat into smaller patches and reducing the size of large contiguous patches, particularly at Year 14. The number of patches of core moose winter habitat will increase by 26% in the WLSA at Year 14, with a 30% increase in the number of 5-20 ha patches (Table 5.3-16, Table 5.3-17, Figure 5.3-41). This amounts to a loss of 771.9 ha (28.2%) of the effective core winter habitat in the WLSA at Year 14. At Year 27, the number of patches is expected to be reduced from baseline conditions by 13% and the area of effective core winter habitat is expected to increase by 588.9 ha (21.5%) in the WLSA as a result of progressive reclamation (Table 5.3-16, Table 5.3-17, Figure 5.3-42). Project effects on the area of effective core winter habitat in the WRSA are expected to be negligible and the number of patches is expected to decline at Years 14 and 27 from Baseline (Tables 5.3-18 and 5.3-19, Figures 5.3-43 and 5.3-44). Although loss of larger habitat patches could lead to greater energy expenditures for foraging, the areal loss of core habitat in the WLSA (Figures 5.3-41 and 5.3-42) is considered relatively small for moose and, in the context of core winter habitat availability in the WRSA, is below the 20% threshold established for wildlife VCs at the regional level (Figures 5.3-43 and 5.3-44).

Table 5.3-14 Change in Moose Winter Habitat Availability between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
High	35.1	34.6	-0.5	-1.4	34.9	-0.3	-0.7
Moderate-high	1,928.2	1,450.0	-478.2	-24.8	2,704.80	776.6	40.3
Moderate	805.7	526.6	-279.0	-34.6	570.7	-235.0	-29.2
Moderate-low	663.7	497.4	-166.3	-25.1	713.0	49.3	7.4
Low	1,464.1	1,298.3	-165.8	-11.3	1,034.2	-429.9	-29.4
Nil	749.7	1,839.5	1,089.8	145.4	588.9	-160.8	-21.4
Effective Habitat[1]	**2,769.0**	**2,011.2**	**-757.7**	**-27.4**	**3,310.40**	**541.4**	**19.6**

[1] Effective Habitat = High plus Moderate-High plus Moderate habitat suitability classes.

Table 5.3-15 Change in Moose Winter Habitat Availability between the Baseline and Application Cases in the Wildlife Regional Study Area

Habitat Suitability Class	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
High	4,228.7	4,140.4	-88.3	-2.1	4,140.6	-88.1	-2.1
Moderate-high	11,779.2	11,689.0	-90.2	-0.8	12,668.8	889.6	7.6
Moderate	18,329.9	18,019.7	-310.2	-1.7	18,309.5	-20.4	-0.1

Table 5.3-15 Change in Moose Winter Habitat Availability between the Baseline and Application Cases in the Wildlife Regional Study Area

Habitat Suitability Class	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
Moderate-low	22,136.9	21,620.6	-516.3	-2.3	21,809.9	-327.0	-1.5
Low	6,877.2	6,964.0	86.8	1.3	6,637.6	-239.6	-3.5
Nil	10,195.1	11,113.3	918.2	9.0	9,980.6	-214.5	-2.1
Effective Habitat[1]	**34,337.8**	**33,849.1**	**-488.8**	**-1.4**	**35,118.9**	**781.1**	**2.3**

[1] Effective Habitat = High plus Moderate-High plus Moderate habitat suitability classes.

Table 5.3-16 Change in the Number of Core Winter Habitat Patches for Moose between the Baseline and the Application Cases in the Wildlife Local Study Area

Patch Size Range (ha)	Baseline (No. Patches)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			No.	%		No.	%
5-20	10	13	3	30.0	8	-2	-20.0
21-40	6	7	1	16.7	6	0	0.0
41-60	1	1	0	0	2	1	100.0
61-80	0	1	1	-	0	0	0
81-100	0	0	0	0	0	0	0
>100	6	7	1	16.7	4	-2	-33.3
Total	**23**	**29**	**6**	**26.1**	**20**	**-3**	**-13.0**

Table 5.3-17 Change in the Area of Core Winter Habitat Patches for Moose between the Baseline and Application Cases in the Wildlife Local Study Area

Patch Size Range (ha)	Baseline (ha)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
5-20	144.2	180.3	36.1	25.0	122.9	-21.3	-14.8
21-40	151.8	195.7	43.9	28.9	185.3	33.5	22.1
41-60	55.5	55.5	0.0	0.1	97.9	42.4	76.5
61-80	0.0	62.1	62.1	-	0.0	-	-
81-100	0.0	0.0	-	-	0.0	-	-
>100	2,386.8	1,472.8	-914.0	-38.3	2,921.1	534.3	22.4
Total	**2,738.3**	**1,966.4**	**-771.9**	**-28.2**	**3,327.2**	**588.9**	**21.5**

Table 5.3-18 Change in the Number of Core Winter Habitat Patches for Moose between Baseline and the Application Cases in the Wildlife Regional Study Area

Patch Size Range (ha)	Baseline (No. Patches)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			No.	%		No.	%
5-20	122	117	-5	-4.1	110	-12	-9.8
21-40	31	29	-2	-6.5	27	-4	-12.9
41-60	13	12	-1	-7.7	12	-1	-7.7
61-80	5	6	1	20.0	6	1	20.0
81-100	8	8	0	0.0	7	-1	-12.5
>100	35	36	1	2.9	34	-1	-2.9
Total	**214**	**208**	**-6**	**-2.8**	**196**	**-18**	**-8.4**

Table 5.3-19 Change in the Area of Core Winter Habitat Patches for Moose between the Baseline and Application Cases in the Wildlife Regional Study Area

Patch Size Range (ha)	Baseline (ha)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
5-20	1,301.0	1,237.6	-63.4	-4.9	1,185.1	-115.9	-8.9
21-40	893.7	815.4	-78.3	-8.8	761.5	-132.2	-14.8
41-60	686.6	629.5	-57.1	-8.3	638.6	-48.0	-7.0
61-80	340.2	427.6	87.4	25.7	427.6	87.4	25.7
81-100	704.3	725.1	20.8	3.0	635.1	-69.2	-9.8
>100	29,688.4	29,288.3	-400.1	-1.3	30,778.5	1,090.1	3.7
Total	**33,614.2**	**33,123.5**	**-490.7**	**-1.5**	**34,426.5**	**812.3**	**2.4**

Reclamation of disturbed areas will occur progressively throughout the life of the Project. Reclaimed areas will initially resemble new cutblocks or open meadows, but will progress through various seral stages which will provide effective habitat for moose. An important component of the reclamation program is reclaiming linear disturbances as quickly as possible to mitigate the adverse effects of habitat fragmentation on moose and other wildlife. Moose are expected to respond positively to progressive reclamation, particularly as shrubs become re-established on disturbed areas.

Moose are attracted to some types of anthropogenic disturbances and avoid others. Moose can benefit from forest harvesting, which revert forest stands to earlier seral stages containing an abundance of preferred browse species. Moose may avoid habitat around developments because of sensory disturbance. For example, moose avoided a heavy oil extraction facility in the Cold Lake area of Alberta by at least 300 m (Westworth, Brusnyk and Associates, 1991) primarily in response to the high density of above-ground pipelines and high levels of human activity. In Quebec, moose avoided busy highways (1,460 – 2,800 vehicles/day) by 500 – 2,000 m, and quiet forest roads by up to 1,000 m (Laurian *et al.*, 2008). In contrast, moose can also habituate to sensory disturbances. For example, Stelfox *et al.* (1995) reported that distance to roads or cutlines appeared to be unimportant to moose in the winter in Alberta. Similarly, Westworth *et al.* (1989) observed concentrations of moose using winter habitats located within 100 m of an active open pit copper mine in north-central British Columbia that had been operating for 17 years. They concluded that moose were responding to the greater availability of browse located near mine than in areas located farther away. In addition, restrictions on hunting in the vicinity of the mine and perhaps the aversion of wolves to areas of concentrated human and industrial activity may have provided a greater degree of security not present in areas further away from the active mine site (Westworth *et al.*, 1989). Sensory disturbances associated with Project development will be minimized using existing topography and Project features (*e.g.* heavy equipment operating in the active pit area) infrastructure to minimize noise-related effects to wildlife where practical. In addition, vegetation adjacent to high-activity linear corridors (*e.g.* access roads, coal conveyor) will be retained to reduce noise and visual sensory disturbances to the extent possible.

With mitigation (Section 7.0), the effects of the Project on moose winter habitat availability in the WLSA are expected to be regional in extent, residual in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The project contributions are expected to be positive with mitigation, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate. All Project interactions with effective moose winter habitat availability in the WRSA are expected to be below the 20% threshold used for wildlife VCs at the regional scale and were therefore considered not significant.

5.3.9.2 Change in Movement

A primary concern with respect to Project development is the potential effect on seasonal movements of moose in and around the WLSA. In boreal forest region of northeastern Alberta, research has shown that moose often undergo seasonal movements of up to 20 km between summer and winter ranges (Hauge and Keith, 1981). However, moose in mountainous regions generally move to lower elevations in winter to avoid deep snow pack (Maier *et al.*, 2005). It is expected that these movements would occur within corridors of suitable habitat, such as the riparian zones along Blairmore Creek and Gold Creek. The valley and riparian zone of the Crowsnest River has been identified as a KWBZ by AEP (2015). KWBZ's typically occur along major river valleys that contain important habitat features (*e.g.* forage, mature and old-growth forests, *etc.*) and function as locally and regionally important movement corridors for moose and other wildlife (AEP, 2015). Because the WLSA and Project footprint are located within 10 km of a KWBZ and several riparian corridors, moose habitat permeability in the WLSA will be altered by the Project footprint.

The ability of moose and other ungulates to access core winter habitat is believed to be just as important as the availability of such habitat. Permeability of the WLSA will be reduced by the Project footprint (Figure 5.3-41), particularly by the active mine site, access road, rail loop, and the coal conveyor. While moose movements in the WLSA will be affected to some extent by the access road and the rail loop which will be at least partially permeable, the active mine site and the coal conveyor is expected to affect moose movements the most. Moose in the vicinity of the active mine site will likely use the riparian zones associated with Blairmore Creek and Gold Creek to move around the Project footprint in a north-south direction although east-west movements along the access road/coal conveyor corridor will be affected. To mitigate this effect, wildlife crossing structures (underpasses and/or overpasses) placed in areas of suitable terrain and/or habitat and spaced at a minimum frequency of 1 crossing/km will be incorporated into the design of the coal conveyor. Successful use of coal conveyor wildlife crossings by moose was documented in a three year ungulate monitoring study conducted for the Obed Coal Mine located in west-central Alberta (Brusnyk and Westworth, 1987). They found that although east-west ungulate movements (moose, deer, and elk) along the south side of the Athabasca River valley were initially disrupted by the access road/coal conveyor corridor, moose had the greatest crossing success rate even though they were the least abundant ungulate species in the area. The crossing success rates for moose over the three year monitoring period, which was initiated one year after construction completion, averaged 70% (Brusnyk and Westworth, 1987).

The permeability of access roads in the WLSA will likely change based on the degree of human use. Access routes that are plowed and maintained in the winter are anticipated to act more as a barrier to ungulate movements than unused or periodically used routes. To mitigate this Project effect, Benga will conduct winter plowing/grading in a manner that does not restrict wildlife from crossing access roads or accessing wildlife crossings.

Moose will also cross roads less frequently at road densities greater than 0.2 km/km^2 in summer and 0.4 km/km^2 in winter (Beyer *et al.*, 2013). Road densities in the WLSA will decline from baseline (0.88 km/km^2) to 0.69 km/km^2 at Year 14 and 0.61 km/km^2 at Year 27 in the WLSA. Road densities in the WRSA are not expected to be affected by Project development. At these road densities, roads are expected to remain semi-permeable to moose movement in both the WLSA and WRSA.

With mitigation (Section 7.0), Project effects on moose movements in the WLSA are expected to be regional in extent, long in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate.

5.3.9.3 Change in Mortality Risk

Mortality due to hunting will be reduced during mine construction and operation as no public access will be permitted on the active mine site. Use of firearms by Benga employees and contractors is prohibited and the facility access roads are not being designed as ‘through routes’ that would encourage poachers to enter the site. Benga will employ an Access Management Plan to control access along Project access roads. Access roads will be reclaimed and are not expected to encourage increased hunting.

Vehicular collisions could result in injury or mortality of ungulates, but can be minimized by controlled traffic speeds, road signage and employee education. However, although the linear feature density (*e.g.* vegetated trails, pipelines, and transmission lines only) was 3.1 km/km^2 in the WLSA at Baseline, this density is expected to be reduced considerably during Project development and following reclamation. Potential effects associated with increased predation as a result of induced access on moose are expected to be lower with Project development. Predators such as bears and coyotes may be attracted to garbage or waste generated for the Project. Benga will mitigate the attraction of wildlife by implementing a Waste Management Plan for the Project.

With mitigation (Section 7.0), Project effects on moose mortality risk in the WLSA are expected to be to be local in extent, long in duration, occasional in frequency, reversible in the long term, low in magnitude, and not significant. The project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is moderate. Moose mortality risk in the WRSA is not expected to be affected by Project development and was considered not significant.

5.3.9.4 Change in Abundance

Because the Project is anticipated to have relatively minor effects on long-term winter habitat availability, movement, or mortality risk in the WRSA, the overall effects on the Project on moose abundance are expected to be low.

With mitigation (Section 7.0), Project effects on moose abundance are expected to be to be local in extent, residual in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The project contributions are expected to be neutral, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate. The Project is not expected to affect moose populations in the WRSA and was considered not significant.

5.3.10 Elk

5.3.10.1 Change in Habitat Availability

The predicted change in the availability of effective winter habitat for elk is based on direct (vegetation clearing) and indirect (sensory disturbance) habitat losses for the Project. Availability of effective winter habitat in the WLSA, considered to be the most energetically restrictive period for ungulates, is predicted to decrease by 36.6% (572.5 ha) at Year 14 but increase by 59.4% (or 928.4 ha) following progressive reclamation activity and mitigation at Year 27 (Table 5.3-20, Figures 5.3-45 and 5.3-46). Similar to moose, elk may be displaced from the WLSA to other areas of effective habitat in the WRSA through Year 14 due to habitat losses and sensory disturbance. However, the loss of effective elk habitat is expected to be temporary since effective habitat availability in the WLSA is predicted to be greater at Year 27 than at baseline. In the WRSA, the Project is expected to reduce the amount of effective habitat for elk by only 1.7% in Year 14 and increase effective habitat for elk by

2.4% in Year 27 following reclamation (Table 5.3-20, Figures 5.3-45 and 5.3-46). All Project interactions with effective elk habitat in the WRSA are expected to be below the 20% threshold for habitat loss used for wildlife VCs at the regional scale.

Table 5.3-20 Change in Elk Winter Habitat Availability between the Baseline and Application Cases in the Wildlife Local Study Area

Habitat Suitability Class	Baseline	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
High	85.9	61.8	-24.1	-28.0	131.3	45.4	52.8
Moderate-high	341.3	168.5	-172.9	-50.6	846.1	504.7	147.9
Moderate	1,136.2	760.7	-375.5	-33.1	1,514.5	378.3	33.3
Moderate-low	1,470.8	1,305.2	-165.6	-11.3	1,204.3	-266.6	-18.1
Low	1,700.2	1,291.5	-408.7	-24.0	1,160.0	-540.2	-31.8
Nil	911.9	2,058.7	1,146.9	125.8	790.3	-121.6	-13.3
Effective Habitat	**1,563.5**	**991.0**	**-572.5**	**-36.6**	**2,491.9**	**928.4**	**59.4**

Table 5.3-21 Change in Elk Winter Habitat Availability between the Baseline and Application Cases in the Wildlife Regional Study Area

Habitat Suitability Class	Baseline (ha)	Year 14			Year 27		
		Application Case (ha)	Change from Baseline		Application Case (ha)	Change from Baseline	
			ha	%		ha	%
High	2,895.6	2,837.7	-57.9	-2.0	2,828.9	-66.7	-2.3
Moderate-high	9,887.0	9,730.0	-157.0	-1.6	9,927.8	40.8	0.4
Moderate	13,881.1	13,649.3	-231.8	-1.7	14,535.0	653.9	4.7
Moderate-low	22,490.6	22,006.3	-484.4	-2.2	22,531.0	40.4	0.2
Low	13,873.1	13,684.7	-188.4	-1.4	13,406.6	-466.5	-3.4
Nil	10,519.6	11,639.1	1,119.5	10.6	10,317.8	-201.8	-1.9
Effective Habitat	**26,663.7**	**26,217.0**	**-446.7**	**-1.7**	**27,291.6**	**627.9**	**2.4**

The distribution of effective core winter habitat for elk in the WLSA is anticipated to change with Project development, particularly at Year 14. Overall, the number of patches of core winter habitat will decrease by 20.6% in the WLSA at Year 14, with a 26% decrease in the number of small 5-20 ha patches and a 60% decrease in the number of large >100 ha patches (Table 5.3-22, Figure 5.3-49). The loss of effective habitat patches in the WLSA amounts to a loss of 550.2 ha of effective core habitat at Year 14. At Year 27, the number of patches is expected to be further reduced by 53% from Baseline conditions, however the area of effective core habitat is expected to increase by 946.0 ha (64.5%) in the WLSA because of progressive reclamation (Tables 5.3-22 and 5.3-23, Figure 5.3-50), thereby reducing the effects of habitat fragmentation. Project effects on number and areal extent of effective core habitat patches in the WRSA are expected to be negligible (< 5%) at Years 14 and 27 from Baseline conditions (Tables 5.3-24 and 5.3-25, Figures 5.3-51 and 5.3-52). Although loss of larger habitat patches could lead to greater energy expenditures for foraging, the loss of core habitat area is considered relatively small for elk and is below the 20% threshold value in the context of habitat availability in the WRSA. The loss of effective core habitat in the WLSA is considered short-term and reversible through progressive reclamation as evidenced by an anticipated increase in effective core habitat at Year 27.

Table 5.3-22 Change in the Number of Core Winter Habitat Patches for Elk between Baseline and the Application Cases in the Wildlife Local Study Area

Patch Size Range (ha)	Baseline (No. Patches)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			No.	%		No.	%
5-20	23	17	-6	-26.1	8	-15	-65.2
21-40	3	5	2	66.7	4	1	33.3
41-60	2	2	0	0	0	-2	-100
61-80	1	1	0	0	1	0	0
81-100	0	0	0	-	0	0	-
>100	5	2	-3	-60.0	3	-2	-40.0
Total	**34**	**27**	**-7**	**-20.6**	**16**	**-18**	**-52.9**

Table 5.3-23 Change in the Area of Core Habitat Patches for Elk between the Baseline and Application Cases in the Wildlife Local Study Area

Patch Size Range (ha)	Baseline (ha)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
5-20	271.6	184.3	-87.3	-32.1	76.1	-195.5	-72.0
21-40	94.3	158.7	64.4	68.3	136.0	41.7	44.3
41-60	101.1	87.3	-13.8	-13.7	0.0	-101.1	-100
61-80	67.0	67.0	0	0	69.8	2.8	4.2
81-100	0.0	0.0	0	-	0.0	0	-
>100	932.0	418.4	-513.6	-55.1	2,130.0	1,198.0	128.5
Total	**1,466.1**	**915.8**	**-550.2**	**-37.5**	**2,412.0**	**946.0**	**64.5**

Table 5.3-24 Change in the Number of Core Winter Habitat Patches for Elk between Baseline and the Application Cases in the Wildlife Regional Study Area

Patch Size Range (ha)	Baseline (No. Patches)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			No.	%		No.	%
5-20	176	173	-3	-1.7	171	-5	-2.8
21-40	51	52	1	2.0	49	-2	-3.9
41-60	22	20	-2	-9.1	19	-3	-13.6
61-80	14	12	-2	-14.3	13	-1	-7.1
81-100	13	12	-1	-7.7	12	-1	-7.7
>100	25	23	-2	-8.0	25	0	0
Total	**301**	**292**	**-9**	**-3.0**	**289**	**-12**	**-4.0**

Table 5.3-25 Change in the Area of Core Habitat Patches for Elk between the Baseline and Application Cases in the Wildlife Local Study Area

Patch Size Range (ha)	Baseline (ha)	Year 14			Year 27		
		Application Case	Change from Baseline		Application Case	Change from Baseline	
			ha	%		ha	%
5-20	1,886.9	1,868.3	-18.6	-1.0	1,842.4	-44.5	-2.4
21-40	1,521.6	1,555.2	33.6	2.2	1,452.3	-69.3	-4.6
41-60	1,072.1	969.4	-102.8	-9.6	928.5	-143.6	-13.4
61-80	1,004.5	859.3	-145.2	-14.5	924.9	-79.6	-7.9
81-100	923.9	1,073.0	149.1	16.1	1,078.6	154.7	16.7
>100	19,287.9	18,917.2	-370.7	-1.9	20,100.2	812.4	4.2
Total	**25,696.9**	**25,242.5**	**-454.4**	**-1.8**	**26,327.0**	**630.1**	**2.5**

Reclamation of disturbed areas will occur progressively throughout the life of the Project. Reclaimed areas will initially resemble open meadows and regenerating cutblocks. Some reclaimed areas will remain as open meadow grasslands while other areas will progress through various woody seral stages. The reclaimed open meadow grasslands in close proximity to treed cover will provide effective habitat for elk. An important component of the reclamation program is reclaiming linear disturbances as quickly as possible to reverse the effects of habitat fragmentation on elk and other wildlife. Elk are expected to respond positively to progressive reclamation, particularly as shrubs become re-established on disturbed areas.

Elk may display a stress response as a result of exposure to visual or auditory disturbances (Creel *et al.*, 2002; Ciuti *et al.*, 2012), and may therefore become startled and temporarily flee in response to particularly loud activities (*e.g.* blasting). In some cases, elk become habituated to roads and other anthropogenic disturbances (Hebblewhite and Merrill, 2009; Robinson *et al.*, 2010; Ciuti *et al.*, 2012). Sensory disturbances associated with Project development will be minimized use existing topography and Project features (*e.g.* heavy equipment operating in the active pit area) infrastructure to minimize noise-related effects to wildlife related to noise where practical. In addition, vegetation adjacent to high-activity linear corridors (*e.g.* access roads, coal conveyor) will be retained to reduce noise and visual sensory disturbances to the extent possible.

With mitigation (Section 7.0), Project effects on elk winter habitat availability in the WLSA are expected to be regional in extent, short in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The project contributions are expected to be positive, the confidence rating of these predictions is high, and the probability of occurrence is high. Project effects on elk winter habitat availability in the WRSA are expected to be below the 20% threshold used for wildlife VCs at the regional scale and were therefore considered not significant.

5.3.10.2 Change in Movement

The ability of elk and other ungulates to access core winter habitat is believed to be just as important as the availability of such habitat. Permeability of the WLSA is expected to be reduced by the Project footprint (Figure 5.3-49), particularly around areas of high human activity such the active mine area, active dumps, CHPP, access roads, coal conveyor, and utility corridors (Rost and Bailey, 1979; Westworth *et al.*, 1989; Ng *et al.*, 2004; Dussault *et al.*, 2006; Dodd *et al.*, 2007; Ciuti *et al.*, 2012). Above-ground conveyors and pipelines act as barriers to movement for elk and other ungulates (*e.g.* Dunne and Quinn, 2009; Greenwood and Dalton, 1984). To mitigate this effect, wildlife crossing structures (underpasses and/or overpasses) placed in areas of suitable terrain and/or habitat and spaced at a minimum frequency of 1 crossing/km will be incorporated into the design of the coal conveyor (Section 7.1.4). Successful use of coal conveyor wildlife crossings by elk was documented in a three year ungulate monitoring study conducted for the Obed Coal Mine located in west-central Alberta (Brusnyk and Westworth, 1987). They found that although east-west ungulate movements (moose, deer, and elk) along the south side of the Athabasca River valley were initially disrupted by the access road/coal conveyor corridor, elk crossing success rates in increased from 0% to 37% over the three year monitoring period (Brusnyk and Westworth, 1987). Based on these results, increasing use of the wildlife crossings by elk suggested that elk were habituating to the presence of the access road/coal conveyor corridor.

The permeability of access roads in the WLSA will likely change based on the degree of human use. Access routes that are plowed and maintained in the winter are anticipated to act more as a barrier to ungulate movements than unused or periodically used routes. To mitigate this Project effect, Benga will conduct winter plowing/grading in a manner that does not restrict wildlife from crossing access roads or accessing wildlife crossings.

Road density was estimated to be 0.88 km/km^2 in the WLSA at Baseline, which will decline to 0.69 km/km^2 at Year 14 and 0.61 km/km^2 at Year 27 with the removal of several existing roads associated with construction, mine operations, and reclamation. An overall reduction in road density in the WLSA following progressive reclamation in Year 27 is expected to improve elk habitat effectiveness, although road density will not be reduced below the 25% habitat effectiveness threshold described by Lyon (1983). Road density in the WRSA was below the 25% threshold described by Lyon (1983) at Baseline (0.47 km/km^2) and not expected to be affected by Project development.

With mitigation (Section 7.0), Project effects on elk movements in the WLSA are expected to be regional in extent, long in duration, continuous in frequency, reversible in the short term, low in magnitude, and not significant. The project contributions are expected to be negative, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate. Permeability of the WRSA for elk is not expected to change appreciably as result of Project development and Project effects in the WRSA were considered not significant.

5.3.10.3 Change in Mortality Risk

Access on the active mine site will be restricted, which is expected to result in reduced hunting mortality of elk during mine operation. Use of firearms by Benga employees and contractors is prohibited and the facility access roads are not being designed as 'through routes' that would encourage poachers to enter the site. Benga will implement an Access Management Plan along Project access roads. Because access roads will be reclaimed, hunting pressure is not expected to increase.

Vehicular collisions resulting from increased traffic levels during the construction and operational phases of the Project (Hatch Mott MacDonald, 2015) could result in injury or mortality of ungulates, but can be minimized by controlled traffic speeds, road signage and employee education. In addition, elk generally avoid areas of high human use, so the effect of increased traffic volumes on the mine access road is not expected to significantly increase elk mortality risk.

Vehicular collisions could result in injury or mortality of ungulates, but can be minimized by controlled traffic speeds, road signage and employee education. However, although the linear feature density (*e.g.* vegetated trails, pipelines, and transmission lines only) was 3.1 km/km^2 in the WLSA at baseline, this density is expected to be reduced considerably during Project development and following reclamation/mitigation. Potential effects associated with increased predation as a result of induced access on moose are expected to be lower with Project development. Predators such as bears and coyotes may be attracted to garbage or waste generated for the Project. Benga will mitigate the attraction of wildlife by implementing a Waste Management Plan for the Project.

With mitigation (Section 7.0), Project-related effects on elk mortality risk in the WLSA are expected to be to be local in extent, long in duration, occasional in frequency, reversible in the short term, nil in magnitude, and not significant. The project contributions are expected to be negative, the confidence rating of these predictions is high, and the probability of occurrence is moderate. Mortality risk for elk in the WRSA is not expected to change appreciably as result of Project development and Project effects in the WRSA were considered not significant.

5.3.10.4 Change in Abundance

The Project is expected to increase elk winter habitat availability by 928.4 ha (59.4%) from baseline to Year 27 because of progressive reclamation and mitigation. Habitat suitable for winter forage by elk will become available as reclamation progresses across the landscape. Elk are expected to re-colonize these reclaimed areas by Year 14 to 27 resulting in a potential increase in the local elk population. The local elk population may also increase in response to hunting restrictions within the Mine Permit Boundary. According to BWT (2008), elk can be expected to colonize reclaimed portions of coal mines within 10 years of reclamation even when other parts of the mine are still being actively mined. As reclaimed habitats mature, the suitability and availability of reclaimed areas for winter elk forage will likely diminish. Positive effects of reclamation on elk abundance may last 25-50 years following successful reclamation of an area (Hab-Tech Environmental, 2012).

With mitigation (Section 7.0), Project-related effects on elk abundance in the WLSA are expected to be to be local in extent, residual in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The project contributions are expected to be positive, the confidence rating of these predictions is moderate, and the probability of occurrence is moderate. Abundance of elk in the WRSA is not expected to change appreciably as result of Project development and Project effects in the WRSA were therefore considered not significant.

5.3.11 Summary of Application Case Residual Effects for Valued Components

The Project will affect the 10 wildlife VCs through changes in habitat availability, habitat fragmentation/connectivity, mortality risk, all of which will affect local populations to some degree. With successful application of mitigation, the residual effects of the Project on habitat availability, habitat connectivity, mortality risk and abundance in the WLSA are summarized in Table 5.3-26. Most of the Project-related effects on wildlife will be locally confined primarily to the Project footprint although sensory disturbances associated with mine construction and operations will, for the most part, be limited to the WLSA. Residual effects are expected to be not significant for all assessed VCs.

Table 5.3-26 Summary of Effects Ratings for Wildlife VCs in the Wildlife Local Study Area, Wildlife Regional Study Area, and Grizzly Bear Regional Study Area for the Application Case

Wildlife VC / Potential Effects	Geographic Extent[1]	Duration[2]	Frequency[3]	Reversibility[4]	Magnitude[5]	Project Contribution[6]	Confidence Rating[7]	Probability of Occurrence[8]	Significance[9]
Columbia Spotted Frog									
Habitat Availability	Local	Long	Continuous	Long-term	Low	Negative	Moderate	High	Not Significant
Movement	Local	Long	Continuous	Short-term	Low	Negative	Moderate	High	Not Significant
Mortality Risk	Local	Extended	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant
Abundance	Local	Extended	Continuous	Long-term	Low	Negative	Moderate	High	Not Significant
Western Toad									
Habitat Availability	Local	Long	Continuous	Long-term	Low	Negative	Moderate	High	Not Significant
Movement	Local	Long	Continuous	Short-term	Low	Negative	Moderate	High	Not Significant
Mortality Risk	Local	Extended	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant
Abundance	Local	Extended	Continuous	Long-term	Low	Negative	Moderate	High	Not Significant
Olive-sided Flycatcher									
Habitat Availability	Local	Extended	Continuous	Long-term	Moderate	Negative	High	High	Not Significant
Movement	Local	Long	Continuous	Short-term	Low	Negative	High	High	Not Significant
Mortality Risk	Local	Long	Isolated	Short-term	Low	Neutral	High	High	Not Significant
Abundance	Local	Long	Continuous	Long-term	Low	Negative	High	High	Not Significant

Table 5.3-26 Summary of Effects Ratings for Wildlife VCs in the Wildlife Local Study Area, Wildlife Regional Study Area, and Grizzly Bear Regional Study Area for the Application Case

Wildlife VC / Potential Effects	Geographic Extent[1]	Duration[2]	Frequency[3]	Reversibility[4]	Magnitude[5]	Project Contribution[6]	Confidence Rating[7]	Probability of Occurrence[8]	Significance[9]
Great Gray Owl									
Habitat Availability	Local	Long	Continuous	Long-term	Low	Neutral	High	High	Not Significant
Movement	Local	Long	Continuous	Short-term	Low	Neutral	High	High	Not Significant
Mortality Risk	Local	Long	Occasional	Short-term	Low	Neutral	High	High	Not Significant
Abundance	Local	Long	Continuous	Short-term	Low	Negative	Moderate	Moderate	Not Significant
Little Brown Myotis									
Habitat Availability	Local	Extended	Continuous	Long-term	Moderate	Negative	High	High	Not Significant
Movement	Local	Long	Continuous	Short-term	Low	Neutral	High	Moderate	Not Significant
Mortality Risk	Local	Long	Occasional	Short-term	Low	Neutral	High	Low	Not Significant
Abundance	Local	Long	Continuous	Long-term	Low	Negative	High	Moderate	Not Significant
American Marten									
Habitat Availability	Local	Extended	Continuous	Long-term	Moderate	Negative	High	High	Not Significant
Movement	Local	Extended	Continuous	Long-term	Low	Negative	Moderate	Low	Not Significant
Mortality Risk	Local	Short	Occasional	Short-term	Low	Negative	Moderate	Low	Not Significant
Abundance	Local	Extended	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant

Table 5.3-26 Summary of Effects Ratings for Wildlife VCs in the Wildlife Local Study Area, Wildlife Regional Study Area, and Grizzly Bear Regional Study Area for the Application Case

Wildlife VC / Potential Effects	Geographic Extent[1]	Duration[2]	Frequency[3]	Reversibility[4]	Magnitude[5]	Project Contribution[6]	Confidence Rating[7]	Probability of Occurrence[8]	Significance[9]
Canada Lynx									
Habitat Availability	Regional	Extended	Continuous	Long-term	Moderate	Negative	High	High	Not Significant
Movement	Regional	Long	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant
Mortality Risk	Local	Long	Occasional	Short-term	Low	Negative	Moderate	Low	Not Significant
Abundance	Local	Extended	Continuous	Short-term	Low	Negative	Moderate	Low	Not Significant
Grizzly Bear									
Habitat Availability	Regional	Extended	Continuous	Long-term	Low	Positive	High	Moderate	Not Significant
Movement	Regional	Long	Isolated	Long-term	Low	Negative	High	Moderate	Not Significant
Mortality Risk	Local	Residual	Occasional	Long-term	Low	Negative	High	Moderate	Not Significant
Abundance	Local	Extended	Continuous	Long-term	Low	Positive	Moderate	Moderate	Not Significant
Moose									
Habitat Availability	Regional	Residual	Continuous	Long-term	Low	Positive	Moderate	Moderate	Not Significant
Movement	Regional	Long	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant
Mortality Risk	Local	Long	Occasional	Long-term	Low	Negative	High	Moderate	Not Significant
Abundance	Local	Residual	Continuous	Long-term	Low	Neutral	Moderate	Moderate	Not Significant

Table 5.3-26 Summary of Effects Ratings for Wildlife VCs in the Wildlife Local Study Area, Wildlife Regional Study Area, and Grizzly Bear Regional Study Area for the Application Case

Wildlife VC / Potential Effects	Geographic Extent[1]	Duration[2]	Frequency[3]	Reversibility[4]	Magnitude[5]	Project Contribution[6]	Confidence Rating[7]	Probability of Occurrence[8]	Significance[9]
Elk									
Habitat Availability	Regional	Residual	Continuous	Long-term	Low	Positive	High	High	Not Significant
Movement	Regional	Long	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant
Mortality Risk	Local	Long	Occasional	Long-term	Low	Negative	High	Moderate	Not Significant
Abundance	Local	Residual	Continuous	Long-term	Low	Positive	Moderate	Moderate	Not Significant

[1] Local, Regional, Provincial, National, Global

[2] Short, Long, Extended, Residual

[3] Continuous, Isolated, Periodic, Occasional

[4] Reversible in short term, Reversible in long term, Irreversible – rare

[5] Nil, Low, Moderate, High

[6] Neutral, Positive, Negative

[7] Low, Moderate, High

[8] Low, Moderate, High

[9] Not Significant, Moderate, Significant.

5.4 Special Status Wildlife Species

The Project could potentially affect several special status or highly-valued wildlife species that were not selected as wildlife VCs through habitat loss and alteration, changes in movement, and increases in mortality risk. To address potential Project-related effects on these special status or highly valued species, a high level assessment was conducted. The wildlife species selected included those that were either confirmed to occur in the WLSA through baseline field surveys and/or incidental and First Nations observations or that would have a high likelihood of occurring in the WLSA based on the presence of potentially suitable habitats. These species include barn swallow, common nighthawk, short-eared owl, and wolverine which are listed as "May Be At Risk" provincially and/or "Threatened" or of "Special Concern" by SARA or COSEWIC, and bighorn sheep, mountain goat, bald eagle and golden eagle because of their value to wildlife watchers, traditional users, and/or hunters. Golden eagles and bald eagles have significant cultural and spiritual importance to Treaty 7 First Nations (*e.g.* Kainai Nation 2015, Piikani Nation 2015, Tsuut'ina Nation 2015). Additionally, bighorn sheep have been hunted in the area by members of the Kainai and Piikani Nations and are valued for their horns, meat, and hides (Kainai Nation 2015, Piikani Nation 2015, Tsuut'ina Nation 2015). Mountain goats and big horn sheep are also prized game species by hunters in Alberta.

5.4.1 Barn Swallow

The Project may affect potential barn swallow nesting habitat if old, abandoned mine structures are removed and potential foraging habitat associated with small wetlands are removed during construction and operations. Although barn swallows are generally tolerant of human activity, they are likely to avoid habitats located close to an active mine site, particularly during high-impact activities such as blasting.

The Project development is unlikely to create any major barriers to movement due to the high level of mobility of barn swallows.

The primary mechanisms by which Project development may increase barn swallow mortality include increases in collisions with vehicles associated with increased traffic volume and the potential destruction of barn swallow nests. Bird collisions can be minimized by establishing and enforcing a low speed limit on the mine access road. Potential destruction of barn swallow nests can be avoided by conducting pre-disturbance nest searches of potential nesting habitat (*e.g.* old buildings) during the breeding season (May to September).

The effects of Project development on barn swallows in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, low in magnitude, low in probability, and not significant (Table 5.4-1). Project contribution to changes in barn swallow abundance and habitat availability will be negative during the lifespan of the Project, but will be reversible in the short-term. The effects are predicted to be of low impact as the WLSA does not appear to have a large population of barn swallows. If they are present, they are likely rare. Because it is unclear if barn swallows breed in the WLSA, the confidence rating is low.

5.4.2 Common Nighthawk

5.4.2.1 Species Account and Potential Project Effects

The primary effect that Project development will have on common nighthawks is likely associated with direct habitat loss. Potential habitat types in the WLSA that provide either good foraging or nesting habitats for common nighthawks may include open forested stands (*e.g.* open pine, open deciduous, open mixedwood, and open mixed coniferous types), wetlands (*e.g.* shrubby and treed wetlands), open natural areas (*e.g.* grassland, rock/barren types), and various anthropogenic disturbances (*e.g.* cutblocks, pipelines, well sites, perennial crops, and other clearings).

Project development may result in further indirect habitat loss for common nighthawks from increased noise levels associated with construction and operations activities. It is unclear how common nighthawks are affected by anthropogenic noise, although they often live and breed in cities and therefore likely habituate easily to many sources of noise (Brigham *et al.,* 2011). Common nighthawks are therefore unlikely to be completely displaced from the WLSA, although they may avoid areas around the active mine site while high-impact activities (such as blasting) take place. Common nighthawk abundance may decrease during the life of the Project but will likely recover following reclamation of the area.

Common nighthawk mortality associated with Project development is likely to be limited to nest destruction associated with vegetation clearing. However, by conducting vegetation clearing outside of the recommended restricted activity period (May to August), common nighthawk mortality (eggs and/or chicks) can be avoided (Environment Canada, 2015a). Other sources of mortality associated with Project development include collisions with vehicles and Project infrastructure, such as buildings and transmission lines. Vehicle collisions can be reduced by establishing and enforcing a low speed limit on the access road. Bird collisions with buildings can be reduced by placing visual markers on windows, and collisions with the proposed power line can be reduced by placing large 'floats' or other markers on it (APLIC, 2012).

Project development is unlikely to alter common nighthawk movement in the area.

The effects of Project development on common nighthawks in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, low in magnitude, high in probability, and not significant (Table 5.4-1). The Project contribution to changes in common nighthawk abundance and habitat availability will be negative during the lifespan of the Project, but will be reversible in the short-term. The confidence rating associated with this assessment is moderate, as common nighthawks are known to occur and likely breed in the WLSA.

5.4.2.2 Impacts to Recovery Strategy

The recovery strategy for common nighthawk (*Contopus cooperi*) in Canada (Environment Canada, 2016b) indicated that there is currently little understanding of what comprises critical habitat for the species in Canada and what are the primary threats to this species' survival. However, reduced availability of insect prey is thought to be a key factor in the decline of this species. There is little known about this species' habitat preferences, and its distribution and abundance across Canada. No action plan has yet been developed for this species but planning to eliminate or reduce knowledge gaps about the species is a priority of the recovery strategy. The recovery strategy indicates several knowledge gaps requiring research, including, but not limited to, identification of critical habitat, determining relative important of breeding and non-breeding habitats, determining threats to the species and its prey, determining availability of nesting sites, determining impacts of climate change, and understanding what site characteristics lead to high collision rates.

The objectives of the recovery strategy include reducing the decline of the species across its Canadian range (abundance and distribution), halting the national decline of the species by 2025, and subsequently ensuring a 10 year increase in abundance across the country. A loss of suitable breeding habitat and reduced population density arising from Project effects in the WLSA would be counter to the initial 10 year plan for common nighthawk.

Working in consultation with the common nighthawk recovery team to monitor presence, abundance, habitat use, fidelity to breeding sites, and factors affecting survival and reproductive output within the WLSA would provide valuable information required for the conservation of this species in both the short-term and long-term.

5.4.3 Short-eared Owl

Sources of mortality associated with Project development include collisions with vehicles and Project infrastructure, such as buildings and transmission lines. Vehicle collisions can be reduced by establishing and enforcing a low speed limit on the access road. Bird collisions with buildings can be reduced by placing visual markers on windows, and collisions with the proposed power line can be reduced by placing large 'floats' or other markers on it (APLIC, 2012). Mortality of birds will be monitored around Project facilities and mitigations will be corrected if required.

The main effect of Project development on short-eared owls in the WLSA is likely to be associated with habitat loss. Vegetation clearing activities associated with Project development have the potential to destroy bird nests, including those of short-eared owls. This can be mitigated by avoiding vegetation clearing within their breeding season (May – August). If vegetation clearing or other high impact activities must occur during the breeding season, a pre-disturbance nest search should be conducted to avoid the destruction of active nests, eggs, and fledglings. If active nests are found, Government of Alberta setback distances should be followed (GoA, 2013).

The geographic extent of Project effects on short-eared owl habitat in the WLSA is predicted to be local, long in duration, and continuous in frequency. The magnitude of these effects is predicted to be low, and because short-eared owl appears to be rare in the vicinity of the WLSA, the overall impact rating is not significant (Table 5.4-1). The effects are expected to be reversible in short term, as reclamation of disturbed mine areas progresses across the landscape. The probability of occurrence and the confidence rating are both low since short-eared owls appear to be uncommon and it is unclear if they breed in the WLSA. The overall contribution of the Project is negative, as some potential short-eared owl habitat will be lost.

5.4.4 Bald Eagle

Project development may result in indirect habitat loss for overwintering or breeding bald eagles if they begin avoiding the Crowsnest River in response to increased anthropogenic disturbance. Bald eagles generally prefer to nest in areas with little to no human disturbance (Peterson, 1986). The section of the Crowsnest River located in the WLSA is already close to a major highway with high traffic volume, an active railway, and a town, so Project development is unlikely to alter bald eagle abundance in the area relative to Baseline levels.

Project development is unlikely to affect the migration pathways of bald eagles. The USFWS (2015) notes that bald eagles are more tolerant of human activities during the non-breeding season than during the breeding season. Bald eagles may slightly alter their flight pathways or increase their altitudes if very high disturbance activities (*e.g.* blasting) occur during migration. Project development is not predicted to adversely affect migrating birds. Both bald and golden eagles will migrate over highly disturbed areas they would not otherwise use as habitat, including large cities (*e.g.* City of Toronto 2009).

Potential sources of increased mortality for bald eagles associated with Project development include increased numbers of collisions with traffic, electrocutions associated with the proposed power line, and the destruction of nests from vegetation clearing. Increases in mortality from traffic collisions can be reduced by maintaining and enforcing a speed limit on the access road. Additionally, pre-disturbance nest searches will be conducted prior to high-intensity activities (such as vegetation clearing) and if a nest is found, appropriate mitigation measures will be implemented, such as restricting high-impact industrial activities in a buffer zone around the nest. The Government of Alberta (2013) has published recommended setback distances from bald eagle nests for low, medium, and high-intensity activities and these will be used as guidelines for establishing buffer zones around bald eagle nests.

Bird deaths associated with power lines can be minimized by following guidelines outlined by APLIC (2012). For example, placing large floats and other markers on power lines can reduce the number of bird collisions by making them more visible to birds, and the use of "tree wire" can protect birds from collision-electrocutions (APLIC, 2012).

Increased levels of selenium in waterways in the WLSA would have the potential to affect bald eagles. Selenium concentrations seven to ten times higher than natural background levels have been found downstream of coal mines in Elk Valley, which is approximately 40 km from the proposed Project (Hauer and Sexton, 2013). However, a water management program has been developed to treat and remove selenium to ensure that water quality parameters do not have significant effects on wildlife health (Section C.8 – Geochemistry and Selenium Management).

The effects of Project development on bald eagles in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, low in magnitude, low in probability, and not significant (Table 5.4-1). The Project contribution to changes in bald eagle abundance and habitat availability will be negative during the lifespan of the Project, but are expected to be reversible in the short-term. The confidence rating is moderate, as bald eagles have been documented in the WLSA, although no nests have yet been located.

5.4.5 Golden Eagle

As with bald eagles, Project development is unlikely to affect the migration pathways of bald eagles because of their tendency to increase their altitudes when flying over highly disturbed areas.

Potential sources of increased mortality for golden eagles associated with Project development are similar to those discussed for the bald eagle (refer to Section 5.4.4).

It is possible that any golden eagles that may be nesting near the Project may abandon their territories in response to the increased human activity associated with Project development. There will also be a small loss of habitat for golden eagles because they are likely to avoid areas of the site that are actively mined. However, as reclamation progresses across the landscape, golden eagles will likely begin to use the reclaimed areas as prey populations begin increasing.

The effects of Project development on golden eagles in the WLSA are predicted to be local in extent, long in duration, continuous in frequency, low in magnitude, moderate in probability, and not significant (Table 5.4-1). The Project contribution to changes in golden eagle abundance and habitat availability will be negative during the lifespan of the Project, but they will be reversible in the short-term. The confidence rating is moderate, as golden eagles have been documented in the WLSA, although no nests have been found yet.

5.4.6 Mountain Goats

The primary effect of Project development on mountain goats is likely to be related to increased habitat fragmentation. Mountain goats can be particularly sensitive to unpredictable stimuli and sudden, loud disturbances (Polfus, 2008) and are likely to avoid travelling through or near the Project area, particularly during high-impact activities such as blasting. Mountain goats may also avoid crossing roads (Polfus, 2008) and the coal conveyor and access road may function as barriers to movements. Barriers to movement will be mitigated by constructing wildlife underpasses and overpasses at suitable crossing locations along the coal conveyor. Similar crossings have been successful in facilitating mountain goat movement across a road. For example, mountain goats in Glacier National Park in Montana frequently use a highway underpass to reach a mineral lick (Pedevillano and Wright, 1987).

No significant increases in mountain goat mortality are expected to occur as a result of Project development since mountain goats are uncommon in the WLSA. The WLSA does not contain suitable goat habitat and Project-related losses of effective goat habitat are expected to be minimal. If goats are present, the steep terrain in the highwall in the reclaimed landscape will provide suitable escape terrain.

The primary effects of the Project on mountain goats will be related to potential habitat fragmentation which may affect movements between the Livingstone Range and Crowsnest Mountain. The effects are predicted to be regional in extent, long in their duration, continuous in frequency, low in magnitude, and not significant (Table 5.4-1). The effects are predicted to be reversible in the short term, as mine affected areas will be progressively reclaimed as the Project moves across the landscape. The probability of impact occurrence is moderate.

5.4.7 Bighorn Sheep

Due to the lack of suitable summer and winter habitats in the WLSA, habitat loss arising from the Project is not an expected effect on bighorn sheep.

The Project has the potential to alter bighorn sheep movements within the WLSA and WRSA. Bighorn sheep may move through the area while travelling between winter and summer ranges. For example, male bighorn sheep in southwest Alberta have made movements of up to 48 km (Festa-Bianchet 1986). In western Montana, DeCesare and Pletscher (2006) detected extra-home range movements of up to 33 km in male bighorns. Poole (2013) similarly reported that one of 41 radio-collared sheep (a four year old ram) in the Elk Valley made extra-home range movements of 38 km and 20 km in June and December, respectively. Bighorn sheep are likely to avoid moving through or near the active mine area and may avoid the coal conveyor and access road as well, although bighorn sheep often habituate to vehicle traffic (Weaver, 2013). If the Project area is avoided, this could potentially funnel animals towards Highway 3 which may result in an increase in sheep vehicle collisions between Blairmore and Coleman. To mitigate this potential funnel effect on sheep movements, wildlife crossings (overpasses and underpasses) will be placed at suitable locations along the coal conveyor.

The main effects of the Project on bighorn sheep will likely be related to potential habitat fragmentation as it relates to movement. The effects are predicted to be regional in extent, long in their duration, continuous in frequency, low in magnitude, and not significant (Table 5.4-1). The effects are predicted to be reversible in the short-term, as mined areas will be progressively reclaimed as the Project progresses over the landscape. Bighorn sheep in Alberta recolonized reclaimed land associated with the Gregg River and Luscar coal mines located east of Jasper National Park (McCallum, 1997), so some suitable bighorn sheep habitat may be created after reclamation. The probability of impact occurrence is moderate, as it is unclear if bighorn sheep currently use or travel within the WLSA, although they are known to occur nearby.

5.4.8 Wolverine

Project development will result in a direct loss of suitable forested and barren rock habitat in the short-term (Table 5.1-1). In addition, wolverines are likely to avoid habitats within at least 1 km of the Project because of increased human activity and sensory disturbance.

With Project development, the density of roads in the WLSA is not expected to increase although traffic volumes will increase along the existing access road. The active coal mine area, access road, and coal conveyor will likely affect east – west movements by wolverine because of the amount of human activity and sensory disturbance. The railway loop may further affect north – south movements of wolverine through the Highway 3 corridor.

Project development is unlikely to increase wolverine mortality since they appear to be uncommon in the WLSA. If wolverines do periodically occur in the vicinity of the WLSA, they are likely to avoid the Project area because of their sensitivity to human-related disturbances.

The main Project-related effects on wolverine in the WLSA will be related to direct and indirect habitat loss and habitat fragmentation. The effects are predicted to be regional in extent, residual in duration, continuous in frequency, low in magnitude, and not significant. The effects are predicted to be reversible in the long term, as affected areas will be reclaimed and subalpine coniferous can be re-established in previously mined areas (Macyk, 2003). Re-establishing mature subalpine coniferous forests will take several decades. The probability of occurrence is moderate, as wolverines are well-known to avoid developed areas but it is unclear if wolverines currently use or travel within the WLSA. The confidence rating associated with this assessment is moderate.

5.4.9 Summary

The predicted project-specific effects on the eight special status species described in this section are summarized in Table 5.4-1. Project-related effects on all eight special status species are predicted to be not significant.

Table 5.4-1 Summary of Predicted Project Effects on Wildlife Special Status Species

Wildlife VC	Geographic Extent[1]	Duration[2]	Frequency[3]	Reversibility[4]	Magnitude[5]	Project Contribution[6]	Confidence Rating[7]	Probability of Occurrence[8]	Significance[9]
Barn Swallow	Local	Long-term	Continuous	Short-term	Low	Negative	Moderate	Low	Not Significant
Common Nighthawk	Local	Long-term	Continuous	Short-term	Low	Negative	Moderate	High	Not Significant
Short-eared Owl	Local	Long-term	Continuous	Short-term	Low	Negative	Low	Low	Not Significant
Bald Eagle	Local	Long-term	Continuous	Short-term	Low	Negative	Low	Low	Not Significant
Golden Eagle	Local	Long-term	Continuous	Short-term	Low	Negative	Moderate	Moderate	Not Significant
Mountain Goat	Regional	Long-term	Continuous	Short-term	Low	Negative	Moderate	Moderate	Not Significant
Bighorn Sheep	Regional	Long-term	Continuous	Short-term	Low	Negative	Moderate	Moderate	Not Significant
Wolverine	Regional	Residual	Continuous	Long-term	Low	Negative	Moderate	Moderate	Not Significant

[1] Local, Regional, Provincial, National, Global
[2] Short, Long, Extended, Residual
[3] Continuous, Isolated, Periodic, Occasional
[4] Reversible in short term, Reversible in long term, Irreversible – rare
[5].Nil, Low, Moderate, High
[6] Neutral, Positive, Negative
[7] Low, Moderate, High
[8].Low, Moderate, High
[9] Not Significant, Moderate, Significant..

5.5 Migratory Birds

The effects of Project development on 10 selected wildlife VCs were assessed quantitatively using habitat suitability index or resource selection function modelling approaches. One of these species, the olive-sided flycatcher, is protected under the MBCA and SARA. In addition, high-level assessments (which did not include habitat suitability index modelling) were conducted for eight species, two of which are protected by the MBCA and SARA (common nighthawk and barn swallow).

As indicated in Section 3.2.3, wildlife VCs were selected based on various criteria including ecological, economic, and traditional use importance. The selected VCs serve as indicator species, which collectively represent most wildlife species in the WLSA, to focus the wildlife assessment in accordance with current practice in Alberta and Canada.

To further assess the effects of the Project on migratory birds, species that may occur in the WLSA were divided into groups based on their preferred habitat type (Table 5.5-1). Most of the migratory bird groups have habitat requirements that are similar to wildlife species selected as VCs (Table 4.6-1), although some do not. A high level assessment of potential Project effects on habitat availability, fragmentation and connectivity, mortality risk and health, and abundance for each group of migratory birds was conducted based on the criteria described in Table 3.2-3.

5.5.1 Change in Habitat Availability

The greatest effect of Project development on migratory birds will be direct habitat loss, most of which is expected to be temporary as disturbed habitats will be reclaimed progressively during Project operations. Wildlife habitat availability under the Baseline and Application (Years 14 and 27) Cases is summarized in Table 5.1-1.The largest extent of habitat loss will occur by Year 14 of Project development, and the largest losses will be of moderate mixed coniferous forest and closed mixedwood forest.

Due to the relative scarcity of wet, shrubby habitats in the WLSA, shorebirds, waterfowl, and other wetland-dependent birds (Table 4.6-1) are expected to be minimally affected by habitat loss. The abundance of species that prefer wet, shrubby habitats, such as common yellowthroat and Wilson's warbler, may decrease in the WLSA as they will be displaced to similar, nearby habitats.

Grassland species (Table 4.6-1) occur in the WLSA but are uncommon because of the relative scarcity of grassland habitat. By Year 14, it is expected that grassland habitat will be reduced by 52% (151 ha) while upland shrub habitat will remain unchanged. However, by Year 27, grassland habitat is predicted to increase by 20% (from 290 has to 349 ha) through progressive reclamation. Therefore, while there will be a temporary decrease in habitat availability for grassland-dwelling migratory birds up to Year 14, grassland habitat availability is expected to increase in the WLSA following progressive reclamation.

Forest-dwelling migratory bird species, particularly those that nest in coniferous and mixedwood forests (Table 4.6-1), will likely be the most affected by Project development. By Year 27 of the Application Case, there will be a reduction in the area of coniferous forest (open pine, open mixed coniferous, moderate mixed coniferous, closed spruce, and closed mixed coniferous habitat types) from 2,832 ha to 2,171 ha (661 ha; 23%) and a reduction in the area of mixedwood forest (open mixedwood and closed mixedwood habitat types) from 1,282 ha to 937 ha (345 ha; 27%). The area of deciduous forest in the WLSA (79 ha) will be minimally affected by Project development. By Year 27 of the Application Case, it is expected that deciduous forest will be reduced by 3.2 ha.

Species preferring old-growth forests are generally vulnerable to habitat loss as it can take 100 years or more for a young forest to display old-growth forest characteristics. The WLSA contains 169 ha of old growth forest, of which 8.3 ha will be affected by Project development (CR #8 – Vegetation and Wetlands, Section 4.5.1). Thus, effects of habitat loss on these species are anticipated to be minimal. The loss of habitat may potentially be offset if mature forests within the undisturbed parts of the WLSA reach the old-growth stage by Year 27 of the Application Case.

A small number of migratory bird species breed in open, rocky habitats, including alpine habitats (Table 4.6-1). By Year 14, it is expected that there will be a loss of 32 ha (66%) of rocky and barren habitat. However, by Year 27, the area of rocky barren habitat is predicted to be 18% greater than Baseline.

Some species with the potential to occur in the WLSA frequently build their nests on anthropogenic structures such as buildings or bridges (Table 4.6-1). One of these is the barn swallow, and the effects of the proposed Project on this species are discussed in Section 5.4.1. The effects of the proposed Project on other species that tend to build their nests on anthropogenic structures are expected to be similar.

In addition to direct habitat losses, Project development may result in indirect habitat losses from sensory disturbances since some migratory birds may avoid otherwise suitable habitats located close to the Project footprint. Sensory disturbances (*e.g.* noise, artificial lighting) arising from Project development may result in an indirect loss of habitat for migratory bird, as some birds may avoid otherwise suitable habitat because of this disturbance. For example, research conducted by Habib *et al*. (2007), Bayne *et al*. (2008), and Bayne and Dale (2011) in the boreal forest indicates that some migratory songbirds may be negatively affected by chronic anthropogenic noise through indirect loss of habitat (or reduced habitat effectiveness). Sound is important for avian communication and chronic noise from well pads, compressors, and road traffic has been reported to affect songbird density and pairing success (Habib *et al*., 2007; Bayne *et al*., 2008). Habib *et al*. (2007) reported that between 31% and 83% of the bird species analyzed were less abundant near a noise source (compressor station) than near a control site (a well pad without compressor station). These effects were noted up to 250 m from compressor stations. Bayne *et al*. (2008) found that up to one-third of bird species within 300 m of a compressor station were affected by noise levels averaging 48 dBA. The density of birds was 1.5 times higher in boreal aspen forests with no anthropogenic noise than in the same habitat beside a noise-generating compressor station (Bayne *et al*., 2008).

Overall, the geographic extent of all changes in habitat availability to migratory birds are predicted to be local, as no migratory bird species that occur in the area have breeding territories that exceed the size of the WLSA. The duration of Project effects will vary among species, but are predicted to be extended for forest-dwelling birds, residual for species that rely on old-growth forests, and long for all other species. The frequency of all Project-related effects on habitat availability for forest-dwelling migratory birds will be continuous, moderate in magnitude and reversible in the long-term. The frequency of all Project-related effects on habitat availability for all non-forest-dwelling migratory bird species will be continuous, nil to low in magnitude, and reversible in the short-term. The proposed Project contribution to changes in habitat availability for migratory birds is predicted to be positive for waterfowl, grassland species, and rock/cliff dwelling species and negative for all other species. The confidence rating for these predicted effects is high, the probability of occurrence is high and the predicted significance is not significant.

5.5.2 Habitat Fragmentation and Connectivity

Depending on territory sizes and nest locations, some species may be reluctant to cross the active mine area while breeding. Due to their mobility, migratory birds in general are not expected to incur large changes to their movements in the WLSA.

With mitigation (Section 7.1.4), the effects of Project development on migratory bird movements are predicted to be local in extent, long in duration, continuous in frequency, reversible in the short-term, low in magnitude, and not significant. The Project contribution to migratory bird movements are predicted to be negative, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.5.3 Change in Mortality Risk and Health

The destruction of nests during vegetation clearing could represent a source of migratory bird mortality associated with Project development. This source of mortality will be minimized by clearing vegetation outside of the period when most migratory birds breed in the WLSA (April 15 to August 31). Wherever possible, vegetation will be cleared outside of this time period. If clearing is required when migratory birds may be breeding, nest surveys will be completed prior to the clearing operations to determine if active nests are present in the vegetation to be cleared. If a nest is found, a temporary buffer zone will be established around the nest, where no clearing may take place until the nest is no longer active. The radius of the buffer will be based on both professional judgement and recommendations published by Environment Canada (2016d) and the Government of Alberta (2013c).

Other sources of migratory bird mortality associated with Project development may include bird collisions with windows, vehicles, or the proposed transmission line, or birds being poisoned through ingesting or swimming in contaminated water. After mitigation, increases in mortality from these causes are likely to be very low. Animal collisions on the access road will be reduced through establishing and enforcing a low speed limit, and bird collisions with buildings will be mitigated by placing visual markers on windows. Collisions with the proposed power line will be mitigated by installing large 'floats' or other markers on the lines. A strategy to minimize changes in water quality downstream of the proposed Project is being developed in conjunction with a water-quality monitoring program. Post-mitigation, sedimentation ponds will be reclaimed to wetland areas and may be used as breeding and foraging habitat by shorebirds and waterfowl.

In addition, changes to the health of waterfowl, shorebirds, and other species that nest along the shorelines and feed on aquatic life could occur if such species nest along the edges of the surge ponds. However, it is anticipated that the level of ongoing disturbance and noise at the surge ponds will deter birds from nesting along the pond edges.

Many of the potential Project-related effects on migratory bird mortality risk will be mitigated (Section 7.1.5). The largest mortality risk for migratory birds associated with Project development is the destruction of nests during vegetation clearing. However, this source of mortality will be mitigated by clearing vegetation outside of the breeding season for migratory birds (April 15 to August 25) to the extent possible.

With mitigation (Section 7.1.5), the effects of Project development on migratory bird mortality risk and health are predicted to be local in extent, long in duration, isolated in frequency, reversible in the short term, low in magnitude, and not significant. The Project contribution to migratory bird mortality is predicted to be neutral, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.5.4 Abundance

Changes in abundance of migratory birds may result from loss of habitats or direct mortality, as described in Sections 5.5.1 and 5.5.2.

Because of Project effects associated with direct and indirect habitat losses, the abundance of migratory birds within the Project footprint and adjacent habitats will be reduced over the short-term.

Migratory birds will largely be displaced to other suitable habitats in the WLSA and surrounding region. With mitigation (Section 7.0), the effects of Project development on migratory bird abundance are predicted to be local in extent, long in duration, continuous in frequency, reversible in the long term, low in magnitude, and not significant. The Project contribution to migratory bird abundance is predicted to be negative, the confidence rating for this prediction is high, and the probability of effect occurrence is high.

5.6 Traditional Resource Use

The Project will have temporary effects on land access for traditional resource use and on the distribution and abundance of species hunted for traditional purposes. Portions of populations of key hunted wildlife species are expected to be displaced into adjacent habitats as a result of mine activities. The return of these wildlife populations to the footprint during progressive reclamation and mitigation will depend on each species' preferred habitat types. Species preferring recently disturbed and young habitats are expected to return first, followed by species preferring increasingly older habitat types. As a result of restricted access to the public and restriction of firearms on site by Project personnel, abundance of some hunted species may increase in the areas accessible to First Nations groups.

5.6.1 Change in Access

To protect First Nations groups and the public from injury during Project construction and operations, access to and within the Mine Permit Boundary will be limited. Benga will develop an Access Control Policy and an Aboriginal Access Management Plan. Where and when safety is not compromised, First Nations will be able to access lands for traditional uses, such as hunting. Active mining areas will not be accessible until areas are reclaimed and safe.

5.6.2 Change in Distribution and Abundance of Key Hunted Species

Section H of the Application provides information on current hunting practices of Aboriginal groups included in the Aboriginal Consultation process for the Project. Three wildlife species common to the six First Nations groups who provided information about their hunting practices – grizzly bear, moose, elk, and– were assessed as VCs (Sections 5.3.8, 5.3.9, and 5.3.10). The results from these assessments, put into the context of effects on availability for traditional hunting practices, are provided in this section.

5.6.2.1 Moose, Elk, and Deer

The assessment of the availability of winter habitats, which is the most energetically restrictive period for moose and elk, indicated that suitable moose habitat and suitable elk habitat will decline initially, and then will become more abundant than baseline levels by end of mine (Sections 5.3.9 and 5.3.10).

The changes in abundance of moose and elk year-round in the WLSA are expected to follow a similar pattern as individuals of both species will be displaced into adjacent habitats. With the Access Control Policy and firearm prohibition by Project personnel, poaching and non-Aboriginal hunting of moose and elk will decline in the WLSA during the life of mine and may result in increased abundance of moose and elk in the areas accessible by First Nations groups.

Deer have similar habitat preferences and similar predators as moose and elk. Therefore, temporal patterns in distribution and availability of these species are expected to be similar to those described for moose and elk.

5.6.2.2 Grizzly Bear

The grizzly bear assessment results (Section 5.3.8) indicate that highly suitable grizzly habitat in the WLSA will decrease initially and then increase throughout the duration of progressive reclamation. Mortality risk also increases with project development (roads, linear features, pits and dumps, increased potential for human encounters) but then decreases with progressive reclamation. With reclamation, the Project footprint is expected to offer more suitable habitat (dietary resources) and lower mortality risk than under baseline conditions, which are anticipated to allow for an increase in the size of the grizzly population that the local area can support. Additionally, as with moose and elk, there is expected to be no poaching of grizzly during the life of mine as a result of Benga's policies.

6.0 PLANNED DEVELOPMENT CASE

The Planned Development Case (PDC) is also the cumulative effects assessment and includes the potential effects of the Project together with the combined effects of all other existing, approved, and planned projects at the regional (WRSA, GBRSA) scale.

6.1 Developments and Activities Included in Cumulative Effects Assessment

Baseline and approved projects and projects planned for the foreseeable future in the WRSA and GBRSA are summarized in Table 6.1-1. Most of the resource development currently occurring within the WRSA and GBRSA at baseline is associated with coal mining, forestry, and oil and gas activities. Other existing and approved developments and activities include various urban areas, road/rail/utility corridors, and recreational areas (including ski hills and golf courses). Several projects and activities are expected to occur in the reasonably foreseeable future including TECK Coal Michel Creek Coking Coal Project, expansion at the TECK Coal Elkview Baldy Ridge Expansion site, timber harvesting up to 2030 and beyond, Altalink Castle Rock Ridge to Chapel Rock Transmission Line, and a realignment of Highway 3 (Table 6.1-1). Including the Grassy Mountain Coal Project, planned developments will cover 11.1% (8,197.7 ha) of the WRSA (73,547.0 ha) and 6.8% (19,350.5 ha)